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Department of
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In cooperation with
Montana Agricultural
Experiment Station

 Natural
Resources
Conservation
Service

Soil Survey of Musselshell County, Montana Part I



How to Use This Soil Survey

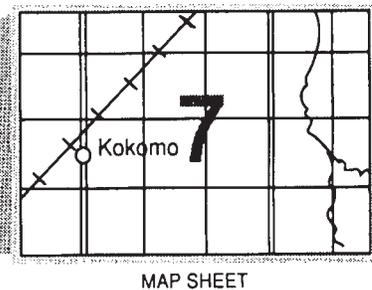
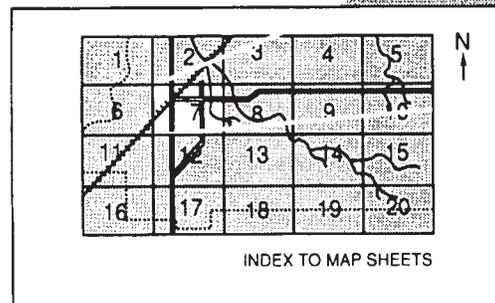
This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties.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

Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

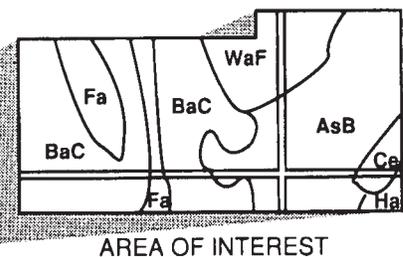
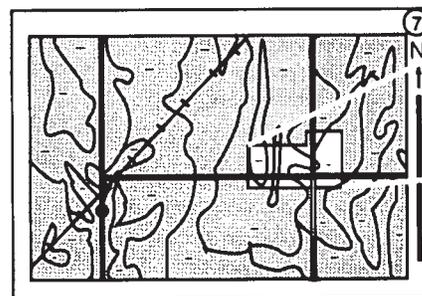
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

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



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

data base consists of a soils map at a scale of 1:250,000 along with groups of associated soils. It replaces the general soils map published in older surveys. This map and its data base can be useful for planning multi-county areas and map output can be tailored for specific use. For more information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, contact your local Natural Resources Conservation Service office.

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 (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Bureau of Land Management and the Lower Musselshell Conservation District. Financial assistance was provided by the Lower Musselshell Conservation District through the Montana Department of Natural Resources and Conservation.

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.

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Cover: The soils of Musselshell County are closely related to the landscape on which they occur. The soils in the foreground are Cabbart-Delpoint-Rock outcrop complex, 4-15 percent slopes.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov>.

Contents

Part I

Index to Series	11	283D—Barvon-Cabba loams, 2 to 8 percent slopes	49
Numerical Index to Map Units	12	289D—Barvon-Cabba-Korchea loams, 3 to 25 percent slopes	50
Summary of Tables	17	255D—Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	51
Foreword	19	Binna Series	51
Introduction	21	92A—Binna loam, 0 to 4 percent slopes	52
How This Survey Was Made	21	Bitton Series	52
General Nature of the Survey Area	22	295F—Bitton-Winifred-Castner complex, 15 to 60 percent slopes	53
History and Development	22	Blacksheep Series	54
Industry	23	80E—Blacksheep-Rock outcrop-Twilight complex, 8 to 45 percent slopes	55
Transportation and Recreation	23	243F—Blacksheep-Twilight sandy loams, 8 to 45 percent slopes	55
Physiography and Drainage	23	Borky Series	56
Geologic History and Regional Geology	24	296D—Borky-Sinnigam very stony clay loams, 2 to 15 percent slopes	57
Geologic Structure	25	Bullhook Series	57
Geologic Units	25	Busby Series	58
Coal, Oil, and Natural Gas Resources	28	30C—Busby fine sandy loam, 2 to 8 percent slopes	59
Ground Water Resources	28	30D—Busby fine sandy loam, 8 to 15 percent slopes	59
Seismic Activity	28	130B—Busby-Twilight complex, 2 to 8 percent slopes	60
Climate	29	Cabba Series	60
Formation and Classification of the Soils	33	289F—Cabba-Barvon loams, 15 to 65 percent slopes	61
Formation of the Soils	33	284D—Cabba-Barvon loams, 4 to 15 percent slopes	61
Classification of the Soils	34	285D—Cabba-Doney loams, 4 to 15 percent slopes	62
Soil Series and Detailed Soil Map Units	41	285F—Cabba-Doney loams, 8 to 45 percent slopes	63
Abor Series	42	283F—Cabba-Rock outcrop complex, 8 to 45 percent slopes	63
60B—Abor silty clay, 1 to 8 percent slopes	43	Cabbart Series	64
74E—Abor-Crago complex, 15 to 35 percent slopes	43	85A—Cabbart clay loam, 0 to 2 percent slopes	64
74D—Abor-Crago complex, 2 to 15 percent slopes	44		
60C—Abor-Neldore silty clays, 2 to 8 percent slopes	44		
Absher Series	45		
Attewan Series	46		
57B—Attewan cobbly loam, 0 to 4 percent slopes	47		
57A—Attewan loam, 0 to 4 percent slopes	48		
57C—Attewan-Niart loams, 0 to 4 percent slopes	48		
1E—Badland	48		
Barvon Series	49		

81D—Cabbart loam, 4 to 15 percent slopes	65	Chinook Series	78
280D—Cabbart, moist-Delpoint, dry loams, 4 to 15 percent slopes	65	90B—Chinook fine sandy loam, 2 to 8 percent slopes	78
287F—Cabbart, moist-Delpoint, dry loams, 8 to 45 percent slopes	66	Crago Series	79
181E—Cabbart-Crago-Delpoint complex, 15 to 35 percent slopes	66	93B—Crago cobbly loam, 1 to 6 percent slopes	80
181D—Cabbart-Crago-Delpoint complex, 4 to 15 percent slopes	67	94A—Crago gravelly loam, 0 to 8 percent slopes	80
288F—Cabbart-Delpoint loams, 15 to 65 percent slopes	68	94E—Crago gravelly loam, 8 to 35 percent slopes	81
82B—Cabbart-Delpoint loams, 4 to 15 percent slopes	68	96E—Crago-Abor complex, 4 to 35 percent slopes	81
82C—Cabbart-Delpoint-Rock outcrop complex, 4 to 15 percent slopes	69	95C—Crago-Attewan cobbly loams, 2 to 8 percent slopes	82
82E—Cabbart-Delpoint-Rock outcrop complex, 8 to 45 percent slopes	69	95B—Crago-Attewan-Musselshell cobbly loams, 0 to 4 percent slopes	82
154D—Cabbart-Marmarth complex, 4 to 15 percent slopes	70	95A—Crago-Musselshell cobbly loams, 0 to 4 percent slopes	83
86D—Cabbart-Rentsac complex, 2 to 15 percent slopes	71	93A—Crago-Musselshell complex, 0 to 4 percent slopes	83
86E—Cabbart-Rock outcrop complex, 4 to 35 percent slopes	71	56A—Crago-Musselshell-Attewan complex, 0 to 2 percent slopes	84
286F—Cabbart-Rock outcrop complex, 8 to 45 percent slopes	72	Creed Series	85
83D—Cabbart-Rock outcrop-Blacksheep complex, 8 to 45 percent slopes	72	123C—Creed-Gerdrum loams, 0 to 8 percent slopes	86
153D—Cabbart-Tanna loams, 4 to 15 percent slopes	73	Dast Series	86
84E—Cabbart-Yawdim-Delpoint complex, 15 to 35 percent slopes	73	242D—Dast-Ridge sandy loams, 2 to 8 percent slopes	87
84C—Cabbart-Yawdim-Delpoint complex, 4 to 15 percent slopes	74	Delplain Series	88
84D—Cabbart-Yawdim-Rock outcrop complex, 4 to 35 percent slopes	75	Delpoint Series	88
Castner Series	75	31B—Delpoint loam, 2 to 8 percent slopes	89
282D—Castner channery loam, 4 to 25 percent slopes	76	39B—Delpoint loam, calcareous, 2 to 8 percent slopes	89
280E—Castner-Kuro complex, 4 to 25 percent slopes	77	87B—Delpoint, calcareous-Cabbart loams, 2 to 8 percent slopes	90
281E—Castner-Rock outcrop complex, 8 to 45 percent slopes	77	39C—Delpoint, calcareous-Cabbart-Yamacall loams, 4 to 15 percent slopes	90
		287D—Delpoint, dry-Cabbart, moist loams, 2 to 8 percent slopes	91
		81B—Delpoint-Cabbart loams, 2 to 8 percent slopes	92
		81C—Delpoint-Cabbart loams, 8 to 15 percent slopes	92

288D—Delpoint-Cabbart-Havre loams, 4 to 25 percent slopes	93	8B—Harlake-Havre complex, 0 to 2 percent slopes	109
88D—Delpoint-Cabbart-Rock outcrop complex, 4 to 35 percent slopes	94	8A—Harlake-Havre complex, 0 to 2 percent slopes, occasionally flooded	109
31C—Delpoint-Cabbart-Yamacall loams, 4 to 15 percent slopes	94	17A—Harlake-Havre complex, calcareous, 0 to 2 percent slopes	110
131C—Delpoint-Yamacall loams, 2 to 8 percent slopes	95	20B—Harlake-Marvan-Vanda silty clays, 0 to 4 percent slopes	110
DA—Denied access	95	Havre Series	111
Doney Series	96	9A—Havre loam, 0 to 2 percent slopes	112
281D—Doney-Cabba-Macar loams, 4 to 15 percent slopes	96	10A—Havre loam, 0 to 2 percent slopes, occasionally flooded	112
284F—Doney-Wayden complex, 15 to 60 percent slopes	97	13A—Havre loam, calcareous, 0 to 2 percent slopes	112
Eapa Series	98	14A—Havre, calcareous-Glendive complex, 0 to 2 percent slopes	113
52A—Eapa loam, 0 to 2 percent slopes	99	14B—Havre, calcareous-Glendive complex, 0 to 2 percent slopes, occasionally flooded	113
52B—Eapa loam, 2 to 8 percent slopes	99	11A—Havre-Glendive complex, 0 to 2 percent slopes	114
152A—Eapa-Attewan loams, 0 to 2 percent slopes	99	11B—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded ...	114
Ethridge Series	100	15A—Havre-Harlake complex, calcareous, 0 to 2 percent slopes	115
51A—Ethridge clay loam, 0 to 2 percent slopes	101	12A—Havre-Harlake complex, channeled, 0 to 2 percent slopes	115
51B—Ethridge clay loam, 2 to 8 percent slopes	101	9B—Havre-Yamacall loams, 0 to 4 percent slopes	116
158A—Ethridge-Verson clay loams, 0 to 2 percent slopes	102	16A—Havre-Yamacall loams, calcareous, 0 to 4 percent slopes	116
Fergus Series	102	Hilger Series	117
254C—Fergus clay loam, 2 to 8 percent slopes	103	252E—Hilger stony loam, 4 to 25 percent slopes	118
Gerdrum Series	103	252D—Hilger-Rock outcrop complex, 4 to 35 percent slopes	118
23C—Gerdrum-Creed loams, 0 to 8 percent slopes	105	Hinterland Series	118
23A—Gerdrum-Vanda complex, 0 to 8 percent slopes	105	50B—Hinterland loam, 1 to 6 percent slopes	119
23B—Gerdrum-Vanda-Creed complex, 0 to 8 percent slopes	106	50C—Hinterland loam, 6 to 15 percent slopes	120
Glendive Series	106		
Harlake Series	107		
5A—Harlake silty clay, 0 to 2 percent slopes	108		
6A—Harlake silty clay, 0 to 2 percent slopes, occasionally flooded	108		

50D—Hinterland-Delplain complex, 8 to 25 percent slopes	120	Marmarth Series	138
Hughesville Series	120	54A—Marmarth fine sandy loam, 0 to 8 percent slopes	139
232E—Hughesville-Tibs-Whitecow complex, 2 to 25 percent slopes	122	154C—Marmarth-Cabbart loams, 2 to 8 percent slopes	139
Kobase Series	122	Marvan Series	140
40B—Kobase silty clay loam, 0 to 8 percent slopes	124	64B—Marvan silty clay, 0 to 8 percent slopes	141
40C—Kobase silty clay loam, calcareous, 0 to 8 percent slopes	124	64A—Marvan-Vanda silty clays, 0 to 8 percent slopes	141
140B—Kobase-Megonot silty clay loams, 0 to 8 percent slopes	124	McKenzie Series	142
140C—Kobase-Megonot silty clay loams, calcareous, 0 to 8 percent slopes	125	21A—McKenzie silty clay, 0 to 2 percent slopes	142
38A—Kobase-Zatoville silty clay loams, 0 to 8 percent slopes	125	Megonot Series	143
Korchea Series	126	68C—Megonot-Yawdim silty clay loams, 4 to 15 percent slopes	144
Kremlin Series	127	Musselshell Series	144
91A—Kremlin loam, 0 to 2 percent slopes	128	97A—Musselshell-Crago cobbly loams, 0 to 4 percent slopes	145
91B—Kremlin loam, 2 to 8 percent slopes	128	97B—Musselshell-Crago complex, 4 to 8 percent slopes	146
Kuro Series	128	Neldore Series	146
260F—Kuro-Wayden-Rock outcrop complex, 4 to 35 percent slopes	129	62C—Neldore silty clay, 4 to 25 percent slopes	147
Lamedeer Series	130	60E—Neldore-Abor silty clays, 15 to 45 percent slopes	147
245C—Lamedeer-Ringling channery loams, 2 to 8 percent slopes	131	60D—Neldore-Abor silty clays, 4 to 15 percent slopes	148
245F—Lamedeer-Ringling channery loams, 4 to 45 percent slopes	131	61D—Neldore-Neldore, saline silty clays, 4 to 25 percent slopes	148
246F—Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes	132	62E—Neldore-Rock outcrop complex, 15 to 45 percent slopes	149
Lostriver Series	132	61E—Neldore-Volborg silty clays, 4 to 25 percent slopes	149
7A—Lostriver silty clay, 0 to 2 percent slopes	133	62D—Neldore-Yawdim silty clays, 4 to 25 percent slopes	150
7B—Lostriver-Bullhook complex, 0 to 2 percent slopes	133	Niart Series	150
Macar Series	134	98A—Niart cobbly loam, 0 to 4 percent slopes	151
230C—Macar loam, 2 to 8 percent slopes	135	98B—Niart-Crago complex, 0 to 4 percent slopes	152
Macmeal Series	135	98C—Niart-Crago complex, 4 to 15 percent slopes	152
250E—Macmeal-Rock outcrop complex, 4 to 35 percent slopes	136		
Marias Series	137		
63A—Marias silty clay, 0 to 4 percent slopes	138		

98D—Niart-Rothiemy loams, 0 to 4 percent slopes	153	53A—Tanna loam, 1 to 6 percent slopes	170
Nobe Series	153	153C—Tanna-Cabbart loams, 2 to 8 percent slopes	171
22B—Nobe-Absher complex, 0 to 4 percent slopes	154	Tibs Series	171
Orinoco Series	155	234F—Tibs-Whitecow cobbly clay loams, 25 to 60 percent slopes	172
69C—Orinoco-Yawdim silty clay loams, 4 to 15 percent slopes	156	Twilight Series	173
Rentsac Series	156	32B—Twilight sandy loam, 2 to 8 percent slopes	174
89C—Rentsac fine sandy loam, 2 to 8 percent slopes	157	132B—Twilight-Blacksheep sandy loams, 2 to 8 percent slopes	174
189C—Rentsac-Cabbart complex, 2 to 15 percent slopes	157	32D—Twilight-Blacksheep-Rock outcrop complex, 4 to 25 percent slopes	175
189E—Rentsac-Rock outcrop complex, 15 to 45 percent slopes	158	241E—Twilight-Blacksheep-Rock outcrop complex, 4 to 35 percent slopes	175
Ridge Series	158	UL—Urban land	176
242F—Ridge-Dast sandy loams, 8 to 45 percent slopes	159	Vanda Series	176
240E—Ridge-Dast-Rock outcrop complex, 4 to 35 percent slopes	160	25A—Vanda silty clay, 0 to 4 percent slopes	177
Ringling Series	160	Verson Series	177
3A—Riverwash	161	58A—Verson clay loam, 0 to 4 percent slopes	178
2E—Rock outcrop	162	Volborg Series	179
Rothiemy Series	162	Warhorse Series	179
142A—Rothiemy loam, calcareous, 0 to 2 percent slopes	163	W—Water	180
142B—Rothiemy loam, calcareous, 2 to 8 percent slopes	163	Wayden Series	180
142C—Rothiemy-Crago complex, 4 to 15 percent slopes	163	261F—Wayden-Castner complex, 8 to 45 percent slopes	181
Savage Series	164	262E—Wayden-Windham complex, 4 to 25 percent slopes	181
251C—Savage loam, 2 to 8 percent slopes	165	Weingart Series	182
Shambo Series	165	26A—Weingart loam, 1 to 8 percent slopes	183
294C—Shambo loam, 2 to 8 percent slopes	166	26B—Weingart-Warhorse loams, 1 to 8 percent slopes	183
255C—Shambo-Korchea-Barvon loams, 2 to 8 percent slopes	166	Whitecow Series	184
Sinnigam Series	167	Windham Series	185
Straw Series	168	291C—Windham very stony loam, 2 to 15 percent slopes	186
292A—Straw-Korchea loams, 0 to 2 percent slopes	169	Winifred Series	186
Tanna Series	169	Yamacall Series	187
		34A—Yamacall clay loam, 0 to 2 percent slopes	188

34B—Yamacall clay loam, 2 to 8 percent slopes	189
37A—Yamacall clay loam, calcareous, 0 to 2 percent slopes	189
37B—Yamacall clay loam, calcareous, 2 to 8 percent slopes	189
33A—Yamacall loam, 0 to 2 percent slopes	190
33B—Yamacall loam, 2 to 8 percent slopes	190
41A—Yamacall loam, calcareous, 0 to 2 percent slopes	190
41B—Yamacall loam, calcareous, 2 to 8 percent slopes	191
35B—Yamacall-Busby complex, 2 to 8 percent slopes	191
36B—Yamacall-Delpoint loams, 2 to 8 percent slopes	192
41C—Yamacall-Delpoint loams, calcareous, 2 to 8 percent slopes	192
256C—Yamacall-Havre-Delpoint loams, 2 to 8 percent slopes	193
Yawdim Series	193
67D—Yawdim silty clay loam, 4 to 25 percent slopes	194
73E—Yawdim-Abor complex, 15 to 60 percent slopes	194
73D—Yawdim-Abor complex, 4 to 15 percent slopes	195
95E—Yawdim-Crago complex, 4 to 35 percent slopes	195
167E—Yawdim-Orinoco silty clay loams, 15 to 35 percent slopes	196
167D—Yawdim-Orinoco silty clay loams, 4 to 15 percent slopes	196
Zatoville Series	197
38B—Zatoville silty clay loam, 0 to 8 percent slopes	198
138B—Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes	198
References	201
Glossary	203

Part II

Detailed Soil Map Unit Legend

Summary of Tables

Introduction

Agronomy

- Cropland Limitations and Hazards
- Crop Yield Estimates
- Pasture and Hayland Interpretations
- Land Capability Classification
- Prime Farmland and Other Important Farmland
- Erosion Factors
- Windbreaks and Environmental Plantings

Range

- General Range Sites in Musselshell County
- Range Condition
- Rangeland Management
- Woodland Understory Vegetation

Forest Land

- Woodland Ordination System
- Forest Land Management and Productivity
- Forest Access Road Limitations and Hazards

Recreation

Wildlife Habitat

- Elements of Wildlife Habitat
- Kinds of Wildlife Habitat
- Wildlife in Musselshell County

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 Series

Abor Series	42	Macar Series	134
Absher Series	45	Macmeal Series	135
Attewan Series	46	Marias Series	137
Barvon Series	49	Marmarth Series	138
Binna Series	51	Marvan Series	140
Bitton Series	52	McKenzie Series	142
Blacksheep Series	54	Megonot Series	143
Borky Series	56	Musselshell Series	144
Bullhook Series	57	Neldore Series	146
Busby Series	58	Niart Series	150
Cabba Series	60	Nobe Series	153
Cabbart Series	64	Orinoco Series	155
Castner Series	75	Rentsac Series	156
Chinook Series	78	Ridge Series	158
Crago Series	79	Ringling Series	160
Creed Series	85	Rothiemy Series	162
Dast Series	86	Savage Series	164
Delplain Series	88	Shambo Series	165
Delpoint Series	88	Sinnigam Series	167
Doney Series	96	Straw Series	168
Eapa Series	98	Tanna Series	169
Ethridge Series	100	Tibs Series	171
Fergus Series	102	Twilight Series	173
Gerdrum Series	103	Vanda Series	176
Glendive Series	106	Verson Series	177
Harlake Series	107	Volborg Series	179
Havre Series	111	Warhorse Series	179
Hilger Series	117	Wayden Series	180
Hinterland Series	118	Weingart Series	182
Hughesville Series	120	Whitecow Series	184
Kobase Series	122	Windham Series	185
Korchea Series	126	Winifred Series	186
Kremlin Series	127	Yamacall Series	187
Kuro Series	128	Yawdim Series	193
Lamedeer Series	130	Zatoville Series	197
Lostriver Series	132		

Numerical Index to Map Units

1E—Badland	48	21A—McKenzie silty clay, 0 to 2 percent slopes	142
2E—Rock outcrop	162	22B—Nobe-Absher complex, 0 to 4 percent slopes	154
3A—Riverwash	161	23A—Gerdrum-Vanda complex, 0 to 8 percent slopes	105
5A—Harlake silty clay, 0 to 2 percent slopes	108	23B—Gerdrum-Vanda-Creed complex, 0 to 8 percent slopes	106
6A—Harlake silty clay, 0 to 2 percent slopes, occasionally flooded	108	23C—Gerdrum-Creed loams, 0 to 8 percent slopes	105
7A—Lostriver silty clay, 0 to 2 percent slopes	133	25A—Vanda silty clay, 0 to 4 percent slopes	177
7B—Lostriver-Bullhook complex, 0 to 2 percent slopes	133	26A—Weingart loam, 1 to 8 percent slopes	183
8A—Harlake-Havre complex, 0 to 2 percent slopes, occasionally flooded	109	26B—Weingart-Warhorse loams, 1 to 8 percent slopes	183
8B—Harlake-Havre complex, 0 to 2 percent slopes	109	30C—Busby fine sandy loam, 2 to 8 percent slopes	59
9A—Havre loam, 0 to 2 percent slopes	112	30D—Busby fine sandy loam, 8 to 15 percent slopes	59
9B—Havre-Yamacall loams, 0 to 4 percent slopes	116	31B—Delpoint loam, 2 to 8 percent slopes	89
10A—Havre loam, 0 to 2 percent slopes, occasionally flooded	112	31C—Delpoint-Cabbart-Yamacall loams, 4 to 15 percent slopes	94
11A—Havre-Glendive complex, 0 to 2 percent slopes	114	32B—Twilight sandy loam, 2 to 8 percent slopes	174
11B—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded	114	32D—Twilight-Blacksheep-Rock outcrop complex, 4 to 25 percent slopes	175
12A—Havre-Harlake complex, channeled, 0 to 2 percent slopes	115	33A—Yamacall loam, 0 to 2 percent slopes	190
13A—Havre loam, calcareous, 0 to 2 percent slopes	112	33B—Yamacall loam, 2 to 8 percent slopes	190
14A—Havre, calcareous-Glendive complex, 0 to 2 percent slopes	113	34A—Yamacall clay loam, 0 to 2 percent slopes	188
14B—Havre, calcareous-Glendive complex, 0 to 2 percent slopes, occasionally flooded	113	34B—Yamacall clay loam, 2 to 8 percent slopes	189
15A—Havre-Harlake complex, calcareous, 0 to 2 percent slopes	115	35B—Yamacall-Busby complex, 2 to 8 percent slopes	191
16A—Havre-Yamacall loams, calcareous, 0 to 4 percent slopes	116	36B—Yamacall-Delpoint loams, 2 to 8 percent slopes	192
17A—Harlake-Havre complex, calcareous, 0 to 2 percent slopes	110	37A—Yamacall clay loam, calcareous, 0 to 2 percent slopes	189
20B—Harlake-Marvan-Vanda silty clays, 0 to 4 percent slopes	110	37B—Yamacall clay loam, calcareous, 2 to 8 percent slopes	189
		38A—Kobase-Zatoville silty clay loams, 0 to 8 percent slopes	125

38B—Zatoville silty clay loam, 0 to 8 percent slopes	198	60C—Abor-Neldore silty clays, 2 to 8 percent slopes	44
39B—Delpoint loam, calcareous, 2 to 8 percent slopes	89	60D—Neldore-Abor silty clays, 4 to 15 percent slopes	148
39C—Delpoint, calcareous-Cabbart-Yamacall loams, 4 to 15 percent slopes	90	60E—Neldore-Abor silty clays, 15 to 45 percent slopes	147
40B—Kobase silty clay loam, 0 to 8 percent slopes	124	61D—Neldore-Neldore, saline silty clays, 4 to 25 percent slopes	148
40C—Kobase silty clay loam, calcareous, 0 to 8 percent slopes	124	61E—Neldore-Volborg silty clays, 4 to 25 percent slopes	149
41A—Yamacall loam, calcareous, 0 to 2 percent slopes	190	62C—Neldore silty clay, 4 to 25 percent slopes	147
41B—Yamacall loam, calcareous, 2 to 8 percent slopes	191	62D—Neldore-Yawdim silty clays, 4 to 25 percent slopes	150
41C—Yamacall-Delpoint loams, calcareous, 2 to 8 percent slopes	192	62E—Neldore-Rock outcrop complex, 15 to 45 percent slopes	149
50B—Hinterland loam, 1 to 6 percent slopes	119	63A—Marias silty clay, 0 to 4 percent slopes ...	138
50C—Hinterland loam, 6 to 15 percent slopes	120	64A—Marvan-Vanda silty clays, 0 to 8 percent slopes	141
50D—Hinterland-Delplain complex, 8 to 25 percent slopes	120	64B—Marvan silty clay, 0 to 8 percent slopes	141
51A—Ethrige clay loam, 0 to 2 percent slopes	101	67D—Yawdim silty clay loam, 4 to 25 percent slopes	194
51B—Ethrige clay loam, 2 to 8 percent slopes	101	68C—Mego not-Yawdim silty clay loams, 4 to 15 percent slopes	144
52A—Eapa loam, 0 to 2 percent slopes	99	69C—Orinoco-Yawdim silty clay loams, 4 to 15 percent slopes	156
52B—Eapa loam, 2 to 8 percent slopes	99	73D—Yawdim-Abor complex, 4 to 15 percent slopes	195
53A—Tanna loam, 1 to 6 percent slopes	170	73E—Yawdim-Abor complex, 15 to 60 percent slopes	194
54A—Marmarth fine sandy loam, 0 to 8 percent slopes	139	74D—Abor-Crago complex, 2 to 15 percent slopes	44
56A—Crago-Musselshell-Attewan complex, 0 to 2 percent slopes	84	74E—Abor-Crago complex, 15 to 35 percent slopes	43
57A—Attewan loam, 0 to 4 percent slopes	48	80E—Blacksheep-Rock outcrop-Twilight complex, 8 to 45 percent slopes	55
57B—Attewan cobbly loam, 0 to 4 percent slopes	47	81B—Delpoint-Cabbart loams, 2 to 8 percent slopes	92
57C—Attewan-Niart loams, 0 to 4 percent slopes	48	81C—Delpoint-Cabbart loams, 8 to 15 percent slopes	92
58A—Verson clay loam, 0 to 4 percent slopes	178		
60B—Abor silty clay, 1 to 8 percent slopes	43		

81D—Cabbart loam, 4 to 15 percent slopes	65	95B—Crago-Attewan-Musselshell cobbly loams, 0 to 4 percent slopes	82
82B—Cabbart-Delpoint loams, 4 to 15 percent slopes	68	95C—Crago-Attewan cobbly loams, 2 to 8 percent slopes	82
82C—Cabbart-Delpoint-Rock outcrop complex, 4 to 15 percent slopes	69	95E—Yawdim-Crago complex, 4 to 35 percent slopes	195
82E—Cabbart-Delpoint-Rock outcrop complex, 8 to 45 percent slopes	69	96E—Crago-Abor complex, 4 to 35 percent slopes	81
83D—Cabbart-Rock outcrop-Blacksheep complex, 8 to 45 percent slopes	72	97A—Musselshell-Crago cobbly loams, 0 to 4 percent slopes	145
84C—Cabbart-Yawdim-Delpoint complex, 4 to 15 percent slopes	74	97B—Musselshell-Crago complex, 4 to 8 percent slopes	146
84D—Cabbart-Yawdim-Rock outcrop complex, 4 to 35 percent slopes	75	98A—Niart cobbly loam, 0 to 4 percent slopes	151
84E—Cabbart-Yawdim-Delpoint complex, 15 to 35 percent slopes	73	98B—Niart-Crago complex, 0 to 4 percent slopes	152
85A—Cabbart clay loam, 0 to 2 percent slopes	64	98C—Niart-Crago complex, 4 to 15 percent slopes	152
86D—Cabbart-Rentsac complex, 2 to 15 percent slopes	71	98D—Niart-Rothiemay loams, 0 to 4 percent slopes	153
86E—Cabbart-Rock outcrop complex, 4 to 35 percent slopes	71	123C—Creed-Gerdrum loams, 0 to 8 percent slopes	86
87B—Delpoint, calcareous-Cabbart loams, 2 to 8 percent slopes	90	130B—Busby-Twilight complex, 2 to 8 percent slopes	60
88D—Delpoint-Cabbart-Rock outcrop complex, 4 to 35 percent slopes	94	131C—Delpoint-Yamacall loams, 2 to 8 percent slopes	95
89C—Rentsac fine sandy loam, 2 to 8 percent slopes	157	132B—Twilight-Blacksheep sandy loams, 2 to 8 percent slopes	174
90B—Chinook fine sandy loam, 2 to 8 percent slopes	78	138B—Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes	198
91A—Kremlin loam, 0 to 2 percent slopes	128	140B—Kobase-Megonot silty clay loams, 0 to 8 percent slopes	124
91B—Kremlin loam, 2 to 8 percent slopes	128	140C—Kobase-Megonot silty clay loams, calcareous, 0 to 8 percent slopes	125
92A—Binna loam, 0 to 4 percent slopes	52	142A—Rothiemay loam, calcareous, 0 to 2 percent slopes	163
93A—Crago-Musselshell complex, 0 to 4 percent slopes	83	142B—Rothiemay loam, calcareous, 2 to 8 percent slopes	163
93B—Crago cobbly loam, 1 to 6 percent slopes	80	142C—Rothiemay-Crago complex, 4 to 15 percent slopes	163
94A—Crago gravelly loam, 0 to 8 percent slopes	80	152A—Eapa-Attewan loams, 0 to 2 percent slopes	99
94E—Crago gravelly loam, 8 to 35 percent slopes	81		
95A—Crago-Musselshell cobbly loams, 0 to 4 percent slopes	83		

153C—Tanna-Cabbart loams, 2 to 8 percent slopes	171	246F—Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes	132
153D—Cabbart-Tanna loams, 4 to 15 percent slopes	73	250E—Macmeal-Rock outcrop complex, 4 to 35 percent slopes	136
154C—Marmarth-Cabbart loams, 2 to 8 percent slopes	139	251C—Savage loam, 2 to 8 percent slopes	165
154D—Cabbart-Marmarth complex, 4 to 15 percent slopes	70	252D—Hilger-Rock outcrop complex, 4 to 35 percent slopes	118
158A—Ethridge-Verson clay loams, 0 to 2 percent slopes	102	252E—Hilger stony loam, 4 to 25 percent slopes	118
167D—Yawdim-Orinoco silty clay loams, 4 to 15 percent slopes	196	254C—Fergus clay loam, 2 to 8 percent slopes	103
167E—Yawdim-Orinoco silty clay loams, 15 to 35 percent slopes	196	255C—Shambo-Korchea-Barvon loams, 2 to 8 percent slopes	166
181D—Cabbart-Crago-Delpoint complex, 4 to 15 percent slopes	67	255D—Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	51
181E—Cabbart-Crago-Delpoint complex, 15 to 35 percent slopes	66	256C—Yamacall-Havre-Delpoint loams, 2 to 8 percent slopes	193
189C—Rentsac-Cabbart complex, 2 to 15 percent slopes	157	260F—Kuro-Wayden-Rock outcrop complex, 4 to 35 percent slopes	129
189E—Rentsac-Rock outcrop complex, 15 to 45 percent slopes	158	261F—Wayden-Castner complex, 8 to 45 percent slopes	181
230C—Macar loam, 2 to 8 percent slopes	135	262E—Wayden-Windham complex, 4 to 25 percent slopes	181
232E—Hughesville-Tibs-Whitecow complex, 2 to 25 percent slopes	122	280D—Cabbart, moist-Delpoint, dry loams, 4 to 15 percent slopes	65
234F—Tibs-Whitecow cobbly clay loams, 25 to 60 percent slopes	172	280E—Castner-Kuro complex, 4 to 25 percent slopes	77
240E—Ridge-Dast-Rock outcrop complex, 4 to 35 percent slopes	160	281D—Doney-Cabba-Macar loams, 4 to 15 percent slopes	96
241E—Twilight-Blacksheep-Rock outcrop complex, 4 to 35 percent slopes	175	281E—Castner-Rock outcrop complex, 8 to 45 percent slopes	77
242D—Dast-Ridge sandy loams, 2 to 8 percent slopes	87	282D—Castner channery loam, 4 to 25 percent slopes	76
242F—Ridge-Dast sandy loams, 8 to 45 percent slopes	159	283D—Barvon-Cabba loams, 2 to 8 percent slopes	49
243F—Blacksheep-Twilight sandy loams, 8 to 45 percent slopes	55	283F—Cabba-Rock outcrop complex, 8 to 45 percent slopes	63
245C—Lamedeer-Ringling channery loams, 2 to 8 percent slopes	131	284D—Cabba-Barvon loams, 4 to 15 percent slopes	61
245F—Lamedeer-Ringling channery loams, 4 to 45 percent slopes	131	284F—Doney-Wayden complex, 15 to 60 percent slopes	97

285D—Cabba-Doney loams, 4 to 15 percent slopes	62	289F—Cabba-Barvon loams, 15 to 65 percent slopes	61
285F—Cabba-Doney loams, 8 to 45 percent slopes	63	291C—Windham very stony loam, 2 to 15 percent slopes	186
286F—Cabbart-Rock outcrop complex, 8 to 45 percent slopes	72	292A—Straw-Korchea loams, 0 to 2 percent slopes	169
287D—Delpoint, dry-Cabbart, moist loams, 2 to 8 percent slopes	91	294C—Shambo loam, 2 to 8 percent slopes	166
287F—Cabbart, moist-Delpoint, dry loams, 8 to 45 percent slopes	66	295F—Bitton-Winifred-Castner complex, 15 to 60 percent slopes	53
288D—Delpoint-Cabbart-Havre loams, 4 to 25 percent slopes	93	296D—Borky-Sinnigam very stony clay loams, 2 to 15 percent slopes	57
288F—Cabbart-Delpoint loams, 15 to 65 percent slopes	68	DA—Denied access	95
289D—Barvon-Cabba-Korchea loams, 3 to 25 percent slopes	50	UL—Urban land	176
		W—Water	180

Summary of Tables

Part I

Temperature and Precipitation	30
Freeze Dates in Spring and Fall	31
Growing Season	32
Classification of the Soils	35
Acreage and Proportionate Extent of the Soils	37

Part II (For page numbers, see "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
Windbreak Suitability Group Species
Windbreak Suitability Groups
Range Site Names
Range Site Species List
Woodland Understory Vegetation and Habitat Type
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 affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil.

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.

Various land use regulations of federal, state, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

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. The location of each soil is shown on the detailed soil maps. Each soil that has a component included in a map unit name 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 Natural Resources Conservation Service or Cooperative Extension Service offices.

Dave White
State Conservationist
Natural Resources Conservation Service

Soil Survey of Musselshell County, Montana

Fieldwork by Jane C. Karinen, Howard B. Main, David H. Omen, David A. Vyain, and Robert E. Wegmann, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
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 may 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, in part, the survey of "Central Montana, Reconnaissance" published in 1953. It provides additional information and has maps that show the soils in greater detail.

Musselshell County is located in the south-central part of Montana (fig. 1) within the Rolling High Plains. The county has a land area of 1,197,200 acres, or 1,870 square miles. Fergus and Petroleum Counties border the county to the north, Rosebud County to the east, Yellowstone County to the south, and Golden Valley County to the west. Roundup, the county seat, is in the central part of the county, located along the Musselshell River.

Ranching, dryland farming, and coal and oil production are the current major occupations and

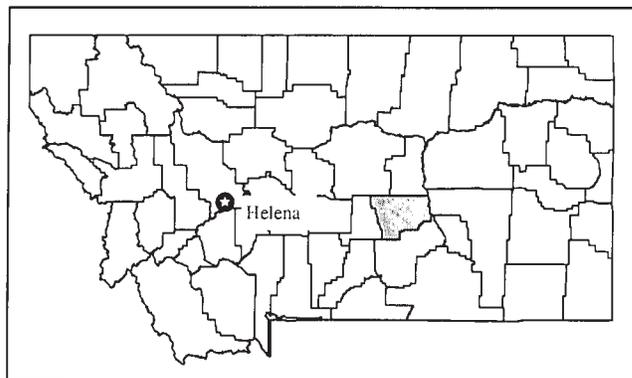


Figure 1. Location of Musselshell County in Montana.

industries in the survey area. About 65 percent of the county is used for range. Beef cattle and sheep are the main enterprises. About 5 percent of the county is used for dryland crops. The principal dryland crops are winter wheat, spring wheat, barley, alfalfa hay, grass-legume hay, and pasture. About 1 percent of the county is used for irrigated crops. Alfalfa hay and grass-legume hay are the main irrigated crops. About 20 percent of the county is used for woodland and understory grazing. Ponderosa pine is the dominant tree species.

Elevation in the survey area ranges from 2,710 to 4,905 feet. The mean annual precipitation ranges from 10 to 19 inches, and the mean annual temperature is 47 degrees F. The frost-free period ranges from 90 to 135 days.

History and Development

Musselshell County was established March 1, 1911 and was named after the Musselshell River that flows through it. The county's largest town and county seat is Roundup, which derived its name from its proximity to a historic staging ground for cattle roundups. Other towns of significant population are Melstone and Musselshell, both of which are located along the Musselshell River.

In the early 1900s, numerous other small towns were located throughout the county but have long since faded with the end of the homestead era.

Commercial coal mining dates back to shortly after the turn of the century when the Republic Coal Company purchased land near the town of Roundup to supply the expanding railroad. Soon after, many other smaller, yet significant, coal companies began business.

Musselshell County was also the scene of early oil field production in Montana. In 1919, the first well that

produced oil was completed in Devils Basin, an area north of Roundup.

Industry

Ranching, farming, and oil field production are the principal enduring industries in Musselshell County. Coal mining was, at one time, a substantial employer but has faded with the railroads. There is, however, potential for coal to be a significant player in area economics in the future. Local timber harvests are driven by the economics of the wood products industry, with the potential for marketable ponderosa pine existing mainly in the Bull Mountain region of the county.

Ranches, which are predominantly cow/calf operations, rely on livestock for nearly 85 percent of their income. Ranchers market livestock at public stockyards in Billings or deal directly with other local or regional buyers.

In dryland farming, winter wheat is the primary crop. Other main dryland crops grown are spring wheat, barley, alfalfa hay, and grass hay. Some alfalfa hay, grass hay, and grass-legume hay crops are irrigated, primarily along the Musselshell River.

Many productive oil fields currently operate in the northern part of the county.

Transportation and Recreation

Several county and state highways serve the Musselshell County area. U.S. Highway 12 runs east and west through the center of the county connecting the towns of Roundup, Musselshell, and Melstone. U.S. Highway 87 runs north and south through the center of the county, and through northern Yellowstone County, connecting Roundup with Billings and Interstate 94. Numerous secondary roads exist throughout the county; however, in areas where all-season surfaced roads do not exist, travel can be impeded by the weather.

Outdoor recreation opportunities are plentiful in Musselshell County. Elk, white-tailed deer, mule deer, antelope, turkey, various upland game birds, and waterfowl are prevalent. Fishing is good along accessible parts of the Musselshell River and other smaller creeks and ponds throughout the county.

Physiography and Drainage

Musselshell County lies within the unglaciated Missouri Plateau section of the Northern Great

Plains Province. The Musselshell River flows to the northeast through the center of the county, turning to the north at the eastern edge where it forms the northern section of the border between Musselshell and Rosebud Counties.

The entire county is included in this soil survey, including the Lake Mason National Wildlife Refuge, managed by the United States Fish and Wildlife Service.

The county contains portions of two mountain ranges. A small portion of the Little Snowy Mountains extends from Fergus County into the northwestern corner of Musselshell County. South of the Musselshell River, the Bull Mountains occupy the southern portion of the county, forming the divide between the Yellowstone and Missouri Rivers.

The county can be divided into three physiographic units. The northwestern corner of the county is mountainous. Plains, made up of shale lowlands separated by sandstone ridges, characterize the remaining area north of the Musselshell River. The plains contain several large, undrained basins including Devils and Lake Mason Basins. A small area of badlands occurs north of Melstone, where bare, steep slopes were eroded into soft shale. South of the Musselshell River, the Bull Mountains are characterized by gently sloping, linear ridgetops with rugged, deeply incised sideslopes.

Elevations range from 2,710 feet above sea level where the Musselshell River flows out of the county to a high of approximately 4,900 feet in the Little Snowy Mountains. Typical elevations in the Bull Mountains range from 3,800 to 4,700 feet. Roundup has an elevation of approximately 3,200 feet.

The Musselshell River drains almost all of the county. The Yellowstone River drains a small area in the southeastern corner of the county, southeast of Burnt Shed Coulee and Carpenter Creek.

The Musselshell River valley is nearly level and wide, ranging from less than half a mile to almost four miles in width. Most of its tributary streams are antecedent; that is, they follow courses preserved from a previous geologic period without regard to the existing geologic structure or topography.

Most of the tributaries of the Musselshell River in this area are intermittent streams. The major tributaries draining the Little Snowy Mountains include Currant, Cameron, Pole, Willow, and North Willow Creeks. Major tributaries draining the Bull Mountains include Dewey, Goulding, Halfbreed, Parrot, Fattig, Hawk, Carpenter, and Horsethief Creeks.

Geologic History and Regional Geology

The geologic history of Musselshell County began approximately 360 million years ago (mya) in the Mississippian Period of the mid-Paleozoic Era.

During most of Paleozoic time, most of Montana was slightly below sea level, covered by warm, shallow seas. Thick sequences of sediments were deposited on coastal plains and the shallow sea floor during alternating periods of emergence and submergence. Sandstone was deposited on beach and near-shore environments; shale was deposited in lower energy, deep-water environments; and limestone was normally formed in warm, shallow-water environments. The rock types grade both laterally and vertically into each other, and their thicknesses are not consistent across large areas. Dark organic matter contained within the sediments was converted into oil and gas and constitutes most of Montana's reserves.

By the beginning of the Pennsylvanian Period, 320-266 mya, much of Montana was above sea level, with the exception of the Big Snowy Trough. It extended through Central Montana from the Rocky Mountain Front to the Williston Basin. Sandstone, shale, and limestone were deposited in this basin during the late-Mississippian to early-Pennsylvanian Periods. Throughout the remainder of the Paleozoic Era, sandstone and shale were deposited on shore and near-shore environments. This era lasted from 570 to 245 mya, ending with an orogeny, or mountain-building episode.

The sea level rose again at the beginning of the Mesozoic Era, 245 to 67 mya. This era was the time of the dinosaur. Fluctuating sea levels continued throughout the Mesozoic Era, depositing thick sedimentary sequences, consisting predominantly of shale and sandstone. Sediments deposited during the Triassic (245-208 mya) and Jurassic (208-144 mya) Periods of the early- to mid-Mesozoic Era consist of a mixture of river, lake, delta, and coastal plain sediments. The land was nearly flat. The fluctuating shoreline shifted back and forth across the region, creating a complex interfingering pattern of sand and mud. Limestone deposition was not as common as it was during the Paleozoic Era. Mesozoic Era sediments also contain oil and gas.

The marine migrations continued without interruption until the late Cretaceous Period, 90 mya, when the uplift of the Rocky Mountains began in

Western Montana. In Musselshell County, marine deposition ended with the Hell Creek Formation, the last unit to be deposited in the late-Cretaceous Period.

As the mountains to the west were rising, rivers were extending to the east and depositing enormous volumes of sediment on a gently sloping plain. Sandstone was deposited in river channels and dunes, and mud was deposited across the landscape during flood events.

Volcanism occurring to the west spread thick layers of volcanic ash over this area. Bentonite, which is derived from weathered volcanic ash, occurs in many of the Cretaceous-aged sediments, particularly the marine shales. It is found in layers from a few inches thick to mineable beds up to 10-foot thick.

The Cretaceous Period ended approximately 67 mya with a decline in the intense mountain building activity and the extinction of the dinosaurs. While the fossils changed significantly, the character of the sediments remained the same as the deposition of massive amounts of sediment from the uplifting Rocky Mountains continued.

At the beginning of the Tertiary Period, 67 to approximately 2 mya, there was still a shallow sea to the east, and the climate was warm and wet. Swamps developed along the rivers and the coastal plain, containing abundant subtropical vegetation. As the sluggish rivers shifted and meandered, this vegetation was buried by the accumulating sediment and eventually converted to coal.

Fifty mya, after a relatively quiet period in the early-Tertiary Period, a major uplift occurred caused by compressional forces from the west. Volcanism increased, and the region rose several thousand feet. Large fault systems and broad folds were developed. The climate became dry, erosion increased, and the streams in Eastern Montana began downcutting into the soft sedimentary plain.

Alternating periods of wet and dry climates continued, changing the depositional and erosional patterns of the mid- to late-Tertiary Period. Most of those rocks have since been eroded; the youngest consolidated bedrock we see today in Musselshell County is from the early-Tertiary Period.

The climate remained mild and dry from 40 to 25 mya and large quantities of sediment were deposited across the Great Plains. Approximately 25 mya, the weather turned hot and wet and remained that way

for 10 million years. Rolling landscapes developed as rivers began eroding valleys into a lush, tropical landscape. Then, 15 mya the climate changed again, becoming extremely dry and probably colder. There was little plant cover and flash floods spread blankets of gravel across the landscape, forming the high plains. No permanent channels were established as gravel choked the streams, and they shifted with every flood event.

Two to three mya, the climate became wetter again and the Quaternary Period began. Plant cover was reestablished, minimizing erosion. Streams became entrenched, beginning to form the channels seen today. Since then, cold, wet ice ages have alternated with drier interglacial periods. Geologists estimate that there may have been up to 20 separate ice ages affecting Montana in the last three million years. (Alt, 1984.) Quaternary-aged deposits include the oldest known glacial deposits in Montana.

Glacial ice repeatedly advanced and retreated over northern Montana during the Pleistocene Epoch, the earliest of two epochs within the Quaternary Period, which lasted until 10,000 years ago. In a relatively early glacial advance, an ice dam on the Missouri River impounded Glacial Lake Musselshell in the area around and south of the Little Rocky Mountains. Water backed up into the northeast portion of Musselshell County. The fine-grained sediments that must have settled to the bottom of this lake have since been eroded; however, boulders dropped from icebergs floating in the lake are still scattered across the landscape.

Today, Musselshell County is geologically quiet. It lies in a tectonically stable area, with no active glaciation, and there has been little or no change to the pattern of the rivers in the Great Plains since the last glacial time. Presently, the streams are in a cycle of downcutting, depositing alluvium along the stream channels during periods of flooding. It is reasonable to expect that within the lifetime of the next several generations, there will be no major changes to the landscape.

Geologic Structure

The bedrock underlying Musselshell County has been folded into a variety of geologic structures, which are frequently associated with economic deposits of oil, gas, or coal. The major structures are the Bull Mountain Basin, occupying the area

south of the Musselshell River, and the Willow Creek Syncline, trending northwest to southeast through the northern portion of the county then turning east near the Lake Mason Wildlife Refuge. There is a major fault near the bottom of the Willow Creek Syncline that extends along most of its length and is downdropped to the south.

Devils Pocket Anticline and Pole Creek Anticline were formed during the Big Snowy Uplift and project into the northwestern corner of the county. To the north of Willow Creek Syncline are Devils Basin Anticline, Big Wall Dome, and Ivanhoe Dome north of Melstone. The Gage Dome lies between Willow Creek Syncline and Bull Mountain Basin, south of Big Wall Dome.

Geologic Units

The sequence of rocks exposed in Musselshell County is summarized below, listed in order of decreasing age. Formations are defined as a succession of strata distinctive enough to constitute a basic unit for mapping, identified by similar rock type and stratigraphic section. Formations can be combined into groups or subdivided into members. Systems are the rocks deposited during a particular geologic period.

Representative soil series are listed for each formation. In some cases, outcrop areas for a particular formation are small and difficult to differentiate in the field. In these cases, no soil series are correlated with the formation.

Paleozoic “Ancient Life” System (570 to 245 mya)

The oldest rocks in Musselshell County are the massive limestones of the Mission Canyon Formation of the Madison Group. These rocks were deposited in the Mississippian Period, 360-320 mya. These rocks outcrop in the Little Snowy Mountains and are associated with a reddish soil zone at the top of the formation. Typical soils derived from this formation include the Hughesville, Tibs, and Whitecow series.

The complete Mississippian System is over 2,500-foot thick in northeastern Musselshell County, and several of its formations are oil and gas producing. The overlying Pennsylvanian-aged rocks are 500-foot thick. This sequence of formations is softer and less resistant to erosion so does not have a significant area of outcrop in Musselshell County. Rocks

deposited during the Permian Period were removed by erosion during the Jurassic Period.

Mesozoic “Middle Life” System (245 to 66 mya)

Triassic Period (245-208 mya)

Rocks deposited during the Triassic Period were also removed by erosion during the Jurassic Period.

Jurassic Period (208-144 mya)

Jurassic-aged rocks are 500-feet thick in northwestern Musselshell County and thicken to approximately 700-feet in the southeastern corner of the county. These rocks consist of the marine Ellis Group that has been subdivided into the Piper, Rierdon, and Swift Formations, overlain by the nonmarine Morrison Formation. In Musselshell County, they outcrop only in a thin band at the base of the Little Snowy Mountains and consequently are not associated with a particular soil series.

The Piper Formation consists of a lower red bed and gypsum member; a middle member composed of gray shale, limestone, and dolomite; and an upper red bed and gypsum member. It is the eastern, stratigraphic equivalent of the Sawtooth Formation that is composed of marine sandstone and crops out in the mountains to the west.

The Rierdon Formation consists of fossiliferous limestones or limy shales that are thin, hard, and platy in outcrop.

The Swift Formation consists of a light-colored, fossiliferous sandstone or coquina and is very porous.

The Morrison Formation is nonmarine and consists of multicolored mudstone with lesser amounts of sandstone, carbonate rock, slightly carbonaceous mudstone, and some coal. This formation can be seen in outcrop as light yellow to tan, purple and brick red slopes near the base of the Little Snowy Mountains.

Cretaceous Period (144-67 mya)

The Kootenai Formation consists of red and green shales that contain large, fairly continuous sandstone channels. This Central Montana oil-producing formation has a basal conglomerate or sandstone that is locally and informally designated as the Third Cat Creek Sand by the petroleum industry. It is approximately 450-feet thick in northwestern Musselshell County, thinning to 200 feet in the southeastern corner. Typical soils derived from this

formation include the Fergus, Kuro, and Wayden series.

The overlying Fall River Sandstone is a fine-grained, finely laminated, yellowish-brown sandstone that is composed primarily of quartz. It is approximately 70-feet thick. Typical soils derived from this formation include the Bitton, Castner, and Winifred series.

The Colorado Group is a sequence of formations composed primarily of marine shale that is 1,880-feet thick. It has been subdivided into six formations: Thermopolis Shale, Mowry Shale, Belle Fourche Shale, Greenhorn Formation, Carlile Shale, and Niobrara Formation. It is exposed along the central portion of the northern border of Musselshell County. Devils Basin has been eroded almost completely through the Colorado Group, and its sequence of shales and sandstones are exposed in descending order. The relatively thin sandstone beds form small, concentric ridges within the basin. Typical soils derived from this group of formations include the Neldore, Volborg, and Zatoville series.

The Montana Group overlies the Colorado Group and contains marginal marine and continental deposits. It has been subdivided into six formations: Telegraph Creek Formation, Eagle Formation, Claggett Shale, Judith River Formation, Bearpaw Shale, and Fox Hills Sandstone. The formations crop out in a band that stretches across the northern central tier of the county and occupies the northeastern portion of the county north of the Musselshell River.

The oldest formation, Telegraph Creek Formation, is a transitional unit between the Niobrara Shale and the sandstones of the overlying Eagle Formation. It consists of sandy shales that weather to light gray with brick-red concretions at the base. The formation becomes sandier upward toward the base of the Eagle Formation. Typical soils derived from the Telegraph Creek Formation include the Cabbart, Gerdrum, and Yawdim series.

The Eagle Formation generally consists of light gray basal sandstone, a middle unit of shale with interbeds of sandstone and siltstone, and an upper unit of shaley sandstone with interbeds of shale. East of the Musselshell River, the formation is primarily shale. The basal sandstone forms the Big Wall just south of North Willow Creek. Total thickness of the formation is approximately 450-feet in Musselshell County, thickening to the east. Typical soils derived from this formation include the Blacksheep, Cabbart, and Eapa series.

The Claggett Formation consists of gray shales that weather to a velvety brown and contains highly fractured orange ironstone concretions. In the upper portion of the formation, the concretions are white and the size of footballs. Total thickness is approximately 750 feet. Typical soils derived from this formation include the Gerdrum, Neldore, and Volborg series.

The Judith River Formation consists predominantly of carbonaceous mudstone, with some coal, and large, fairly continuous sandstone channels. The sandstone characteristically weathers to a darker brown than the sandstone of the Eagle Formation and has a dirtier appearance. It is approximately 400-feet thick. Typical soils derived from this formation include the Busby, Cabbart, and Twilight series.

The Bearpaw Shale is composed of 600 to 700 feet of gray to black, bentonitic shales. The upper portion of the formation has increased sand content and is fossiliferous. Typical soils derived from this formation include the Abor, Gerdrum, Marvan, and Neldore series.

The Fox Hills Formation is the youngest member of the Montana Group. It is composed of fine- to medium-grained sandstone that weathers to light tan to orange, with interbedded gray shale. It is 150-feet thick in this area. It is poorly consolidated and consequently does not form prominent ridges; however, it is used extensively as an aquifer. Typical soils derived from this formation include the Blacksheep, Marmarth, and Twilight series.

The Hell Creek Formation, 200- to 600-feet thick, overlies the Fox Hills Formation. It was the last formation to be deposited in the Cretaceous Period before the final marine withdrawal. It is composed primarily of soft, fine- to medium-grained, gray to brown lenticular sandstone, interbedded with green to gray claystone and sandy shale. Sandstone beds are often over 25-feet thick. Thin, discontinuous coal seams, carbonaceous shales, and bentonite are also common within the formation. Typical soils formed on the sandstone bedrock include the Cabbart and Delpoint series. Typical soils formed on the shale bedrock include the Gerdrum, Tanna, and Yawdim series.

Cenozoic “Recent Life” System (66 mya to present)

Tertiary Period (67-1.6 mya.)

The remainder of the survey area is covered by the Fort Union Formation. It is more than 2,000-feet thick

and has been subdivided on the basis of color, topography, and the occurrence of coal. The members are the basal Tullock Member, the Lebo Shale, and the upper Tongue River Member.

The Tullock Member consists of 180- to 200-feet of light yellow, fine-grained sandstone and siltstone, interbedded with gray sandy or silty shale. It contains thin but laterally persistent coal beds that grade upward into light gray, carbonaceous shale. Typical soils derived from the Tullock Member include the Cabbart, Marmarth, and Yawdim series.

The Lebo Member consists of approximately 200 feet of dark gray, alkaline shale with thin interbeds of fine-grained sandstone, sandy shale, and coal. Calcareous and ironstone concretions are characteristic and weather to small, reddish-brown fragments covering outcrop slopes. In most areas, the Lebo Member is easily distinguished from the other members of the Fort Union Formation as it is darker in color and contains more clay. Sparsely vegetated badlands are commonly formed in Lebo outcrop. Typical soils derived from this formation include the Cabbart, Delpoint, and Yawdim series.

The uppermost Tongue River Member is the thickest of the Fort Union members and is the youngest bedrock exposed in Musselshell County. It consists of 700 to 1,400 feet of soft, light-colored, fine- to medium-grained sandstone with siltstone interbeds. It contains coal seams that are thicker and more persistent than those in the Tullock Member. Some of the coal is of economic importance.

The sandstone is thick bedded, locally crossbedded, and lenticular. In the Bull Mountains, the Tongue River Member contains more thick sandstone beds than in other areas, and they are uncharacteristically continuous. The sandstone beds represent old stream channels, and most grade laterally into siltstone and shale. Typical soils that developed on the sandstone bedrock include the Blacksheep, Dast, and Ridge series. Typical soils that developed on shalier bedrock include the Barvon, Cabba, and Yamacall series.

Upper Tertiary and Quaternary Deposits (38 mya to present)

There are unconsolidated terrace deposits of late-Tertiary to early-Quaternary age on some valley sides and upland areas along the Musselshell River. These deposits are remnants of former flood plains and consist predominantly of gravel interbedded with sand, silt, and clay. Typical soils derived from these

deposits include the Crago, Marias, and Musselshell series.

Southeast of the Little Snowy Mountains, there are extensive gravel terraces that rise gradually and become more continuous toward the mountains. Typical soils derived from these deposits include the Attewan, Crago, and Musselshell series.

Alluvial deposits formed in the last 10,000 years can be found along the Musselshell River and its tributaries. The most extensive alluvial deposits occur near the Musselshell River. They are unconsolidated and consist of clay, silt, and sand with local lenses of gravel. Typical soils derived from these deposits include the Glendive, Harlake, and Havre series.

Coal, Oil, and Natural Gas Resources

Fossil fuels have played an important part in the development of Musselshell County. Extensive coal deposits have been mined in the Bull Mountains since the late 1800s, and there are fifteen active oil fields in the northern portion of the county.

Coal was reported in the Bull Mountains in 1873, and geologic mapping was initiated in 1881. Ranchers and homesteaders, who excavated small outcrops for their own use, originally mined the coal. The first commercial mine opened in 1907 to provide fuel for the railroads. Most of the coal was mined by underground methods. Several coal mines operated for the first part of this century; however, the demand diminished in the 1950s as the railroads converted to diesel fuel. The last major mine closed in the mid-1960s; since then, mining has been ongoing but sporadic, involving only small volumes for local use.

The coal is subbituminous, relatively low in sulfur, and is in compliance with the United States Environmental Protection Agency's requirements for sulfur content. It is mined from the Tongue River Member of the Fort Union Formation that contains 26 persistent coal beds ranging from 1- to 15-feet thick. Most of the coal beds are lenticular and vary in thickness at different points along the bed. Three of these beds are thick enough to be mined with current technology.

Musselshell County still has significant coal reserves; however, their development will be dependent on the market, particularly the demand for specialty coal. Development of more efficient underground mining technology may enable the thinner coal seams to be commercially mined in the future.

Geologic structures favorable for the accumulation of oil were recognized in Musselshell County in the

early 1900s. No direct surface indications were observed; however, hydrogen sulfide gas was known to escape from several springs in the area, and several people reported natural gas in their hand-dug wells. Two wildcat drilling operations were underway by 1915. The Devils Basin field, discovered in 1919, was the first wildcat discovery in Montana. This discovery, and the Cat Creek field discovery in 1920, started a small oil boom that failed to find the reservoirs that are producing today. By the mid-1920s, the surface geology had been mapped, and most operators had left the area.

Exploration began again in the early 1940s due to increased demand caused by World War II. The first discovery in Central Montana during this period was the Gage Dome field, also in Musselshell County. Discovery of the Ragged Point field followed in 1948. The oil fields in production today were discovered in the period between 1948 and 1974.

Ground Water Resources

The most productive wells in Musselshell County are developed from alluvial gravels along the Musselshell River flood plain. Quantities of water suitable for stock and domestic use can be developed from sandstone and coal beds within the Tongue River Member of the Fort Union Formation and the Hell Creek and Fox Hills Formations. In the Tongue River Member, well depth is partially dependent on the topography, particularly on the relative position of the well with respect to the nearest stream. In general, drilling on ridgetops or divides results in the deepest wells with the greatest pump lifts in the area.

Most of the water developed from bedrock sources in this area is high in calcium and magnesium and is therefore hard and unsatisfactory for domestic use or irrigation. The water can be used successfully by most livestock.

Seismic Activity

Musselshell County lies in a seismically inactive area. The Earthquake Studies Office of the Montana Bureau of Mines and Geology maintains a network of seismographs throughout the State of Montana. There have been no earthquakes of any size recorded with epicenters in Musselshell County since the network began in 1982. While the historical record is very short, there is no evidence to indicate active seismicity in Musselshell County.

Climate

The table, "Temperature and Precipitation," gives data on temperature and precipitation in the survey area as recorded at Roundup and Melstone, Montana. Other tables, "Freeze Dates in Spring and Fall" and "Growing Season," show probable dates of the last spring freeze and the first fall freeze and provide data on length of the growing season, respectively.

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

The total average annual precipitation for Roundup during the period 1948 to 1995 is 12.51 inches. Of this, 9.63 inches, or 77 percent, usually falls from April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall is less than 9.32 inches.

The total average annual precipitation for Melstone during the period 1948 to 1995 is 14.32 inches. Of this, 10.51 inches, or 73 percent, usually falls from April through September. In 2 years out of 10, the rainfall is less than 10.36 inches.

During winter, the average January temperature for Roundup is 23.3 degrees F, and the average daily minimum temperature is 10.9 degrees F. The average January temperature for Melstone is 20.8 degrees F, and the average daily minimum temperature is 8.9 degrees F. During summer, the average July temperature for Roundup and Melstone is approximately 71.0 degrees F.

The average seasonal snowfall is 15.7 inches at Roundup with an average of 7 days per year that have at least 1 inch of snow on the ground. The average seasonal snowfall is 46.1 inches at Melstone with an average of 57 days per year that have at least 1 inch of snow on the ground.

Temperature and Precipitation

(Recorded in the period 1948-1995 at Melstone and Roundup, Montana.)

Month	Temperature (Degrees F.)					Precipitation (Inches)					
	Average	Average	Average	2 yrs in 10 will have		Average	2 years in 10			Average	Average
	daily	daily		max.	min.	number	Average	Less	More	number	
maximum	minimum	temp.	temp.	of	of	than	than	of days	total		
			more	less	growing				with	snow	
			than	than	degree				0.10 or	fall	
					days*				more		
MELSTONE:											
January----	32.7	8.9	20.8	62	-31	15	0.58	0.21	0.89	2	9.0
February----	39.9	14.9	27.4	69	-23	27	0.45	0.20	0.69	1	6.6
March-----	47.9	22.1	35.0	75	-14	67	0.72	0.30	1.08	2	7.4
April-----	59.9	31.5	45.7	85	11	211	1.42	0.54	2.15	4	5.4
May-----	70.2	41.4	55.8	93	24	488	2.48	1.25	3.56	5	1.2
June-----	79.5	49.9	64.7	99	35	731	2.56	1.34	3.63	6	0.0
July-----	88.2	54.9	71.6	104	40	952	1.47	0.46	2.29	4	0.0
August-----	87.4	53.4	70.4	103	38	921	1.25	0.46	1.90	3	0.0
September--	75.6	43.4	59.5	98	25	578	1.33	0.40	2.14	3	0.3
October----	63.8	33.5	48.6	88	11	293	0.89	0.34	1.46	2	2.4
November---	46.9	22.2	34.6	73	-12	60	0.57	0.29	0.89	2	4.9
December---	36.9	13.4	25.1	64	-26	18	0.59	0.18	0.92	2	8.9
Yearly:											
Average--	60.7	32.4	46.6	----	----	----	----	----	----	----	----
Extreme--	110	-43	----	105	-34	----	----	----	----	----	----
Total----	----	----	----	----	----	4,360	14.32	10.36	17.30	36	46.1
ROUNDUP:											
January----	35.7	10.9	23.3	62	-30	17	0.40	0.13	0.70	1	4.9
February---	42.4	16.4	29.4	68	-22	32	0.31	0.10	0.52	1	2.5
March-----	49.0	22.1	35.5	74	-14	73	0.53	0.16	0.84	1	2.2
April-----	60.3	31.7	46.0	84	12	219	1.09	0.45	1.63	3	1.2
May-----	70.4	41.3	55.8	92	24	491	2.22	0.92	3.32	5	0.0
June-----	79.2	49.4	64.3	98	35	721	2.38	1.19	3.42	5	0.0
July-----	87.7	54.4	71.1	103	41	954	1.53	0.49	2.38	4	0.0
August-----	87.2	52.3	69.7	102	37	911	1.26	0.46	1.97	3	0.0
September--	75.6	42.5	59.0	97	25	567	1.15	0.37	1.79	2	0.0
October----	64.4	33.4	48.9	87	10	300	0.84	0.28	1.34	2	0.3
November---	47.8	22.7	35.3	72	-11	66	0.40	0.13	0.70	1	1.1
December---	38.7	14.8	26.8	63	-26	21	0.40	0.14	0.71	1	3.5
Yearly:											
Average--	61.5	32.6	47.1	----	----	----	----	----	----	----	----
Extreme--	109	-44	----	104	-34	----	----	----	----	----	----
Total----	----	----	----	----	----	4,373	12.51	9.32	15.34	29	15.7

*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 (Threshold: 40.0 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1948-1995 at Melstone and Roundup, Montana.)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
MELSTONE:			
Last freezing temperature in spring:			
1 year in 10 later than----	May 11	May 17	May 30
2 years in 10 later than---	May 5	May 12	May 24
5 years in 10 later than---	April 23	May 2	May 14
First freezing temperature in fall:			
1 year in 10 earlier than--	September 25	September 17	September 8
2 years in 10 earlier than-	September 30	September 22	September 13
5 years in 10 earlier than-	October 11	October 2	September 22
ROUNDUP:			
Last freezing temperature in spring:			
1 year in 10 later than----	May 5	May 16	May 29
2 years in 10 later than---	April 30	May 11	May 24
5 years in 10 later than---	April 20	May 2	May 13
First freezing temperature in fall:			
1 year in 10 earlier than--	September 23	September 14	August 29
2 years in 10 earlier than-	September 29	September 19	September 4
5 years in 10 earlier than-	October 10	September 29	September 16

Growing Season

(Recorded in the period 1961-1990 at Blackleaf, Choteau Airport, Conrad, Fairfield, and Valier, Montana.)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	Days	Days	Days
BLACKLEAF:			
9 years in 10-----	127	97	66
8 years in 10-----	134	104	75
5 years in 10-----	149	119	91
2 years in 10-----	163	133	108
1 year in 10-----	171	140	117
CHOTEAU AIRPORT:			
9 years in 10-----	147	126	101
8 years in 10-----	156	135	108
5 years in 10-----	174	151	122
2 years in 10-----	191	168	136
1 year in 10-----	200	177	144
CONRAD:			
9 years in 10-----	134	112	81
8 years in 10-----	141	118	89
5 years in 10-----	156	130	105
2 years in 10-----	170	141	122
1 year in 10-----	178	147	130
FAIRFIELD:			
9 years in 10-----	146	126	99
8 years in 10-----	156	134	106
5 years in 10-----	174	151	120
2 years in 10-----	192	167	135
1 year in 10-----	202	175	142
VALIER:			
8 years in 10-----	155	132	105
5 years in 10-----	168	145	119
2 years in 10-----	182	157	133
1 year in 10-----	190	163	140

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" at the end of this section.

Formation of the Soils

Soil is a natural, three-dimensional body on the earth's surface that supports or is capable of supporting plants. Physical and chemical processes have determined its morphology. These processes have resulted from the interaction of five factors—parent material, climate, living organisms, relief, and time. Differences between soils can be traced to differences in one or more of these factors.

Climate and plant and animal life are active factors in soil formation. They act on parent material through weathering, slowly changing it into a natural body with individual, related horizons. Relief and time condition the effects of climate and plant and animal life. Parent material affects the kind of soil that forms; it is the dominant factor in young soils, but its influence generally lessens as the soil develops. Time is necessary for the formation of a soil, but the length of time required depends upon the other factors of soil formation.

Climate

Mainly temperature and precipitation determine climate, an active force in the formation of soils. Soils form in rocks that have been broken into suitable materials by erosion and alternate freezing and thawing. Water and wind are active agents in transporting and separating weathered material. This weathered material is further broken down by chemical reactions, such as solution and hydration.

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 microorganisms 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.

Topography

The uplift of mountain masses and the resistance of bedrock and geologic formations to erosion by water and wind determine topography, or relief. In the eroded uplands of the survey area, runoff water has carved deep valleys into the original bedrock. The rugged relief contrasts sharply with the smooth, low relief of the stream terraces and flood plains along the river valleys.

On uplands, soil horizons decrease in number, distinctness, and thickness as slope increases. Steep soils that have rapid runoff have many characteristics similar to those of soils that formed in arid climates. Nearly level to moderately sloping soils that receive runoff water from soils above them have many characteristics of soils that formed in more humid climates.

Parent Material

Many of the soils in this survey area formed in place over semiconsolidated sedimentary beds or shale. Some soils formed in alluvium and colluvium and were deposited in major valleys and on bordering uplands. Soils that formed in material derived from semiconsolidated, sandy sedimentary beds are

generally sandy. Soils that formed in residuum derived from shale are clayey. The basic constituent of shale is clay. Soils that formed in mixed alluvium derived from semiconsolidated, loamy sedimentary beds are loamy. Some of the soils in the area acquired salt and sodium from the parent material. The salts and sodium in these saline, alkaline, or saline-alkaline soils limit the kind and amount of plants that can grow on them. The density of the parent rock and its mineral composition can limit the rate of weathering and the depth of the soil.

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, consistency, thickness, permeability, and chemistry.

Soils can be classified from 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.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975) (USDA, 1996). 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 Entisol, from *ent*, meaning recent.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or

properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Orthent (*Orth*, meaning common, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Ustorthents (*Ust*, meaning ustic moisture regime, plus *orthents*, the suborder of the Entisols).

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 Ustorthents.

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, cation exchange activity class, 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 loamy, mixed (calcareous), superactive, frigid, shallow Typic Ustorthents.

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 underlying material can differ within a series. An example is the Cabba series. The Cabba series is a loamy, mixed, calcareous, superactive, frigid, shallow, Typic Ustorthent.

Classification of the Soil

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics outside the range of the series.)

Soil name	Family or higher taxonomic class
Abor-----	Fine, smectitic, frigid Leptic Udic Haplusterts
Absher-----	Fine, smectitic, frigid Torrertic Natrustalfs
Attewan-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive Aridic Argiborolls
Barvon-----	Fine-loamy, mixed, superactive Entic Haploborolls
Binna-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive Aridic Calciborolls
Bitton-----	Loamy-skeletal, mixed, superactive Typic Haploborolls
Blacksheep-----	Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents
Borky-----	Clayey-skeletal, mixed, superactive Typic Argiborolls
Bullhook-----	Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents
Busby-----	Coarse-loamy, mixed, superactive, frigid Aridic Ustochrepts
Cabba-----	Loamy, mixed, calcareous, superactive, frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents
Castner-----	Loamy-skeletal, mixed, superactive Lithic Haploborolls
Chinook-----	Coarse-loamy, mixed, superactive Aridic Haploborolls
Crago-----	Loamy-skeletal, carbonatic, frigid Haplocalcidic Ustochrepts
Creed-----	Fine, smectitic, frigid Aridic Natrustalfs
Dast-----	Coarse-loamy, mixed, superactive, frigid Typic Ustochrepts
Delpain-----	Clayey-skeletal, mixed, nonacid, superactive, frigid Lithic Ustorthents
Delpoint-----	Fine-loamy, mixed, superactive, frigid Aridic Ustochrepts
Doney-----	Fine-loamy, mixed, superactive, frigid Typic Ustochrepts
Eapa-----	Fine-loamy, mixed, superactive Aridic Argiborolls
Ethridge-----	Fine, smectitic Torrertic Argiborolls
Fergus-----	Fine, mixed, superactive Typic Argiborolls
Gerdrum-----	Fine, smectitic, frigid Torrertic Natrustalfs
Glendive-----	Coarse-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents
Harlake-----	Fine, smectitic, calcareous, frigid Aridic Ustifluvents
Havre-----	Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents
Hilger-----	Loamy-skeletal, mixed, superactive Typic Argiborolls
Hinterland-----	Clayey, smectitic Lithic Argiborolls
*Hughesville-----	Loamy-skeletal, carbonatic Udic Haploborolls
Kobase-----	Fine, smectitic, frigid Torrertic Ustochrepts
Korchea-----	Fine-loamy, mixed, superactive, calcareous, frigid Mollic Ustifluvents
Kremlin-----	Fine-loamy, mixed, superactive Aridic Haploborolls
Kuro-----	Clayey, mixed, superactive, calcareous, frigid, shallow Typic Ustorthents
Lamedeer-----	Loamy-skeletal, mixed, superactive, frigid Typic Ustochrepts
Lostriver-----	Fine, smectitic, calcareous, frigid Aridic Ustifluvents
Macar-----	Fine-loamy, mixed, superactive, frigid Typic Ustochrepts
Macmeal-----	Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs
Marias-----	Fine, smectitic, frigid Chromic Udic Haplusterts
Marmarth-----	Fine-loamy, mixed, superactive Aridic Argiborolls
Marvan-----	Fine, smectitic, frigid Sodic Haplusterts
McKenzie-----	Fine, smectitic, frigid Chromic Endoaquerts

Classification of the Soil--Continued

Soil name	Family or higher taxonomic class
Megonot-----	Fine, smectitic, frigid Torreritic Ustochrepts
Misselshell-----	Coarse-loamy, carbonatic, frigid Haplocalcidic Ustochrepts
Neldore-----	Clayey, smectitic, nonacid, frigid, shallow Aridic Ustorthents
Niart-----	Fine-loamy, carbonatic Aridic Calciborolls
Nobe-----	Fine, smectitic, calcareous, frigid Vertic Ustorthents
Orinoco-----	Fine, smectitic, calcareous, frigid Vertic Ustorthents
Rentsac-----	Loamy-skeletal, mixed, superactive, calcareous, frigid Lithic Ustorthents
Ridge-----	Loamy, mixed, superactive, frigid, shallow Typic Ustochrepts
Ringling-----	Loamy-skeletal over fragmental, mixed, superactive Typic Haploborolls
Rothiemay-----	Fine-loamy, mixed, superactive Aridic Calciborolls
Savage-----	Fine, smectitic Vertic Argiborolls
Shambo-----	Fine-loamy, mixed, superactive Typic Haploborolls
Sinnigam-----	Clayey-skeletal, mixed, superactive Lithic Argiborolls
Straw-----	Fine-loamy, mixed, superactive Cumulic Haploborolls
Tanna-----	Fine, smectitic Aridic Argiborolls
Tibs-----	Clayey-skeletal, mixed, superactive, calcareous, frigid Typic Ustorthents
Twilight-----	Coarse-loamy, mixed, superactive, frigid Aridic Ustochrepts
Vanda-----	Fine, smectitic, calcareous, frigid Vertic Ustorthents
Verson-----	Clayey over loamy-skeletal, mixed, superactive Aridic Argiborolls
Volborg-----	Clayey, smectitic, acid, frigid, shallow Aridic Ustorthents
Warhorse-----	Clayey, smectitic, frigid, shallow Aridic Haplustalfs
Wayden-----	Clayey, smectitic, calcareous, frigid, shallow Typic Ustorthents
Weingart-----	Fine, smectitic, frigid Torreritic Natrustalfs
Whitecow-----	Loamy-skeletal, carbonatic, frigid Calcic Ustochrepts
Windham-----	Loamy-skeletal, carbonatic Typic Calciborolls
Winifred-----	Fine, smectitic Vertic Haploborolls
Yamacall-----	Fine-loamy, mixed, superactive, frigid Aridic Ustochrepts
Yawdim-----	Clayey, smectitic, calcareous, frigid, shallow Aridic Ustorthents
Zatoville-----	Fine, smectitic, frigid Torreritic Ustochrepts

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
1E	Badland-----	1,158	*
2E	Rock outcrop-----	750	*
3A	Riverwash-----	295	*
5A	Harlake silty clay, 0 to 2 percent slopes-----	717	*
6A	Harlake silty clay, 0 to 2 percent slopes, occasionally flooded-----	18	*
7A	Lostriver silty clay, 0 to 2 percent slopes-----	1,282	0.1
7B	Lostriver-Bullhook complex, 0 to 2 percent slopes-----	3,768	0.3
8A	Harlake-Havre complex, 0 to 2 percent slopes, occasionally flooded-----	2,560	0.2
8B	Harlake-Havre complex, 0 to 2 percent slopes-----	2,300	0.2
9A	Havre loam, 0 to 2 percent slopes-----	4,143	0.3
9B	Havre-Yamacall loams, 0 to 4 percent slopes-----	5,689	0.5
10A	Havre loam, 0 to 2 percent slopes, occasionally flooded-----	519	*
11A	Havre-Glendive complex, 0 to 2 percent slopes-----	5,093	0.4
11B	Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	566	*
12A	Havre-Harlake complex, channeled, 0 to 2 percent slopes-----	5,856	0.5
13A	Havre loam, calcareous, 0 to 2 percent slopes-----	3,974	0.3
14A	Havre, calcareous-Glendive complex, 0 to 2 percent slopes-----	1,841	0.2
14B	Havre, calcareous-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	401	*
15A	Havre-Harlake complex, calcareous, 0 to 2 percent slopes-----	1,025	*
16A	Havre-Yamacall loams, calcareous, 0 to 4 percent slopes-----	1,137	*
17A	Harlake-Havre complex, calcareous, 0 to 2 percent slopes-----	714	*
20B	Harlake-Marvan-Vanda silty clays, 0 to 4 percent slopes-----	2,690	0.2
21A	McKenzie silty clay, 0 to 2 percent slopes-----	3,482	0.3
22B	Nobe-Absher complex, 0 to 4 percent slopes-----	5,515	0.5
23A	Gerdum-Vanda complex, 0 to 8 percent slopes-----	16,076	1.3
23B	Gerdum-Vanda-Creed complex, 0 to 8 percent slopes-----	19,053	1.6
23C	Gerdum-Creed loams, 0 to 8 percent slopes-----	7,754	0.6
25A	Vanda silty clay, 0 to 4 percent slopes-----	2,918	0.2
26A	Weingart loam, 1 to 8 percent slopes-----	1,199	0.1
26B	Weingart-Warhorse loams, 1 to 8 percent slopes-----	214	*
30C	Busby fine sandy loam, 2 to 8 percent slopes-----	2,531	0.2
30D	Busby fine sandy loam, 8 to 15 percent slopes-----	609	*
31B	Delpoint loam, 2 to 8 percent slopes-----	5,164	0.4
31C	Delpoint-Cabbart-Yamacall loams, 4 to 15 percent slopes-----	25,801	2.2
32B	Twilight sandy loam, 2 to 8 percent slopes-----	3,356	0.3
32D	Twilight-Blacksheep-Rock outcrop complex, 4 to 25 percent slopes-----	7,044	0.6
33A	Yamacall loam, 0 to 2 percent slopes-----	1,854	0.2
33B	Yamacall loam, 2 to 8 percent slopes-----	12,567	1.0
34A	Yamacall clay loam, 0 to 2 percent slopes-----	896	*
34B	Yamacall clay loam, 2 to 8 percent slopes-----	3,076	0.3
35B	Yamacall-Busby complex, 2 to 8 percent slopes-----	5,490	0.5
36B	Yamacall-Delpoint loams, 2 to 8 percent slopes-----	21,257	1.8
37A	Yamacall clay loam, calcareous, 0 to 2 percent slopes-----	953	*
37B	Yamacall clay loam, calcareous, 2 to 8 percent slopes-----	888	*
38A	Kobase-Zatoville silty clay loams, 0 to 8 percent slopes-----	7,262	0.6
38B	Zatoville silty clay loam, 0 to 8 percent slopes-----	5,915	0.5
39B	Delpoint loam, calcareous, 2 to 8 percent slopes-----	1,174	*
39C	Delpoint, calcareous-Cabbart-Yamacall loams, 4 to 15 percent slopes-----	14,964	1.2
40B	Kobase silty clay loam, 0 to 8 percent slopes-----	7,535	0.6
40C	Kobase silty clay loam, calcareous, 0 to 8 percent slopes-----	2,399	0.2
41A	Yamacall loam, calcareous, 0 to 2 percent slopes-----	2,017	0.2
41B	Yamacall loam, calcareous, 2 to 8 percent slopes-----	7,140	0.6
41C	Yamacall-Delpoint loams, calcareous, 2 to 8 percent slopes-----	7,930	0.7
50B	Hinterland loam, 1 to 6 percent slopes-----	1,579	0.1
50C	Hinterland loam, 6 to 15 percent slopes-----	421	*
50D	Hinterland-Delplain complex, 8 to 25 percent slopes-----	1,316	0.1
51A	Ethridge clay loam, 0 to 2 percent slopes-----	3,351	0.3
51B	Ethridge clay loam, 2 to 8 percent slopes-----	5,621	0.5
52A	Eapa loam, 0 to 2 percent slopes-----	1,607	0.1
52B	Eapa loam, 2 to 8 percent slopes-----	7,655	0.6

* See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
53A	Tanna loam, 1 to 6 percent slopes-----	1,127	*
54A	Mazmarth fine sandy loam, 0 to 8 percent slopes-----	2,604	0.2
56A	Crago-Musselshell-Attewan complex, 0 to 2 percent slopes-----	15,330	1.3
57A	Attewan loam, 0 to 4 percent slopes-----	2,522	0.2
57B	Attewan cobbly loam, 0 to 4 percent slopes-----	46	*
57C	Attewan-Niart loams, 0 to 4 percent slopes-----	3,828	0.3
58A	Verson clay loam, 0 to 4 percent slopes-----	3,465	0.3
60B	Abor silty clay, 1 to 8 percent slopes-----	7,614	0.6
60C	Abor-Neldore silty clays, 2 to 8 percent slopes-----	20,097	1.7
60D	Neldore-Abor silty clays, 4 to 15 percent slopes-----	28,989	2.4
60E	Neldore-Abor silty clays, 15 to 45 percent slopes-----	1,270	0.1
61D	Neldore-Neldore, saline silty clays, 4 to 25 percent slopes-----	6,396	0.5
61E	Neldore-Volborg silty clays, 4 to 25 percent slopes-----	2,785	0.2
62C	Neldore silty clay, 4 to 25 percent slopes-----	1,602	0.1
62D	Neldore-Yawdim silty clays, 4 to 25 percent slopes-----	7,827	0.7
62E	Neldore-Rock outcrop complex, 15 to 45 percent slopes-----	3,046	0.3
63A	Marias silty clay, 0 to 4 percent slopes-----	7,888	0.7
64A	Marvan-Vanda silty clays, 0 to 8 percent slopes-----	21,460	1.8
64B	Marvan silty clay, 0 to 8 percent slopes-----	13,570	1.1
67D	Yawdim silty clay loam, 4 to 25 percent slopes-----	2,383	0.2
68C	Megnot-Yawdim silty clay loams, 4 to 15 percent slopes-----	4,093	0.3
69C	Orinoco-Yawdim silty clay loams, 4 to 15 percent slopes-----	1,888	0.2
73D	Yawdim-Abor complex, 4 to 15 percent slopes-----	4,288	0.4
73E	Yawdim-Abor complex, 15 to 60 percent slopes-----	1,589	0.1
74D	Abor-Crago complex, 2 to 15 percent slopes-----	5,722	0.5
74E	Abor-Crago complex, 15 to 35 percent slopes-----	9,807	0.8
80E	Blacksheep-Rock outcrop-Twilight complex, 8 to 45 percent slopes-----	1,046	*
81B	Delpoint-Cabbart loams, 2 to 8 percent slopes-----	19,577	1.6
81C	Delpoint-Cabbart loams, 8 to 15 percent slopes-----	2,329	0.2
81D	Cabbart loam, 4 to 15 percent slopes-----	3,857	0.3
82B	Cabbart-Delpoint loams, 4 to 15 percent slopes-----	34,868	2.9
82C	Cabbart-Delpoint-Rock outcrop complex, 4 to 15 percent slopes-----	21,206	1.8
82E	Cabbart-Delpoint-Rock outcrop complex, 8 to 45 percent slopes-----	15,840	1.3
83D	Cabbart-Rock outcrop-Blacksheep complex, 8 to 45 percent slopes-----	5,453	0.5
84C	Cabbart-Yawdim-Delpoint complex, 4 to 15 percent slopes-----	10,048	0.8
84D	Cabbart-Yawdim-Rock outcrop complex, 4 to 35 percent slopes-----	14,416	1.2
84E	Cabbart-Yawdim-Delpoint complex, 15 to 35 percent slopes-----	2,764	0.2
85A	Cabbart clay loam, 0 to 2 percent slopes-----	682	*
86D	Cabbart-Rentsac complex, 2 to 15 percent slopes-----	2,649	0.2
86E	Cabbart-Rock outcrop complex, 4 to 35 percent slopes-----	2,125	0.2
87B	Delpoint, calcareous-Cabbart loams, 2 to 8 percent slopes-----	5,013	0.4
88D	Delpoint-Cabbart-Rock outcrop complex, 4 to 35 percent slopes-----	1,630	0.1
89C	Rentsac fine sandy loam, 2 to 8 percent slopes-----	2,886	0.2
90B	Chinook fine sandy loam, 2 to 8 percent slopes-----	799	*
91A	Kremlin loam, 0 to 2 percent slopes-----	119	*
91B	Kremlin loam, 2 to 8 percent slopes-----	659	*
92A	Binna loam, 0 to 4 percent slopes-----	4,816	0.4
93A	Crago-Musselshell complex, 0 to 4 percent slopes-----	6,741	0.6
93B	Crago cobbly loam, 1 to 6 percent slopes-----	535	*
94A	Crago gravelly loam, 0 to 8 percent slopes-----	1,901	0.2
94E	Crago gravelly loam, 8 to 35 percent slopes-----	1,119	*
95A	Crago-Musselshell cobbly loams, 0 to 4 percent slopes-----	6,191	0.5
95B	Crago-Attewan-Musselshell cobbly loams, 0 to 4 percent slopes-----	434	*
95C	Crago-Attewan cobbly loams, 2 to 8 percent slopes-----	901	*
95E	Yawdim-Crago complex, 4 to 35 percent slopes-----	8,369	0.7
96E	Crago-Abor complex, 4 to 35 percent slopes-----	1,636	0.1
97A	Musselshell-Crago cobbly loams, 0 to 4 percent slopes-----	3,945	0.3
97B	Musselshell-Crago complex, 4 to 8 percent slopes-----	1,499	0.1
98A	Niart cobbly loam, 0 to 4 percent slopes-----	7,895	0.7
98B	Niart-Crago complex, 0 to 4 percent slopes-----	58	*
98C	Niart-Crago complex, 4 to 15 percent slopes-----	1,446	0.1

* See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
98D	Niart-Rothiemay loams, 0 to 4 percent slopes-----	921	*
123C	Creed-Gerdrum loams, 0 to 8 percent slopes-----	2,925	0.2
130B	Busby-Twilight complex, 2 to 8 percent slopes-----	105	*
131C	Delpoint-Yamacall loams, 2 to 8 percent slopes-----	8,388	0.7
132B	Twilight-Blacksheep sandy loams, 2 to 8 percent slopes-----	15,199	1.3
138B	Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes-----	3,580	0.3
140B	Kobase-Megonot silty clay loams, 0 to 8 percent slopes-----	4,236	0.4
140C	Kobase-Megonot silty clay loams, calcareous, 0 to 8 percent slopes-----	559	*
142A	Rothiemay loam, calcareous, 0 to 2 percent slopes-----	23	*
142B	Rothiemay loam, calcareous, 2 to 8 percent slopes-----	42	*
142C	Rothiemay-Crago complex, 4 to 15 percent slopes-----	1,025	*
152A	Eapa-Attewan loams, 0 to 2 percent slopes-----	3,124	0.3
153C	Tanna-Cabbart loams, 2 to 8 percent slopes-----	1,112	*
153D	Cabbart-Tanna loams, 4 to 15 percent slopes-----	1,269	0.1
154C	Mammarth-Cabbart loams, 2 to 8 percent slopes-----	2,922	0.2
154D	Cabbart-Mammarth complex, 4 to 15 percent slopes-----	1,431	0.1
158A	Ethridge-Verson clay loams, 0 to 2 percent slopes-----	1,886	0.2
167D	Yawdim-Orinoco silty clay loams, 4 to 15 percent slopes-----	7,423	0.6
167E	Yawdim-Orinoco silty clay loams, 15 to 35 percent slopes-----	2,430	0.2
181D	Cabbart-Crago-Delpoint complex, 4 to 15 percent slopes-----	5,316	0.4
181E	Cabbart-Crago-Delpoint complex, 15 to 35 percent slopes-----	9,463	0.8
189C	Rentsac-Cabbart complex, 2 to 15 percent slopes-----	3,192	0.3
189E	Rentsac-Rock outcrop complex, 15 to 45 percent slopes-----	1,965	0.2
230C	Macar loam, 2 to 8 percent slopes-----	5,853	0.5
232E	Hughesville-Tibs-Whitecow complex, 2 to 25 percent slopes-----	910	*
234F	Tibs-Whitecow cobbly clay loams, 25 to 60 percent slopes-----	131	*
240E	Ridge-Dast-Rock outcrop complex, 4 to 35 percent slopes-----	8,358	0.7
241E	Twilight-Blacksheep-Rock outcrop complex, 4 to 35 percent slopes-----	9,325	0.8
242D	Dast-Ridge sandy loams, 2 to 8 percent slopes-----	3,842	0.3
242F	Ridge-Dast sandy loams, 8 to 45 percent slopes-----	13,546	1.1
243F	Blacksheep-Twilight sandy loams, 8 to 45 percent slopes-----	10,867	0.9
245C	Lamedeer-Ringling channery loams, 2 to 8 percent slopes-----	817	*
245F	Lamedeer-Ringling channery loams, 4 to 45 percent slopes-----	1,256	0.1
246F	Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes-----	2,107	0.2
250E	Macneal-Rock outcrop complex, 4 to 35 percent slopes-----	543	*
251C	Savage loam, 2 to 8 percent slopes-----	61	*
252D	Hilger-Rock outcrop complex, 4 to 35 percent slopes-----	385	*
252E	Hilger stony loam, 4 to 25 percent slopes-----	582	*
254C	Fergus clay loam, 2 to 8 percent slopes-----	593	*
255C	Shambo-Korchea-Barvon loams, 2 to 8 percent slopes-----	12,214	1.0
255D	Barvon-Cabba-Shambo loams, 4 to 15 percent slopes-----	6,939	0.6
256C	Yamacall-Havre-Delpoint loams, 2 to 8 percent slopes-----	15,258	1.3
260F	Kuro-Wayden-Rock outcrop complex, 4 to 35 percent slopes-----	79	*
261F	Wayden-Castner complex, 8 to 45 percent slopes-----	745	*
262E	Wayden-Windham complex, 4 to 25 percent slopes-----	96	*
280D	Cabbart, moist-Delpoint, dry loams, 4 to 15 percent slopes-----	29,922	2.5
280E	Castner-Kuro complex, 4 to 25 percent slopes-----	466	*
281D	Doney-Cabba-Macar loams, 4 to 15 percent slopes-----	17,193	1.4
281E	Castner-Rock outcrop complex, 8 to 45 percent slopes-----	339	*
282D	Castner channery loam, 4 to 25 percent slopes-----	2,078	0.2
283D	Barvon-Cabba loams, 2 to 8 percent slopes-----	11,046	0.9
283F	Cabba-Rock outcrop complex, 8 to 45 percent slopes-----	28,372	2.4
284D	Cabba-Barvon loams, 4 to 15 percent slopes-----	17,944	1.5
284F	Doney-Wayden complex, 15 to 60 percent slopes-----	186	*
285D	Cabba-Doney loams, 4 to 15 percent slopes-----	14,472	1.2
285F	Cabba-Doney loams, 8 to 45 percent slopes-----	37,818	3.2
286F	Cabbart-Rock outcrop complex, 8 to 45 percent slopes-----	27,341	2.3
287D	Delpoint, dry-Cabbart, moist loams, 2 to 8 percent slopes-----	11,169	0.9
287F	Cabbart, moist-Delpoint, dry loams, 8 to 45 percent slopes-----	33,649	2.8
288D	Delpoint-Cabbart-Havre loams, 4 to 25 percent slopes-----	5,740	0.5
288F	Cabbart-Delpoint loams, 15 to 65 percent slopes-----	21,969	1.8

* See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
289D	Barvon-Cabba-Korchea loams, 3 to 25 percent slopes-----	9,627	0.8
289F	Cabba-Barvon loams, 15 to 65 percent slopes-----	75,019	6.3
291C	Windham very stony loam, 2 to 15 percent slopes-----	1,960	0.2
292A	Straw-Korchea loams, 0 to 2 percent slopes-----	5,329	0.4
294C	Shambo loam, 2 to 8 percent slopes-----	2,298	0.2
295F	Bitton-Winifred-Castner complex, 15 to 60 percent slopes-----	530	*
296D	Borky-Sinnigam very stony clay loams, 2 to 15 percent slopes-----	1,039	*
DA	Denied access-----	17,129	1.4
UL	Urban land-----	455	*
W	Water-----	2,300	0.2
	Total-----	1,197,200	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each series is described that has a component included in a map unit name. The detailed soil map units associated with the series follow, organized by the first named map unit component.

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." Many of the technical terms used in the descriptions are defined in "Soil Taxonomy." 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, Harlake silty clay, occasionally flooded, 0 to 2 percent slopes, is a phase of the Harlake 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. Yamacall-Busby 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. Rock outcrop, 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.

Abor Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Very slow (0.01 to 0.06 inch/hour)

Landform: Sedimentary plains and hills

Parent material: Residuum or locally transported material weathered from shale

Slope range: 1 to 35 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Leptic Udic Haplusterts

Typical Pedon

Abor silty clay, in an area of Abor-Crago complex, 2 to 15 percent slopes, 2,100 feet south and 1,800 feet east of the northwest corner of sec 2, T. 11 N., R. 26 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; hard, friable, sticky and plastic; many fine and very fine roots; moderately alkaline; gradual smooth boundary.

Bss—3 to 15 inches; light brownish gray (2.5Y 6/2) silty clay, dark brown (2.5Y 4/2) moist; strong medium blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; common slickensides on faces of pedis; slightly effervescent; moderately alkaline; clear smooth boundary.

Bssk—15 to 27 inches; light brownish gray (2.5Y 6/2) silty clay, dark brown (2.5Y 4/2) moist; common fine and medium subangular blocky structure; extremely hard, friable, sticky and plastic; common fine and very fine roots; common slickensides on faces of pedis; violently effervescent; moderately alkaline; clear smooth boundary.

Bky—27 to 32 inches; pale yellow (2.5Y 7/4) silty clay, dark brown (2.5Y 4/2) moist; common fine and medium subangular blocky structure; extremely hard, friable, sticky and plastic; few fine and very fine roots; few shale chips; strongly effervescent; strongly alkaline; abrupt smooth boundary.

Cr—32 to 60 inches; light gray (2.5Y 7/2) semiconsolidated sedimentary beds; light brownish gray (2.5Y 6/2) moist; massive; strongly alkaline.

Range in Characteristics

Soil Temperature: 42 to 47 degrees F with summer temperatures of 60 to 72 degrees F

Moisture control section: between 4 and 12 inches, dry in all parts between four tenths and five tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees or higher.

Depth to Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches, but mainly 25 to 35 inches

Note: These soils have cracks which extend to the paralithic contact and are as wide as 1/4 inch to 3 inches at the surface and are open for 150 days or less.

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4 (The 1 chroma are inherent from the parent material.)

Clay content: 40 to 55 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

Bss horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay, silty clay loam, or clay
 Clay content: 35 to 60 percent
 Rock fragments: 0 to 15 percent—0 to 3 percent
 greater than 3 inches cobbles and stones, 0
 to 12 percent less than 3 inches pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 9.0
 Slickensides: few to common

Bssk horizon

Hue: 2.5Y, 5Y, 2.5YR, or 10YR
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay, silty clay loam, clay loam, or
 clay
 Clay content: 35 to 60 percent
 Slickensides: few to common
 Rock fragments: 0 to 20 percent—0 to 5 percent
 cobbles and stones; 0 to 15 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

Bky horizon

Hue: 2.5Y, 5Y, 10YR, or 2.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay, silty clay loam, or clay
 Clay content: 35 to 60 percent
 Rock fragments: 0 to 20 percent—0 to 5 percent
 cobbles and stones; 0 to 15 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Gypsum: 1 to 5 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

60B—Abor silty clay, 1 to 8 percent slopes**Setting**

Landform: Sedimentary plains
Slope: 1 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Abor and similar soils: 85 percent

Minor Components

Neldore and similar soils: 0 to 5 percent
 Neldore, saline soils: 0 to 5 percent
 Volborg and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale
 residuum
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

74E—Abor-Crago complex, 15 to 35 percent slopes**Setting**

Landform:
 Abor—Hills
 Crago—Relict stream terraces
Position on landform:
 Abor—Backslopes
 Crago—Shoulders and summits
Slope:
 Abor—15 to 35 percent
 Crago—15 to 35 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Abor and similar soils: 45 percent
 Crago and similar soils: 40 percent

Minor Components

Verson and similar soils: 0 to 5 percent
 Neldore and similar soils: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description**Abor**

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

74D—Abor-Crago complex, 2 to 15 percent slopes**Setting***Landform:*

Abor—Hills
 Crago—Relict stream terraces

Position on landform:

Abor—Backslopes
 Crago—Shoulders and summits

Slope:

Abor—2 to 15 percent
 Crago—2 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Abor and similar soils: 45 percent
 Crago and similar soils: 40 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent
 Verson and similar soils: 0 to 5 percent
 Neldore and similar soils: 0 to 5 percent

Major Component Description**Abor**

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60C—Abor-Neldore silty clays, 2 to 8 percent slopes**Setting***Landform:*

Abor—Sedimentary plains
 Neldore—Sedimentary plains

Position on landform:

Abor—Backslopes, footslopes, and side slopes
 Neldore—Shoulders and summits

Slope:

Abor—2 to 8 percent

Neldore—2 to 8 percent

Elevation: 2,710 to 4,200 feet**Mean annual precipitation:** 10 to 14 inches**Frost-free period:** 105 to 135 days**Composition****Major Components**

Abor and similar soils: 50 percent

Neldore and similar soils: 40 percent

Minor Components

Neldore, saline soils: 0 to 5 percent

Volborg and similar soils: 0 to 5 percent

Major Component Description**Abor****Surface layer texture:** Silty clay**Depth class:** Moderately deep (20 to 40 inches)**Drainage class:** Well drained**Dominant parent material:** Semiconsolidated shale residuum**Native plant cover type:** Rangeland**Flooding:** None**Available water capacity:** Mainly 4.8 inches**Neldore****Surface layer texture:** Silty clay**Depth class:** Shallow (10 to 20 inches)**Drainage class:** Well drained**Dominant parent material:** Semiconsolidated shale residuum**Native plant cover type:** Rangeland**Flooding:** None**Available water capacity:** Mainly 2.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Absher Series**Depth class:** Very deep (greater than 60 inches)**Drainage class:** Moderately well drained**Permeability:** Very slow (0.01 to 0.06 inch/hour)**Landform:** Alluvial fans and stream terraces**Parent material:** Alluvium**Slope range:** 0 to 4 percent**Elevation range:** 2,710 to 4,200 feet**Annual precipitation:** 10 to 14 inches**Frost-free period:** 105 to 135 days**Taxonomic Class:** Fine, smectitic, frigid Torric
Natrustalfs**Typical Pedon**

Absher silty clay, in an area of Nobe-Absher complex, 0 to 4 percent slopes, 1,200 feet east and 300 feet north of the southwest corner of sec. 15, T. 9 N, R. 24 E.

E—0 to 1 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate thin platy structure parting to strong fine and medium granular; slightly hard, friable, sticky and plastic; many very fine roots; moderately alkaline; abrupt smooth boundary

Btn—1 to 6 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium columnar structure parting to strong fine and medium subangular blocky; extremely hard, firm, very sticky and very plastic; many very fine roots; continuous distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Btkn—6 to 14 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; continuous distinct clay films on faces of peds; few fine and medium masses of lime; slightly effervescent; strongly alkaline; clear smooth boundary.

Bknyz1—14 to 30 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, very sticky and very plastic; few fine and very fine roots; common fine crystals of gypsum; common fine crystals of salt; common fine and medium masses of lime; slightly effervescent; moderately alkaline; clear smooth boundary.

Bknyz2—30 to 60 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, very sticky and very plastic; few fine roots; common

very fine crystals of gypsum; common very fine crystals of salt; few fine and medium threads of lime; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F (60 to 68 degrees, summer).

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

E horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 6 or 7 dry; 3, 4, or 5 moist
Chroma: 1, 2, or 3
Clay content: 40 to 55 percent
Electrical conductivity: 4 to 8 mmhos/cm
Reaction: pH 6.6 to 8.4

Btn horizon

Hue: 2.5Y, 7.5YR, or 10YR
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1, 2, or 3
Texture: silty clay, clay, or clay loam
Clay content: 35 to 60 percent
Structure: moderate or strong columnar or prismatic
Consistence: very hard or extremely hard when dry
Rock fragments: 0 to 15 percent pebbles
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 18 to 70
Reaction: pH 6.6 to 8.4

Btkn horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: clay loam, clay, or silty clay
Clay content: 35 to 50 percent
Rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 16 to 32 mmhos/cm
Sodium adsorption ratio: 18 to 70
Gypsum: 1 to 5 percent
Reaction: pH 7.9 to 9.6

Bknyz horizons

Hue: 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: clay loam, silty clay, or clay
Clay content: 35 to 50 percent

Rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 4 to 15 percent
Electrical conductivity: 16 to 32 mmhos/cm
Sodium adsorption ratio: 18 to 70
Gypsum: 1 to 5 percent
Reaction: pH 7.9 to 9.6

Attewan Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) above the 2C horizon, rapid (6.0 to 20.0 inches/hour) in the 2C horizon

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost free period: 105 to 135 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive Aridic Argiborolls

Typical Pedon

Attewan loam, in an area of Eapa-Attewan loams, 0 to 2 percent slopes, 100 feet north and 200 feet west of the southeast corner of sec. 1, T. 9 N., R. 22 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, sticky and plastic; many fine and very fine and few coarse roots; moderately alkaline; clear smooth boundary.

Bt1—5 to 9 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium blocky structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; many fine and very fine and few coarse roots; common distinct clay films on faces of peds and lining pores; moderately alkaline; clear smooth boundary.

Bt2—9 to 14 inches; pale brown (10YR 6/3) clay loam, dark brown (10 YR 3/3) moist; weak fine prismatic structure parting to moderate medium subangular blocky; hard, very firm, sticky and plastic; many fine and very fine and common coarse roots; common distinct clay films on faces of peds and lining pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—14 to 20 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, very firm, slightly sticky and plastic; many fine and very fine roots; few medium irregular masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 26 inches; pale yellow (2.5Y 7/4) gravelly loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; hard, very firm, sticky and plastic; common fine roots; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—26 to 60 inches; pale yellow (2.5Y 7/4) very gravelly loamy sand, light olive brown (2.5Y 5/4) moist; massive; loose, very friable, nonsticky and nonplastic; few fine roots; 60 percent pebbles; disseminated lime; common distinct lime crusts on underside of pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in some part six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Mollic epipedon thickness: 7 to 12 inches and may include part or all of the argillic horizon

Depth to Bk horizon: 10 to 21 inches

Depth to 2C horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Rock fragments: 0 to 35 percent—0 to 10 percent stones and cobbles; 0 to 25 percent pebbles

Reaction: pH 6.6 to 8.4

Bt horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 25 percent—0 to 5 percent stones and cobbles; 0 to 20 percent pebbles

Reaction: pH 6.6 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, 4, or 6

Texture: loam, clay loam, sandy clay loam, or sandy loam

Clay content: 15 to 30 percent

Rock fragments: 0 to 30 percent—0 to 5 percent stones and cobbles; 0 to 25 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2C horizon

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

Texture: loamy sand or sand

Clay content: 0 to 10 percent

Rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles; 35 to 60 percent pebbles

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.4 to 8.4

57B—Attewan cobbly loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Attewan and similar soils: 85 percent

Minor Components

Crago and similar soils: 0 to 5 percent

Musselshell and similar soils: 0 to 5 percent

Niart and similar soils: 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: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

57A—Attewan loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Attewan and similar soils: 85 percent

Minor Components

Crago and similar soils: 0 to 5 percent

Musselshell and similar soils: 0 to 5 percent

Niart and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 4.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

57C—Attewan-Niart loams, 0 to 4 percent slopes

Setting

Landform:

Attewan—Relict stream terraces

Niart—Relict stream terraces

Slope:

Attewan—0 to 4 percent

Niart—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Attewan and similar soils: 45 percent

Niart and similar soils: 40 percent

Minor Components

Verson and similar soils: 0 to 5 percent

Crago and similar soils: 0 to 5 percent

Musselshell and similar soils: 0 to 5 percent

Major Component Description

Attewan

Surface layer texture: 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 4.8 inches

Niart

Surface layer texture: 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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

1E—Badland

Composition

Major Components

Badland: 85 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent

Yawdim and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Major Component Description

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

Barvon Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated sedimentary beds

Slope range: 2 to 35 percent

Elevation range: 3,200 to 4,600 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive Entic Haploborolls

Typical Pedon

Barvon loam, in an area of Cabba-Barvon loams, 15 to 65 percent slopes, 300 feet east and 450 feet north of the southwest corner of sec. 25, T. 8 N., R. 28 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

A2—6 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and medium roots, neutral; clear smooth boundary.

Bk1—10 to 22 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; disseminated lime; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—22 to 29 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; disseminated lime; few fine masses of

lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—29 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Mollic epipedon thickness: 7 to 16 inches

Depth to bedrock: 20 to 40 inches

Depth to K horizon: 7 to 16 inches

A horizons

Hue: 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: less than 2 mm: loam or clay loam

Clay content: 20 to 30 percent

Rock fragments: 0 to 10 percent flat angular pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Note: semiconsolidated sandy or silty sedimentary beds or semiconsolidated shale that texture to loamy fine sand to light silty clay

283D—Barvon-Cabba loams, 2 to 8 percent slopes

Setting

Landform:

Barvon—Sedimentary plains

Cabba—Sedimentary plains

Position on landform:

Barvon—Backslopes, footslopes, and side slopes

Cabba—Shoulders and summits

Slope:

Barvon—2 to 8 percent

Cabba—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Barvon and similar soils: 45 percent
Cabba and similar soils: 40 percent

Minor Components

Doney and similar soils: 0 to 5 percent
Dast and similar soils: 0 to 5 percent
Macar and similar soils: 0 to 5 percent

Major Component Description

Barvon

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.7 inches

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

289D—Barvon-Cabba-Korchea loams, 3 to 25 percent slopes

Setting

Landform:

Barvon—Sedimentary plains and hills
Cabba—Hills
Korchea—Flood plains

Position on landform:

Barvon—Backslopes, footslopes, and side slopes
Cabba—Shoulders and summits
Korchea—Drainageways

Slope:

Barvon—3 to 25 percent
Cabba—8 to 25 percent
Korchea—3 to 4 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Barvon and similar soils: 35 percent
Cabba and similar soils: 25 percent
Korchea and similar soils: 20 percent

Minor Components

Shambo and similar soils: 0 to 5 percent
Macar and similar soils: 0 to 10 percent
Doney and similar soils: 0 to 5 percent

Major Component Description

Barvon

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.0 inches

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.0 inches

Korchea

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 10.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

255D—Barvon-Cabba-Shambo loams, 4 to 15 percent slopes

Setting

Landform:

- Barvon—Sedimentary plains
- Cabba—Hills
- Shambo—Alluvial fans and stream terraces

Position on landform:

- Barvon—Backslopes, footslopes, and side slopes
- Cabba—Shoulders and summits
- Shambo—Footslopes

Slope:

- Barvon—4 to 8 percent
- Cabba—8 to 15 percent
- Shambo—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

- Barvon and similar soils: 35 percent
- Cabba and similar soils: 30 percent
- Shambo and similar soils: 30 percent

Minor Components

- Korchea and similar soils: 0 to 5 percent

Major Component Description

Barvon

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.7 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.8 inches

Shambo

Surface layer texture: 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 10.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Binna Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate in the upper 25 inches (0.6 to 2.0 inches/hour); below this depth rapid (6.0 to 20.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive Aridic Calciborolls

Typical Pedon

Binna loam, 0 to 4 percent slopes, 2,400 feet west and 2,500 feet south of the northeast corner of sec. 6, T. 9 N., R. 25 E.

Ap—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; 5 percent pebbles; few faint lime coatings on pebbles; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—6 to 13 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; 5 percent pebbles; common

distinct lime coatings on pebbles; disseminated lime; many fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—13 to 25 inches; very pale brown (10YR 7/3) gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine matted roots; 25 percent pebbles; common distinct lime cast on pebbles; disseminated lime; many very fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

2C—25 to 60 inches; brownish yellow (10YR 6/6) very gravelly loamy sand, yellowish brown (10YR 5/6) moist; massive; loose, nonsticky and nonplastic; 5 percent cobbles, 50 percent pebbles; 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: 7 to 10 inches

Depth to sandy-skeletal horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry (value dry is 5 when mixed to 7 inches)

Chroma: 2 or 3

Clay content: 15 to 27 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.9 to 9.0

2C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: sand or loamy sand

Clay content: 0 to 10 percent

Rock fragments: 35 to 80 percent—5 to 15 percent cobbles, 30 to 65 percent pebbles

Calcium carbonate equivalent: 5 to 20 percent

Reaction: pH 7.9 to 9.0

92A—Binna loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Binna and similar soils: 85 percent

Minor Components

Rothiemay and similar soils: 0 to 5 percent

Niart and similar soils: 0 to 5 percent

Attewan and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 4.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bitton Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills

Parent material: Alluvium or colluvium

Slope range: 15 to 60 percent
Elevation range: 4,200 to 4,700 feet
Annual precipitation: 15 to 19 inches
Frost free period: 90 to 125 days

Taxonomic Class: Loamy-skeletal, mixed, superactive
 Typic Haploborolls

Typical Pedon

Bitton gravelly loam, in an area of Bitton-Winifred-Castner complex, 15 to 60 percent slopes, 2,600 feet west and 800 feet south of the northeast corner of sec. 5, T. 11 N., R. 23 E.

A—0 to 8 inches; dark brown (10YR 4/3) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 15 percent pebbles; slightly alkaline; clear smooth boundary.

Bw—8 to 15 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 30 percent pebbles; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk1—15 to 35 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; 30 percent pebbles; common distinct lime casts on undersides of pebbles; common fine and medium masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—35 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few fine and very fine roots; 70 percent pebbles; common distinct lime casts on undersides of pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Moisture control section: between 4 and 12 inches
Mollic epipedon thickness: 7 to 15 inches
Depth to Bk horizon: 11 to 28 inches

A horizon

Hue: 10YR, 2.5Y, 7.5YR, or 5YR
 Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 15 to 27 percent
 Rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
 Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, 7.5YR, or 5YR
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Clay content: 15 to 27 percent
 Rock fragments: 20 to 60 percent—0 to 10 percent stones and cobbles; 20 to 60 percent channers and pebbles
 Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, 7.5YR, or 5YR
 Value: 5, 6, 7, or 8 dry; 5, 6, 7, or 8 moist
 Chroma: 3 or 4
 Texture: loam or sandy loam
 Clay content: 10 to 27 percent
 Rock fragments: 35 to 75 percent—0 to 60 percent cobbles and stones; 35 to 60 percent pebbles and channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

295F—Bitton-Winifred-Castner complex, 15 to 60 percent slopes

Setting

Landform:

Bitton—Hills
 Winifred—Hills
 Castner—Hills

Position on landform:

Bitton—Backslopes, footslopes, and side slopes
 Winifred—Backslopes
 Castner—Shoulders and summits

Slope:

Bitton—15 to 60 percent
 Winifred—15 to 45 percent
 Castner—15 to 60 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Composition

Major Components

Bitton and similar soils: 40 percent
Winifred and similar soils: 30 percent
Castner and similar soils: 25 percent

Minor Components

Kuro and similar soils: 0 to 5 percent

Major Component Description

Bitton

Surface layer texture: Gravelly 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 6.1 inches

Winifred

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

Castner

Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Blacksheep Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains and hills

Parent material: Semiconsolidated sandy sedimentary beds

Slope range: 2 to 45 percent

Elevation range: 2,710 to 4,600 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents

Typical Pedon

Blacksheep sandy loam, in an area of Twilight-Blacksheep sandy loams, 2 to 8 percent slopes, 2,400 feet north and 1,800 feet west of the southeast corner of sec. 23, T. 9 N., R. 27 E.

A—0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; common medium and fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—4 to 18 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—18 to 60 inches; semiconsolidated sandy sedimentary beds.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: between 8 inches and the paralithic contact; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 5 degrees F or higher

A horizon

Hue: 2.5Y, 7.5YR, or 10YR

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

Chroma: 2 or 3

Texture: fine sandy loam or sandy loam

Clay content: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5Y, 7.5YR, or 10YR

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

Chroma: 2 or 3

Texture: very fine sandy loam, fine sandy loam, or sandy loam

Clay content: 5 to 15 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.9 to 8.4

80E—Blacksheep-Rock outcrop-Twilight complex, 8 to 45 percent slopes

Setting

Landform:

Blacksheep—Hills
 Twilight—Hills

Position on landform:

Blacksheep—Backslopes and side slopes
 Rock outcrop—Shoulders and summits
 Twilight—Backslopes, footslopes, and side slopes

Slope:

Blacksheep—8 to 45 percent
 Twilight—8 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Blacksheep and similar soils: 40 percent
 Rock outcrop: 25 percent
 Twilight and similar soils: 25 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent

Major Component Description

Blacksheep

Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

Rock outcrop

Definition: Areas of exposed hard sandstone

Twilight

Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

243F—Blacksheep-Twilight sandy loams, 8 to 45 percent slopes

Setting

Landform:

Blacksheep—Hills
 Twilight—Hills

Position on landform:

Blacksheep—Backslopes and side slopes
 Twilight—Backslopes, footslopes, and side slopes

Slope:

Blacksheep—15 to 45 percent
 Twilight—8 to 25 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Blacksheep and similar soils: 45 percent
 Twilight and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Blacksheep

Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.6 inches

Twilight

Surface layer texture: Sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 3.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Borky Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Hills and sedimentary plains

Parent material: Semiconsolidated shale residuum

Slope range: 2 to 15 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Clayey-skeletal, mixed, superactive
Typic Argiborolls

Typical Pedon

Borky very stony clay loam, in an area of Borky-Sinnigam very stony clay loams, 2 to 15 percent slopes, 700 feet west and 1,800 feet south of the northeast corner of sec. 7, T. 11 N., R. 22 E.

A—0 to 3 inches; dark brown (10YR 4/3) very stony loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; 20 percent stones and cobbles, 15 percent pebbles; neutral; clear wavy boundary.

Bt—3 to 11 inches; brown (10YR 4/3) very stony clay loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; hard, firm, sticky and very plastic; many fine and very fine roots; many distinct clay films on faces of peds; 25 percent stones, 15 percent pebbles; neutral; clear wavy boundary.

Bk1—11 to 21 inches; light brownish gray (10YR 6/2) very stony clay loam, grayish brown (10YR 5/2) moist; moderate fine and very fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots; 30 percent stones, 20 percent pebbles; many fine irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—21 to 33 inches; light brownish gray (10YR 6/2) very stony clay loam, grayish brown (10YR 5/2) moist; moderate fine and very fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots; 25 percent stones, 20 percent pebbles; many medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—33 to 60 inches; semiconsolidated shale interbedded with sandstone.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Mollic epipedon thickness: 7 to 14 inches

Depth to Bk horizon: 11 to 20 inches

Depth to Cr horizon: 20 to 40 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 15 to 60 percent—0 to 30 percent flagstones, stones, or cobbles; 15 to 30 percent pebbles or channers

Reaction: pH 6.6 to 7.8

Bt horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: clay or clay loam

Clay content: 35 to 50 percent

Rock fragments: 35 to 60 percent—20 to 40 percent flagstones, stones, and cobbles; 15 to 30 percent pebbles or channers

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Clay content: 35 to 45 percent

Rock fragments: 35 to 60 percent—20 to 40 percent stones and cobbles; 15 to 30 percent pebbles or channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

296D—Borky-Sinnigam very stony clay loams, 2 to 15 percent slopes

Setting

Landform:

Borky—Sedimentary plains and hills
 Sinnigam—Hills and bedrock floored plains

Position on landform:

Borky—Backslopes
 Sinnigam—Shoulders and summits

Slope:

Borky—2 to 15 percent
 Sinnigam—2 to 15 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Borky and similar soils: 50 percent
 Sinnigam and similar soils: 40 percent

Minor Components

Cabba and similar soils: 0 to 5 percent
 Delplain and similar soils: 0 to 5 percent

Major Component Description

Borky

Surface layer texture: Very stony loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

Sinnigam

Surface layer texture: Very stony clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 1.5 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bullhook Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical Pedon

Bullhook loam in an area of Lostriver-Bullhook complex, 0 to 2 percent slopes, 100 feet east and 1,700 feet south of the northwest corner of sec. 18, T. 7 N., R. 25 E.

A—0 to 5 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—5 to 11 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, sticky and plastic; many fine and very fine roots; strongly effervescent; strongly alkaline; clear smooth boundary.

Cyz—11 to 60 inches; light brownish gray (2.5Y 6/2) clay loam with thin strata of loam and fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, sticky and plastic; few very fine roots; many fine and very fine irregular masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Clay content: 15 to 27 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 8 to 13

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 9.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam, loam, or silty clay loam with or without thin layers of loam, clay, silty clay loam, fine sandy loam, or silt loam

Clay content: 18 to 35 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 20

Calcium carbonate equivalent: 5 to 10

Reaction: pH 7.4 to 9.6

Cyz horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam, loam, or silty clay loam with or without thin layers of fine sandy loam, loam, clay loam, silty clay loam, or silt loam

Clay content: 18 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Gypsum: 2 to 5 percent

Calcium carbonate equivalent: 5 to 10

Reaction: pH 7.4 to 9.6

Busby Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour)

Landform: Sedimentary plains and hills

Parent material: Alluvium

Slope range: 2 to 15 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Aridic Ustochrepts

Typical Pedon

Busby fine sandy loam, 8 to 15 percent slopes 3,875 feet south and 250 feet east of the northwest corner of sec. 1, T. 8 N., R 30 E.

A—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; moderately alkaline; clear smooth boundary.

Bw—6 to 13 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, nonsticky and nonplastic; many very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—13 to 24 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—24 to 43 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine roots; few fine masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

BC—43 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 8 and 24 inches; dry in all parts between four-tenths and five-tenths of the cumulative days when the soil temperature at 20 inches is 41 degrees F or above

Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3 or 4 moist
 Chroma: 2, 3, or 4
 Clay content: 10 to 18 percent
 Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: fine sandy loam, sandy loam, or loam
 Clay content: 10 to 18 percent
 Reaction: pH 7.4 to 8.4
 Effervescence: none to strongly

Bk horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Textures: fine sandy loam or sandy loam
 Clay content: 10 to 18 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: fine sandy loam, sandy loam, loamy fine sand, loamy sand, or fine sand (The loamy fine sand, loamy sand, or fine sand textures are below depths of 40 inches.)
 Clay content: 3 to 18 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

30C—Busby fine sandy loam, 2 to 8 percent slopes**Setting**

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Busby and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 5 percent
 Twilight and similar soils: 0 to 5 percent
 Yamacall 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
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.4 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

30D—Busby fine sandy loam, 8 to 15 percent slopes**Setting**

Landform: Hills
Slope: 8 to 15 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Busby and similar soils: 85 percent

Minor Components

Twilight and similar soils: 0 to 5 percent
 Chinook and similar soils: 0 to 5 percent
 Blacksheep 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
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.4 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

130B—Busby-Twilight complex, 2 to 8 percent slopes

Setting

Landform: Fans and uplands

Slope: 2 to 8 percent

Elevation: 2,000 to 5,500 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Busby and similar soils: 45 percent

Twilight and similar soils: 40 percent

Minor Components

Blackhall and similar soils: 15 percent

Major Component Description

Busby

Surface layer texture: Fine sandy loam

Depth class: Deep (40 inches or more)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Twilight

Surface layer texture: Sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cabba Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills and sedimentary plains

Parent material: Semiconsolidated sedimentary beds

Slope range: 4 to 65 percent

Elevation range: 3,200 to 4,600 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Loamy, mixed, calcareous, superactive, frigid, shallow Typic Ustorthents

Typical Pedon

Cabba loam, in an area of Cabba-Doney loams, 8 to 45 percent slopes, 2,400 east and 1,200 feet north of the southwest corner of sec. 4, T. 6 N., R. 27 E.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—3 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; few fine masses of lime; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk2—7 to 17 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very roots; few fine masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

Cr—17 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches or to the paralithic contact. Frozen November through March; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees or higher

Depth to Cr horizon: 10 to 20 inches

Notes: The chromas of 1 are lithochromic.

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, 3, or 4

Clay content: 10 to 27 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 9.0

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, 4, or 6

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

Clay content: 20 to 35 percent

Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles or channers

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 9.0

289F—Cabba-Barvon loams, 15 to 65 percent slopes

Setting

Landform:

Cabba—Hills

Barvon—Hills

Position on landform:

Cabba—Backslopes and side slopes

Barvon—Backslopes, footslopes, and side slopes

Slope:

Cabba—25 to 65 percent

Barvon—15 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabba and similar soils: 45 percent

Barvon and similar soils: 40 percent

Minor Components

Doney and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.0 inches

Barvon

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

284D—Cabba-Barvon loams, 4 to 15 percent slopes

Setting

Landform:

Cabba—Sedimentary plains and hills

Barvon—Sedimentary plains

Position on landform:

Cabba—Backslopes and side slopes

Barvon—Backslopes, footslopes, and side slopes

Slope:

Cabba—8 to 15 percent

Barvon—4 to 8 percent

Elevation: 3,200 to 4,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 105 to 135 days**Composition****Major Components**

Cabba and similar soils: 45 percent

Barvon and similar soils: 40 percent

Minor Components

Doney and similar soils: 0 to 5 percent

Wayden and similar soils: 0 to 5 percent

Dast and similar soils: 0 to 5 percent

Major Component Description**Cabba***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 2.8 inches**Barvon***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

285D—Cabba-Doney loams, 4 to 15 percent slopes**Setting***Landform:*

Cabba—Hills

Doney—Sedimentary plains

Position on landform:

Cabba—Backslopes and side slopes

Doney—Backslopes, footslopes, and side slopes

Slope:

Cabba—8 to 15 percent

Doney—4 to 8 percent

Elevation: 3,200 to 4,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 90 to 135 days**Composition****Major Components**

Cabba and similar soils: 45 percent

Doney and similar soils: 40 percent

Minor Components

Barvon and similar soils: 0 to 5 percent

Macar and similar soils: 0 to 5 percent

Wayden and similar soils: 0 to 5 percent

Major Component Description**Cabba***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 2.8 inches**Doney***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

285F—Cabba-Doney loams, 8 to 45 percent slopes

Setting

Landform:

Cabba—Hills

Doney—Hills

Position on landform:

Cabba—Backslopes and side slopes

Doney—Backslopes, footslopes, and side slopes

Slope:

Cabba—15 to 45 percent

Doney—8 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Composition

Major Components

Cabba and similar soils: 45 percent

Doney and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Barvon and similar soils: 0 to 5 percent

Ridge and similar soils: 0 to 5 percent

Major Component Description

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.8 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

283F—Cabba-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform: Hills

Slope: 8 to 45 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabba and similar soils: 60 percent

Rock outcrop: 25 percent

Minor Components

Doney and similar soils: 0 to 5 percent

Wayden and similar soils: 0 to 5 percent

Ridge and similar soils: 0 to 5 percent

Major Component Description

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.0 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cabbart Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated sedimentary beds

Slope range: 0 to 65 percent

Elevation range: 2,710 to 4,600 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents

Typical Pedon

Cabbart loam, in an area of Cabbart-Delpoint loams, 4 to 15 percent slopes, in cropland, 2,800 feet south and 50 feet east of the northwest corner of sec. 33, T. 11 N., R. 22 E.

Ap—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—4 to 8 inches; very pale brown (10YR 7/4) loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—8 to 16 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; weak medium

prismatic structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few very fine roots; violently effervescent; moderately alkaline; diffuse wavy boundary.

Cr—16 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches or to the paralithic contact; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F

Depth to Cr horizon: 10 to 20 inches

Soil phases: moist; high ppt

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 18 to 27 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 9.0

Bk and BC horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

Clay content: 18 to 35 percent

Rock fragments: 0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 1 to 10

Gypsum: 1 to 5 percent

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.4 to 9.0

85A—Cabbart clay loam, 0 to 2 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 85 percent

Minor Components

Rentsac and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

81D—Cabbart loam, 4 to 15 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 15 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 85 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent
 Yamacall and similar soils: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

280D—Cabbart, moist-Delpoint, dry loams, 4 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills

Delpoint—Sedimentary plains

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—4 to 15 percent

Delpoint—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 45 percent

Delpoint and similar soils: 40 percent

Minor Components

Twilight and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.8 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

287F—Cabbart, moist-Delpoint, dry loams, 8 to 45 percent slopes**Setting***Landform:*

Cabbart—Hills
 Delpoint—Hills

Position on landform:

Cabbart—Backslopes and side slopes
 Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—25 to 45 percent
 Delpoint—8 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Cabbart and similar soils: 45 percent
 Delpoint and similar soils: 40 percent

Minor Components

Yawdim and similar soils: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent
 Blacksheep and similar soils: 0 to 5 percent

Major Component Description**Cabbart**

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.1 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

181E—Cabbart-Crago-Delpoint complex, 15 to 35 percent slopes**Setting***Landform:*

Cabbart—Hills
 Crago—Relict stream terraces
 Delpoint—Hills

Position on landform:

Cabbart—Backslopes and side slopes
 Crago—Shoulders and summits
 Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—15 to 35 percent
 Crago—15 to 35 percent
 Delpoint—15 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Cabbart and similar soils: 35 percent
 Crago and similar soils: 30 percent
 Delpoint and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent

Major Component Description**Cabbart**

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

181D—Cabbart-Crago-Delpoint complex, 4 to 15 percent slopes**Setting***Landform:*

Cabbart—Sedimentary plains and hills
 Crago—Relict stream terraces
 Delpoint—Sedimentary plains and hills

Position on landform:

Cabbart—Backslopes and side slopes
 Crago—Shoulders and summits
 Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—4 to 15 percent
 Crago—4 to 15 percent
 Delpoint—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Cabbart and similar soils: 35 percent
 Crago and similar soils: 30 percent
 Delpoint and similar soils: 25 percent

Minor Components

Yawdim and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent

Major Component Description**Cabbart**

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

288F—Cabbart-Delpoint loams, 15 to 65 percent slopes

Setting

Landform:

Cabbart—Hills

Delpoint—Hills

Position on landform:

Cabbart—Backslopes and side slopes

Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—25 to 65 percent

Delpoint—15 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 45 percent

Delpoint and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.8 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

82B—Cabbart-Delpoint loams, 4 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills

Delpoint—Sedimentary plains and hills

Position on landform:

Cabbart—Shoulders and summits

Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—4 to 15 percent

Delpoint—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 45 percent

Delpoint and similar soils: 40 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Yawdim and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

82C—Cabbart-Delpoint-Rock outcrop complex, 4 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills
 Delpoint—Sedimentary plains and hills

Position on landform:

Cabbart—Shoulders and summits
 Delpoint—Backslopes, footslopes, and side slopes

Rock outcrop—Shoulders and summits

Slope:

Cabbart—4 to 15 percent
 Delpoint—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 35 percent
 Delpoint and similar soils: 30 percent
 Rock outcrop: 25 percent

Minor Components

Yawdim and similar soils: 0 to 5 percent
 Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

82E—Cabbart-Delpoint-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform:

Cabbart—Hills
 Delpoint—Hills

Position on landform:

Cabbart—Shoulders and summits
 Delpoint—Backslopes, footslopes, and side slopes
 Rock outcrop—Shoulders and summits

Slope:

Cabbart—8 to 45 percent
 Delpoint—8 to 15 percent

Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 35 percent
 Delpoint and similar soils: 30 percent
 Rock outcrop: 25 percent

Minor Components

Blacksheep and similar soils: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

154D—Cabbart-Marmarth complex, 4 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills
 Marmarth—Sedimentary plains and hills

Position on landform:

Cabbart—Shoulders and summits
 Marmarth—Backslopes, footslopes, and side slopes

Slope:

Cabbart—4 to 15 percent
 Marmarth—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 45 percent
 Marmarth and similar soils: 40 percent

Minor Components

Tanna and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Amherst and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Marmarth

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

86D—Cabbart-Rentsac complex, 2 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills

Rentsac—Sedimentary plains and hills

Slope:

Cabbart—2 to 15 percent

Rentsac—2 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 45 percent

Rentsac and similar soils: 40 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Yawdim and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Rentsac

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

86E—Cabbart-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform: Hills

Slope: 4 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 60 percent

Rock outcrop: 25 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent

Yawdim and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

286F—Cabbart-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform: Hills
Slope: 8 to 45 percent
Elevation: 3,200 to 4,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 65 percent
 Rock outcrop: 20 percent

Minor Components

Doney and similar soils: 0 to 5 percent
 Ridge and similar soils: 0 to 5 percent
 Wayden and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.1 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

83D—Cabbart-Rock outcrop-Blacksheep complex, 8 to 45 percent slopes

Setting

Landform:

Cabbart—Hills
 Blacksheep—Hills

Slope:

Cabbart—8 to 45 percent
 Blacksheep—8 to 45 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 35 percent
 Rock outcrop: 30 percent
 Blacksheep and similar soils: 25 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

Rock outcrop

Definition: Areas of exposed bedrock

Blacksheep

Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

153D—Cabbart-Tanna loams, 4 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills

Tanna—Sedimentary plains and hills

Position on landform:

Cabbart—Shoulders and summits

Tanna—Backslopes, footslopes, and side slopes

Slope:

Cabbart—4 to 15 percent

Tanna—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 45 percent

Tanna and similar soils: 40 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent

Megonot and similar soils: 0 to 5 percent

Welter and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Tanna

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84E—Cabbart-Yawdim-Delpoint complex, 15 to 35 percent slopes

Setting

Landform:

Cabbart—Hills

Yawdim—Hills

Delpoint—Hills

Position on landform:

Cabbart—Shoulders and summits

Yawdim—Shoulders and summits

Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—15 to 35 percent

Yawdim—15 to 35 percent

Delpoint—15 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 35 percent

Yawdim and similar soils: 30 percent

Delpoint and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84C—Cabbart-Yawdim-Delpoint complex, 4 to 15 percent slopes

Setting

Landform:

Cabbart—Sedimentary plains and hills
 Yawdim—Sedimentary plains and hills
 Delpoint—Sedimentary plains and hills

Position on landform:

Cabbart—Shoulders and summits
 Yawdim—Shoulders and summits
 Delpoint—Backslopes, footslopes, and side slopes

Slope:

Cabbart—4 to 15 percent

Yawdim—4 to 15 percent

Delpoint—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 35 percent

Yawdim and similar soils: 30 percent

Delpoint and similar soils: 25 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84D—Cabbart-Yawdim-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform:

Cabbart—Hills

Yawdim—Hills

Slope:

Cabbart—4 to 35 percent

Yawdim—4 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Cabbart and similar soils: 35 percent

Yawdim and similar soils: 30 percent

Rock outcrop: 25 percent

Minor Components

Blacksheep and similar soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Castner Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to moderately rapid (2.0 to 6.0 inches/hour)

Landform: Hills and bedrock floored plains

Parent material: Sandstone residuum

Slope range: 4 to 60 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Haploborolls

Typical Pedon

Castner channery loam, 4 to 25 percent slopes, 2,200 feet west and 2,100 feet south of the northeast corner of sec. 7, T. 11 N., R. 22 E.

A—0 to 2 inches; brown (10YR 4/3) channery loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; 20 percent channers; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—2 to 7 inches; brown (10YR 5/3) channery loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; 5 percent flagstones, 30 percent channers; common distinct lime casts on the underside of coarse fragments; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—7 to 13 inches; pale brown (10YR 6/3) very channery loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; 10 percent flagstones, 50 percent

channers; common distinct lime casts on coarse fragments; many large irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—13 to 18 inches; pale brown (10YR 6/3) extremely channery loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; 60 percent channers, 10 percent flagstones; common distinct lime casts on undersides of channers and flagstones, disseminated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

R—18 inches; layered shattered calcareous sandstone.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: between 4 and 12 inches

Mollic epipedon thickness: 7 to 15 inches

Depth to bedrock: 10 to 20 inches

Depth to k horizon: 7 to 15 inches

A horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR

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

Chroma: 1, 2, or 3

Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand

Rock fragments: 15 to 35 percent—0 to 10 percent cobbles and stones, 15 to 25 percent pebbles and channers

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR

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

Chroma: 1, 2, or 3

Texture: loam or sandy loam

Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand

Rock fragments: 30 to 70 percent—0 to 20 percent cobbles and stones, 30 to 55 percent pebbles and channers

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 2.5Y, 10YR, 7.5YR, or 5YR

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

Chroma: 2 or 3

Texture: loam or sandy loam

Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand

Rock fragments: 35 to 80 percent—10 to 25 percent cobbles and stones, 25 to 60 percent pebbles and channers

Calcium carbonate equivalent: 3 to 15 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 8.4

282D—Castner channery loam, 4 to 25 percent slopes

Setting

Landform: Hills and bedrock floored plains

Slope: 4 to 25 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Composition

Major Components

Castner and similar soils: 90 percent

Minor Components

Kuro and similar soils: 0 to 5 percent

Cabba and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Channery loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

280E—Castner-Kuro complex, 4 to 25 percent slopes**Setting***Landform:*

Castner—Hills and bedrock floored plains
Kuro—Sedimentary plains and hills

Position on landform:

Castner—Shoulders and summits
Kuro—Backslopes

Slope:

Castner—4 to 25 percent
Kuro—4 to 25 percent

Elevation: 4,200 to 4,700 feet*Mean annual precipitation:* 15 to 16 inches*Frost-free period:* 90 to 135 days**Composition****Major Components**

Castner and similar soils: 45 percent
Kuro and similar soils: 40 percent

Minor Components

Cabba and similar soils: 0 to 5 percent
Wayden and similar soils: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent

Major Component Description**Castner***Surface layer texture:* Channery loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Sandstone residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 1.7 inches**Kuro***Surface layer texture:* Silty clay loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated shale residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

281E—Castner-Rock outcrop complex, 8 to 45 percent slopes**Setting***Landform:* Hills*Position on landform:*

Castner—Backslopes and side slopes
Rock outcrop—Shoulders and summits

Slope: 8 to 45 percent*Elevation:* 4,200 to 4,700 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 90 to 135 days**Composition****Major Components**

Castner and similar soils: 60 percent
Rock outcrop: 25 percent

Minor Components

Kuro and similar soils: 0 to 5 percent
Cabba and similar soils: 0 to 5 percent
Wayden and similar soils: 0 to 5 percent

Major Component Description**Castner***Surface layer texture:* Channery loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Sandstone residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 1.3 inches**Rock outcrop***Definition:* Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Chinook Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 8 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Coarse-loamy, mixed, superactive
 Aridic Haploborolls

Typical Pedon

Chinook fine sandy loam, 2 to 8 percent slopes, 500 feet south and 2,400 feet west of the northeast corner of sec. 6, T. 10 N., R. 26 E.

Ap—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; loose, nonsticky and nonplastic; common fine and few medium roots; neutral; clear smooth boundary.

Bw1—4 to 11 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; loose, nonsticky and nonplastic; common fine roots; neutral; gradual smooth boundary.

Bw2—11 to 27 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to weak fine subangular blocky; loose, nonsticky and nonplastic; few fine roots; moderately alkaline; clear smooth boundary.

Bw3—27 to 34 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; loose, nonsticky and nonplastic; moderately alkaline; gradual smooth boundary.

Bk—34 to 60 inches; pale yellow (2.5Y 7/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; loose, nonsticky and nonplastic; few fine masses of lime; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: between 8 and 24 inches
Mollic epipedon thickness: 7 to 15 inches thick
Depth to Bk horizon: 10 to 35 inches.

Ap horizon

Hue: 10YR or 2.5Y
 Value: 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 8.4

Bw1 horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry; 2, 3, or 4 moist
 Chroma: 2, 3, or 4
 Textures: fine sandy loam or sandy loam
 Clay content: 5 to 18 percent and more than 50 percent medium, fine, and coarser sand
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 8.4

Bw2 and Bw3 horizons

Hue: 10YR or 2.5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2, 3, or 4
 Textures: fine sandy loam or sandy loam
 Clay content: 5 to 18 percent and more than 50 percent medium, fine, and coarser sand
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Textures: fine sandy loam or sandy loam
 Clay content: 5 to 18 percent and more than 50 percent medium, fine, and coarser sand
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 6.6 to 9.0

90B—Chinook fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Chinook and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent

Kremlin and similar soils: 0 to 5 percent

Twilight 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

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Crago Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) in the upper 21 inches, rapid below this depth (6.0 to 20.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 35 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid
Haplocalcidic Ustochrepts

Typical Pedon

Crago gravelly loam, in an area of Yawdim-Crago complex, 4 to 35 percent slopes, 500 feet south and 500 feet west of the northeast corner of sec. 25, T. 11 N., R. 23 E.

A—0 to 4 inches; light yellowish gray (10YR 6/2) gravelly loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 20 percent pebbles; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—4 to 10 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; 35 percent pebbles; continuous distinct lime casts on undersides of pebbles; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—10 to 21 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and very roots; 60 percent pebbles; continuous prominent lime casts on surface of pebbles; some cementation between individual pebbles; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk3—21 to 37 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, loose, nonsticky and nonplastic; 75 percent pebbles; continuous distinct lime casts on pebbles; some lime cementation between individual pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—37 to 60 inches; brownish yellow (10YR 6/6) extremely gravelly loamy sand, yellowish brown (10YR 5/6) moist; massive; loose, nonsticky and nonplastic; 75 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: between 4 and 12 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is higher than 41 degrees F

Calcium carbonate equivalent: 10 to 40 inch zone—15 to 60 percent of fine earth fraction and the whole soil, including rock fragments less than 3/4-inch in size, is 40 to 70 percent calcium carbonate equivalent.

A horizon

Hue: 2.5Y through 7.5YR
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2 or 3
 Clay content: 15 to 27 percent
 Rock fragments: 15 to 35 percent—0 to 10 percent
 stones and cobbles; 15 to 25 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 2.5Y through 7.5YR
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam, or sandy clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 15 to 75 percent—0 to 30 percent
 stones and cobbles; 15 to 60 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent in
 the fine earth fraction, 40 to 70 percent for the
 whole soil including coarse fragments less than
 3/4-inch in size
 Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons

Hue: 2.5Y or 10YR
 Value: 6, 7, or 8 dry; 4, 5, 6, or 7 moist
 Chroma: 2, 3, or 4
 Texture: loam, sandy clay loam, or clay loam
 Clay content: 15 to 30 percent
 Calcium carbonate equivalent: 15 to 30 percent for
 fine earth fraction and the whole soil including
 coarse fragments less than 3/4-inch in size is
 40 to 70 percent
 Reaction: pH 7.4 to 8.4

2C horizon

Hue: 2.5Y or 10YR
 Value: 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, 4, or 6
 Texture: loamy sand, coarse sandy loam, sandy
 loam, or loam
 Clay content: 0 to 20 percent
 Rock fragments: 40 to 80 percent—0 to 40 percent
 stones and cobbles; 40 to 80 percent pebbles
 Calcium carbonate equivalent: 10 to 25 percent for
 fine earth fraction and the whole soil including
 rock fragments less than 3/4-inch in size is 20
 to 50 percent
 Reaction: pH 7.4 to 8.4

93B—Crago cobbly loam, 1 to 6 percent slopes**Setting**

Landform: Relict stream terraces
Slope: 1 to 6 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Crago and similar soils: 85 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent
 Attewan and similar soils: 0 to 5 percent
 Yawdim and similar soils: 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: Limestone alluvium
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

94A—Crago gravelly loam, 0 to 8 percent slopes**Setting**

Landform: Relict stream terraces
Slope: 0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Crago and similar soils: 85 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent

Attewan and similar soils: 0 to 5 percent

Niart 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 alluvium

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

94E—Crago gravelly loam, 8 to 35 percent slopes

Setting

Landform: Relict stream terraces

Slope: 8 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Crago and similar soils: 85 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent

Attewan and similar soils: 0 to 5 percent

Yawdim 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 alluvium

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

96E—Crago-Abor complex, 4 to 35 percent slopes

Setting

Landform:

Crago—Relict stream terraces

Abor—Sedimentary plains and hills

Position on landform:

Crago—Shoulders and summits

Abor—Backslopes, footslopes, and side slopes

Slope:

Crago—4 to 35 percent

Abor—4 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Crago and similar soils: 45 percent

Abor and similar soils: 40 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent

Neldore and similar soils: 0 to 5 percent

Verson and similar soils: 0 to 5 percent

Major Component Description

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale
 residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95C—Crago-Attewan cobbly loams, 2 to 8 percent slopes**Setting***Landform:*

Crago—Relict stream terraces
 Attewan—Relict stream terraces

Slope:

Crago—2 to 8 percent
 Attewan—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Crago and similar soils: 45 percent
 Attewan and similar soils: 40 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent
 Niart and similar soils: 0 to 5 percent
 Rothiemay and similar soils: 0 to 5 percent

Major Component Description**Crago**

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Attewan

Surface layer texture: Cobbly 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 4.3 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95B—Crago-Attewan-Musselshell cobbly loams, 0 to 4 percent slopes**Setting***Landform:*

Crago—Relict stream terraces
 Attewan—Relict stream terraces
 Musselshell—Relict stream terraces

Slope:

Crago—0 to 4 percent
 Attewan—0 to 4 percent
 Musselshell—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Crago and similar soils: 35 percent
 Attewan and similar soils: 30 percent
 Musselshell and similar soils: 25 percent

Minor Components

Verson and similar soils: 0 to 5 percent
 Niart and similar soils: 0 to 5 percent

Major Component Description**Crago**

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Attewan

Surface layer texture: Cobbly 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 4.3 inches

Musselshell

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95A—Crago-Musselshell cobbly loams, 0 to 4 percent slopes

Setting

Landform:

Crago—Relict stream terraces
Musselshell—Relict stream terraces

Slope:

Crago—0 to 4 percent
Musselshell—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Crago and similar soils: 45 percent
Musselshell and similar soils: 40 percent

Minor Components

Attewan and similar soils: 0 to 5 percent
Verson and similar soils: 0 to 5 percent
Niart and similar soils: 0 to 5 percent

Major Component Description

Crago

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Musselshell

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

93A—Crago-Musselshell complex, 0 to 4 percent slopes

Setting

Landform:

Crago—Relict stream terraces
Musselshell—Relict stream terraces

Slope:

Crago—0 to 4 percent
Musselshell—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Crago and similar soils: 45 percent
Musselshell and similar soils: 40 percent

Minor Components

Attewan and similar soils: 0 to 5 percent
 Cabbart and similar soils: 0 to 5 percent
 Binna and similar soils: 0 to 5 percent

Major Component Description**Crago**

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Musselshell

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

56A—Crago-Musselshell-Attewan complex, 0 to 2 percent slopes**Setting***Landform:*

Crago—Relict stream terraces
 Musselshell—Relict stream terraces
 Attewan—Relict stream terraces

Slope:

Crago—0 to 2 percent
 Musselshell—0 to 2 percent
 Attewan—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Crago and similar soils: 35 percent
 Musselshell and similar soils: 30 percent
 Attewan and similar soils: 25 percent

Minor Components

Verson and similar soils: 0 to 5 percent
 Niart and similar soils: 0 to 5 percent

Major Component Description**Crago**

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Musselshell

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.5 inches

Attewan

Surface layer texture: 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 4.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Creed Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Aridic
Natrustalfs

Typical Pedon

Creed loam, in an area of Creed-Gerdrum loams, 0 to 8 percent slopes, 400 feet north and 500 feet west of the southeast corner of sec. 11, T. 10 N., R. 26 E.

Ap—0 to 5 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; thin vesicular crust over weak fine and very fine granular structure; loose, very friable, slightly sticky and slightly plastic; few fine roots; slightly alkaline; abrupt smooth boundary.

Btn—5 to 10 inches; brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; strong medium columnar structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; common distinct clay films on faces of peds and lining pores; few fine and very fine roots; slightly alkaline; clear smooth boundary.

Btnk—10 to 13 inches; pale brown (10YR 6/3) silty clay, brown (10YR 5/3) moist; strong medium columnar structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common distinct clay films on faces of peds and lining pores; few fine and very fine roots; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bkn—13 to 28 inches; light yellowish brown (2.5Y 6/4) silty clay, light olive brown (2.5Y 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few fine roots; common fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bkny—28 to 35 inches; light yellowish brown (2.5Y 6/4) silty clay, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine masses and seams of gypsum; common fine masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Byz—35 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine seams of gypsum and other salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above

Depth to secondary lime: 10 to 20 inches

Depth to gypsum and other salts: 22 to 30 inches

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 8.4

Btn horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 8 to 13

Reaction: pH 6.6 to 9.0

Btnk, Bkn, Bkny horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

Rock fragments: 0 to 15 percent pebbles

Clay content: 27 to 45 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 4 to 8 mmhos/cm
 Sodium adsorption ratio: 13 to 20
 Gypsum: 0 to 2 percent
 Reaction: pH 7.9 to 9.0

Byz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam, sandy clay loam, or silty clay loam
 Clay content: 25 to 35 percent
 Rock fragments: 0 to 15 percent pebbles
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 25
 Gypsum: 1 to 5 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.9 to 9.0

123C—Creed-Gerdrum loams, 0 to 8 percent slopes

Setting

Landform:

Creed—Alluvial fans and stream terraces
 Gerdrum—Alluvial fans and stream terraces

Position on landform:

Creed—Microhighs
 Gerdrum—Microlows

Slope:

Creed—0 to 8 percent
 Gerdrum—0 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Creed and similar soils: 45 percent
 Gerdrum and similar soils: 40 percent

Minor Components

Marvan and similar soils: 0 to 5 percent
 Vanda and similar soils: 0 to 5 percent
 Marias and similar soils: 0 to 5 percent

Major Component Description

Creed

Surface layer texture: 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 6.4 inches

Gerdrum

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Dast Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills and sedimentary plains
Parent material: Sandstone residuum
Slope range: 2 to 35 percent
Elevation range: 3,200 to 4,600 feet
Annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Typic Ustochrepts

Typical Pedon

Dast sandy loam, in an area of Ridge-Dast sandy loams, 8 to 45 percent slopes, 1,400 feet west and 600 feet south of the northeast corner of sec. 26, T. 8 N., R. 28 E.

A—0 to 5 inches; light olive brown (2.5Y 5/4) sandy loam, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine and few medium roots; 10 percent channers; slightly alkaline; clear smooth boundary.

Bw—5 to 18 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine and few medium roots; 10 percent channers; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—18 to 33 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine and few medium roots; 10 percent channers; common distinct lime casts on undersides of channers; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—33 to 60 inches; semiconsolidated sandy sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 8 and 24 inches

Depth to Bk horizon: 12 to 24 inches

Depth to bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam or sandy loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles or channers

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles or channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles or channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

242D—Dast-Ridge sandy loams, 2 to 8 percent slopes

Setting

Landform:

Dast—Sedimentary plains

Ridge—Sedimentary plains

Position on landform:

Dast—Foothills

Ridge—Backslopes

Slope:

Dast—2 to 8 percent

Ridge—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Dast and similar soils: 45 percent

Ridge and similar soils: 40 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Doney and similar soils: 0 to 5 percent

Wayden and similar soils: 0 to 5 percent

Major Component Description

Dast

Surface layer texture: Sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.7 inches

Ridge

Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Delplain Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Hills
Parent material: Residuum or colluvium derived from sandstone and shale
Slope range: 4 to 25 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Clayey-skeletal, mixed, nonacid, superactive, frigid Lithic Ustorthents

Typical Pedon

Delplain channery clay loam, in an area of Hinterland-Delplain complex, 8 to 25 percent slopes, 200 feet east and 300 feet north of the southwest corner sec. 33, T. 11 N., R. 25 E.

- A—0 to 3 inches; grayish brown (2.5Y 5/2) channery clay loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; soft, friable, sticky and plastic; common fine and very fine roots; 20 percent channers; slightly acid; clear smooth boundary.
- C—3 to 12 inches; grayish brown (2.5Y 5/2) extremely channery clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft, friable, sticky and plastic; common fine and very fine roots; 80 percent channers; slightly acid; clear smooth boundary.
- R—12 inches; hard shale and sandstone.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: between 4 and 12 inches
Depth to bedrock: 10 to 20 inches

A horizon

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 27 to 40 percent
 Rock fragments: 20 to 35 percent—0 to 5 percent flagstones; 20 to 30 percent channers
 Reaction: pH 6.1 to 7.8

C horizon

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay loam or clay
 Clay content: 35 to 45 percent
 Rock fragments: 45 to 85 percent—0 to 5 percent flagstones; 45 to 80 percent channers
 Reaction: pH 6.1 to 7.8

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated sedimentary beds
Slope range: 2 to 35 percent
Elevation range: 2,710 to 4,600 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Ustochrepts

Typical Pedon

Delpoint loam, in an area of Delpoint, calcareous-Cabbart loams, 2 to 8 percent slopes, 1,000 feet south and 400 feet west of the northeast corner of sec. 22, T. 9 N., R. 27 E.

- Ap—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—3 to 11 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 22 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; disseminated lime; many fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—22 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Depth to Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Clay content: 18 to 27 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent clay

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

Clay content: 18 to 35 percent clay

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

31B—Delpoint loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

39B—Delpoint loam, calcareous, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

87B—Delpoint, calcareous-Cabbart loams, 2 to 8 percent slopes**Setting**

Landform:

Delpoint—Sedimentary plains

Cabbart—Sedimentary plains

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Cabbart—Shoulders and summits

Slope:

Delpoint—2 to 8 percent

Cabbart—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Delpoint and similar soils: 45 percent

Cabbart and similar soils: 40 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Yamacall, calcareous soils: 0 to 5 percent

Major Component Description**Delpoint**

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

39C—Delpoint, calcareous-Cabbart-Yamacall loams, 4 to 15 percent slopes**Setting**

Landform:

Delpoint—Sedimentary plains and hills

Cabbart—Sedimentary plains and hills

Yamacall—Sedimentary plains and hills

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Cabbart—Shoulders and summits

Yamacall—Footslopes and toeslopes

Slope:

Delpoint—4 to 15 percent

Cabbart—4 to 15 percent

Yamacall—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 35 percent
Cabbart and similar soils: 30 percent
Yamacall and similar soils: 25 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent
Busby and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Yamacall

Surface layer texture: 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 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

287D—Delpoint, dry-Cabbart moist loams, 2 to 8 percent slopes

Setting

Landform:

Delpoint—Sedimentary plains
Cabbart—Sedimentary plains

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes
Cabbart—Shoulders and summits

Slope:

Delpoint—2 to 6 percent
Cabbart—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 45 percent
Cabbart and similar soils: 40 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent
Twilight and similar soils: 0 to 5 percent
Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

81B—Delpoint-Cabbart loams, 2 to 8 percent slopes

Setting

Landform:

Delpoint—Sedimentary plains

Cabbart—Sedimentary plains

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Cabbart—Shoulders and summits

Slope:

Delpoint—2 to 8 percent

Cabbart—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 45 percent

Cabbart and similar soils: 40 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Eapa and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

81C—Delpoint-Cabbart loams, 8 to 15 percent slopes

Setting

Landform:

Delpoint—Hills

Cabbart—Hills

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Cabbart—Shoulders and summits

Slope:

Delpoint—8 to 15 percent

Cabbart—8 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 45 percent

Cabbart and similar soils: 40 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

288D—Delpoint-Cabbart-Havre loams, 4 to 25 percent slopes

Setting

Landform:

Delpoint—Sedimentary plains and hills
 Cabbart—Hills
 Havre—Flood plains

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes
 Cabbart—Shoulders and summits

Slope:

Delpoint—4 to 15 percent
 Cabbart—8 to 25 percent
 Havre—4 to 6 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 35 percent
 Cabbart and similar soils: 25 percent
 Havre and similar soils: 20 percent

Minor Components

Yamacall and similar soils: 0 to 10 percent
 Blacksheep and similar soils: 0 to 5 percent
 Twilight and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.1 inches

Havre

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Rare
Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

88D—Delpoint-Cabbart-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform:

Delpoint—Sedimentary plains and hills

Cabbart—Sedimentary plains and hills

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Cabbart—Backslopes and side slopes

Rock outcrop—Shoulders and summits

Slope:

Delpoint—4 to 15 percent

Cabbart—4 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 35 percent

Cabbart and similar soils: 30 percent

Rock outcrop: 25 percent

Minor Components

Yawdim and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

31C—Delpoint-Cabbart-Yamacall loams, 4 to 15 percent slopes

Setting

Landform:

Delpoint—Sedimentary plains and hills

Cabbart—Sedimentary plains and hills

Yamacall—Sedimentary plains and hills

Position on landform:

Delpoint—Backslopes, footslopes, and side slopes

Cabbart—Shoulders and summits

Yamacall—Footslopes and toeslopes

Slope:

Delpoint—4 to 15 percent

Cabbart—4 to 15 percent

Yamacall—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 35 percent

Cabbart and similar soils: 30 percent

Yamacall and similar soils: 25 percent

Minor Components

Twilight and similar soils: 0 to 5 percent

Megonot and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Yamacall

Surface layer texture: 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 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

131C—Delpoint-Yamacall loams, 2 to 8 percent slopes

Setting

Landform:
 Delpoint—Sedimentary plains
 Yamacall—Sedimentary plains
Position on landform:
 Delpoint—Shoulders and summits
 Yamacall—Backslopes, footslopes, and side slopes
Slope:
 Delpoint—2 to 8 percent
 Yamacall—2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Delpoint and similar soils: 45 percent
 Yamacall and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
 Busby and similar soils: 0 to 5 percent
 Twilight and similar soils: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Yamacall

Surface layer texture: 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 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

DA—Denied access

Composition

Major Components

Denied Access: 100 percent

Major Component Description

Definition: Areas where mapping access was denied by landowner

Doney Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated sedimentary beds
Slope range: 4 to 60 percent
Elevation range: 3,200 to 4,600 feet
Annual precipitation: 15 to 19 inches
Frost-free period: 90 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Ustocrepts

Typical Pedon

Doney loam, in an area of Cabba-Doney loams, 4 to 15 percent slopes, 1,200 feet south and 50 feet east of the northwest corner of sec. 36, T. 6 N., R. 25 E.

Ap—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine and very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; abrupt smooth boundary.

Bw1—4 to 10 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 5/4) moist; strong medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; clear wavy boundary.

Bw2—10 to 14 inches; pale brown (10YR 6/3) clay loam, light olive brown (2.5Y 5/4) moist; strong medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—14 to 26 inches; pale yellow (2.5Y 7/4) clay loam, light yellowish brown (2.5Y 6/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—26 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Moisture control section: between 4 and 12 inches
Depth to bedrock: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1, 2, or 3
 Clay content: 10 to 27 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 8.4

Bw horizons

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam, or silty clay loam
 Clay content: 18 to 30 percent
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

Bk horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam, or silty clay loam
 Clay content: 18 to 30 percent
 Rock fragments: 0 to 30 percent—0 to 10 percent cobbles; 0 to 20 percent pebbles and channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

281D—Doney-Cabba-Macar loams, 4 to 15 percent slopes

Setting

Landform:

Doney—Hills
 Cabba—Hills
 Macar—Alluvial fans

Position on landform:

Doney—Backslopes, footslopes, and side slopes
 Cabba—Shoulders and summits
 Macar—Footslopes

Slope:

Doney—8 to 15 percent

Cabba—8 to 15 percent

Macar—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Composition

Major Components

Doney and similar soils: 35 percent

Cabba and similar soils: 30 percent

Macar and similar soils: 30 percent

Minor Components

Barvon and similar soils: 0 to 5 percent

Major Component Description

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.8 inches

Macar

Surface layer texture: 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 9.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

284F—Doney-Wayden complex, 15 to 60 percent slopes

Setting

Landform:

Doney—Hills

Wayden—Hills

Position on landform:

Doney—Backslopes

Wayden—Shoulders and summits

Slope:

Doney—15 to 60 percent

Wayden—15 to 60 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Composition

Major Components

Doney and similar soils: 40 percent

Wayden and similar soils: 25 percent

Minor Components

Cabba and similar soils: 0 to 10 percent

Areas of rock outcrop: 0 to 15 percent

Ridge and similar soils: 0 to 10 percent

Major Component Description

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.9 inches

Wayden

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Eapa Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive
Aridic Argiborolls

Typical Pedon

Eapa loam, in an area of Eapa-Attewan loams, 0 to 2 percent slopes, 500 feet east and 500 feet north of the southwest corner of sec. 6, T. 9 N., R. 23 E.

A—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to strong fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt1—5 to 10 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; hard, friable, sticky and plastic; few faint clay films bridging sand grains; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt2—10 to 15 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong medium subangular blocky; hard, friable, sticky and plastic; common distinct clay films on faces

of peds; common fine and very fine roots; slightly alkaline; clear smooth boundary.

Bk—15 to 32 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; strong medium prismatic structure; hard, firm, sticky and slightly plastic; common fine and very fine roots; many fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bky—32 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; strongly effervescent; few fine masses of lime and gypsum; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Mollic epipedon thickness: 7 to 16 inches

A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.1 to 8.4

Bt horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 24 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 6.1 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 6.6 to 8.4

Bky horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4
 Texture: clay loam or loam
 Clay content: 15 to 30 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Gypsum: 0 to 1 percent
 Reaction: pH 7.4 to 8.4

52A—Eapa loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Eapa and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent
 Eapa, calcareous soils: 0 to 5 percent
 Ethridge and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

52B—Eapa loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Eapa and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent
 Eapa, calcareous soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

152A—Eapa-Attewan loams, 0 to 2 percent slopes

Setting

Landform:
 Eapa—Alluvial fans and stream terraces
 Attewan—Relict stream terraces
Slope:
 Eapa—0 to 2 percent
 Attewan—0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Eapa and similar soils: 45 percent
 Attewan and similar soils: 40 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 5 percent

Major Component Description

Eapa

Surface layer texture: 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 10.9 inches

Attewan

Surface layer texture: 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 4.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ethridge Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic Torrertic
Argiborolls

Typical Pedon

Ethridge clay loam, 0 to 2 percent slopes, 2,000 feet south and 2,500 feet west of the northeast corner of sec. 14, T. 11 N., R. 22 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine and common medium roots; slightly alkaline; clear smooth boundary.

Bt—6 to 14 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; few distinct clay films on faces of peds; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—14 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; common fine and few very fine roots; common medium masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bky—25 to 43 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; few fine masses of lime and gypsum; violently effervescent; moderately alkaline; gradual smooth boundary.

BC—43 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few fine roots; 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: 7 to 14 inches

Depth to Bk horizon: 10 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y
 Value: 3 or 4 moist
 Chroma: 2, 3, or 4
 Texture: clay, silty clay, or silty clay loam
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 5 percent pebbles
 Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: clay, silty clay loam, or clay loam
 Clay content: 30 to 45 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Bky horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: clay loam, silt loam, or silty clay loam
 Clay content: 25 to 40 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 2 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Gypsum: 1 to 3 percent
 Reaction: pH 7.4 to 8.4

BC horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: clay loam, silt loam, or silty clay loam
 Clay content: 25 to 40 percent slopes
 Rock fragments: 0 to 5 percent
 Electrical conductivity: 2 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 10 percent
 Gypsum: 0 to 3 percent
 Reaction: pH 7.4 to 8.4

51A—Ethridge clay loam, 0 to 2 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Ethridge and similar soils: 85 percent

Minor Components

Tanna and similar soils: 0 to 5 percent
 Eapa and similar soils: 0 to 5 percent
 Verson and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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
Available water capacity: Mainly 9.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

51B—Ethridge clay loam, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Ethridge and similar soils: 85 percent

Minor Components

Tanna and similar soils: 0 to 5 percent
 Eapa and similar soils: 0 to 5 percent
 Verson and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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
Available water capacity: Mainly 9.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

158A—Ethridge-Verson clay loams, 0 to 2 percent slopes

Setting

Landform:

Ethridge—Alluvial fans and stream terraces
 Verson—Relict stream terraces

Slope:

Ethridge—0 to 2 percent
 Verson—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Ethridge and similar soils: 45 percent
 Verson and similar soils: 40 percent

Minor Components

Eapa and similar soils: 0 to 5 percent
 Attewan and similar soils: 0 to 5 percent
 Kobase and similar soils: 0 to 5 percent

Major Component Description

Ethridge

Surface layer texture: 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
Available water capacity: Mainly 9.8 inches

Verson

Surface layer texture: 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
Available water capacity: Mainly 5.5 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Fergus Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 2 to 8 percent
Elevation range: 4,200 to 4,700 feet
Annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, mixed, superactive Typic Argiborolls

Typical Pedon

Fergus clay loam, 2 to 8 percent slopes, 900 feet north and 150 feet west of the southeast corner of sec. 8, T. 11 N., R. 22 E.

A—0 to 6 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

Bt—6 to 15 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

Btk—15 to 20 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many distinct clay films on faces of peds; many medium irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—20 to 46 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many fine and very fine irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—46 to 60 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common fine and very fine irregular 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: 7 to 12 inches
Depth to Bk horizon: 20 to 36 inches

A horizon

Hue: 5YR, 7.5YR, or 10YR
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 2.5YR, 5YR, or 7.5YR
 Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2, 3, 4, or 6
 Texture: clay loam, clay, or silty clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Btk horizon

Hue: 2.5YR, 5YR, or 7.5YR
 Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 2, 3, 4, or 6
 Texture: silty clay loam, clay loam, or clay
 Clay content: 27 to 45 percent
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

Bk horizons

Hue: 2.5YR, 5YR, or 7.5YR
 Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 2, 3, 4, or 6
 Texture: silty clay loam, clay loam, or clay
 Clay content: 27 to 45 percent
 Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

254C—Fergus clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 4,200 to 4,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Fergus and similar soils: 90 percent

Minor Components

Darret and similar soils: 0 to 5 percent
 Terrad and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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
Available water capacity: Mainly 8.5 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Gerdrum Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.01 to 0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Natrustalfs

Typical Pedon

Gerdrum loam, in an area of Gerdrum-Vanda-Creed complex, 0 to 8 percent slopes, 1,300 feet south and 410 feet west of the northeast corner of sec. 33, T. 11 N., R. 29 E.

A—0 to 1 inch; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

E—1 to 3 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; weak very fine platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; abrupt smooth boundary.

Btn—3 to 10 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very friable, very sticky and very plastic; common fine roots; slightly alkaline; clear smooth boundary.

Btkn—10 to 23 inches; pale brown (10YR 6/3) silty clay, brown (10YR 5/3) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, friable, very sticky and very plastic; common fine roots; disseminated lime; few fine masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

Bknyz—23 to 48 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common medium irregular masses of lime, gypsum and other salts; violently effervescent; strongly alkaline; gradual wavy boundary.

Cknyz—48 to 60 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, sticky and plastic; common medium masses of lime, gypsum and other salts; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry

in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above

Depth to k horizon: 10 to 24 inches

Depth to gypsum: 10 to 28 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

E horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Btn horizon

Hue: 10YR or 2.5Y

Value: 5, 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 55 percent

Rock fragments: 0 to 10 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 20

Reaction: pH 7.4 to 9.0

Btkn horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 13 to 20

Reaction: pH 7.4 to 9.0

Bknyz and Cknyz horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

Clay content: 30 to 50 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Gypsum: 1 to 5 percent
Reaction: pH 7.9 to 9.0

23C—Gerdrum-Creed loams, 0 to 8 percent slopes

Setting

Landform:

Gerdrum—Alluvial fans and stream terraces
Creed—Alluvial fans and stream terraces

Position on landform:

Gerdrum—Microlows
Creed—Microhighs

Slope:

Gerdrum—0 to 8 percent
Creed—0 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Gerdrum and similar soils: 45 percent
Creed and similar soils: 40 percent

Minor Components

Vanda and similar soils: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent
Zatoville and similar soils: 0 to 5 percent

Major Component Description

Gerdrum

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.2 inches

Creed

Surface layer texture: 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 6.4 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

23A—Gerdrum-Vanda complex, 0 to 8 percent slopes

Setting

Landform:

Gerdrum—Alluvial fans and stream terraces
Vanda—Alluvial fans and stream terraces

Position on landform:

Gerdrum—Microhighs
Vanda—Microlows

Slope:

Gerdrum—0 to 8 percent
Vanda—0 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Gerdrum and similar soils: 45 percent
Vanda and similar soils: 40 percent

Minor Components

Creed and similar soils: 0 to 10 percent
Marvan and similar soils: 0 to 5 percent

Major Component Description

Gerdrum

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.2 inches

Vanda

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 1.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

23B—Gerdrum-Vanda-Creed complex, 0 to 8 percent slopes

Setting

Landform:

Gerdrum—Alluvial fans and stream terraces
 Vanda—Alluvial fans and stream terraces
 Creed—Alluvial fans and stream terraces

Position on landform:

Gerdrum—Microhighs
 Vanda—Microlows
 Creed—Microhighs

Slope:

Gerdrum—0 to 8 percent
 Vanda—0 to 8 percent
 Creed—0 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Gerdrum and similar soils: 35 percent
 Vanda and similar soils: 30 percent
 Creed and similar soils: 25 percent

Minor Components

Zatoville and similar soils: 0 to 5 percent
 Marvan and similar soils: 0 to 5 percent

Major Component Description

Gerdrum

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.2 inches

Vanda

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 10.8 inches

Creed

Surface layer texture: 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 6.4 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Glendive Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Coarse-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical Pedon

Glendive fine sandy loam in an area of Havre-Glendive complex, 0 to 2 percent slopes, 150 feet north and 800 feet west of the southeast corner of sec. 13, T. 8 N., R. 25 E.

Ap—0 to 8 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and few medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—8 to 14 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; common fine and few medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—14 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam with thin layers of loam, sandy loam, and loamy fine sand, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 8 and 24 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Clay content: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 9.0

C1 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

Clay content: 5 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 9.0

C2 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam or fine sandy loam consisting

of thin layers of loam, sandy loam, silt loam, loamy sand, loamy fine sand, and occasionally clay loam

Clay content: 5 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 9.0

Harlake Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, calcareous, frigid
Aridic Ustifluvents

Typical Pedon

Harlake silty clay, 0 to 2 percent slopes, 2,250 feet west and 1,400 feet north of the southeast corner of sec. 27, T. 9 N., R. 28 E.

A—0 to 5 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine roots; moderately alkaline; clear wavy boundary.

C1—5 to 15 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; many fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—15 to 60 inches; pale brown (10YR 6/3) silty clay with thin strata of silty clay loam, loam, and sandy loam, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; few fine and medium roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil

temperature at a depth of 20 inches is 41 degrees F or higher

A horizon

Hue: 10YR or 2.5Y
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 35 to 55 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 8
 Calcium carbonate equivalent: 0 to 10 percent
 Reaction: pH 6.6 to 8.4

C1 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay, clay loam, or silty clay loam
 Clay content: 35 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 13
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay, clay loam, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay
 Clay content: 35 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 13
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

5A—Harlake silty clay, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Harlake and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 8 percent
 Bigsandy and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

6A—Harlake silty clay, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Harlake and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 5 percent
 Bigsandy and similar soils: 0 to 5 percent
 Harlake and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 9.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

8B—Harlake-Havre complex, 0 to 2 percent slopes**Setting***Landform:*

Harlake—Flood plains

Havre—Flood plains

Slope:

Harlake—0 to 2 percent

Havre—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Harlake and similar soils: 45 percent

Havre and similar soils: 40 percent

Minor Components

Glendive and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 10 percent

Major Component Description**Harlake**

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.6 inches

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Rare

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

8A—Harlake-Havre complex, 0 to 2 percent slopes, occasionally flooded**Setting***Landform:*

Harlake—Flood plains

Havre—Flood plains

Slope:

Harlake—0 to 2 percent

Havre—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Harlake and similar soils: 45 percent

Havre and similar soils: 40 percent

Minor Components

Glendive and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 5 percent

Havre and similar soils: 0 to 5 percent

Major Component Description**Harlake**

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.6 inches

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

17A—Harlake-Havre complex, calcareous, 0 to 2 percent slopes

Setting

Landform:

Harlake—Flood plains

Havre—Flood plains

Slope:

Harlake—0 to 2 percent

Havre—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Harlake and similar soils: 45 percent

Havre and similar soils: 40 percent

Minor Components

Havre and similar soils: 0 to 4 percent

Bigsandy and similar soils: 0 to 3 percent

Harlake and similar soils: 0 to 4 percent

Glendive and similar soils: 0 to 4 percent

Major Component Description

Harlake

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.6 inches

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

20B—Harlake-Marvan-Vanda silty clays, 0 to 4 percent slopes

Setting

Landform:

Harlake—Flood plains

Marvan—Alluvial fans and stream terraces

Vanda—Alluvial fans and stream terraces

Slope:

Harlake—0 to 2 percent

Marvan—0 to 4 percent

Vanda—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Harlake and similar soils: 35 percent

Marvan and similar soils: 30 percent

Vanda and similar soils: 25 percent

Minor Components

Gerdrum and similar soils: 0 to 5 percent

Creed and similar soils: 0 to 5 percent

Major Component Description

Harlake

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.6 inches

Marvan

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.9 inches

Vanda

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Havre Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 6 percent
Elevation range: 2,710 to 4,600 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical Pedon

Havre loam, in an area of Havre-Yamacall loams, 0 to 4 percent slopes, 200 feet north and 500 feet west of the southeast corner of sec. 34, T. 9 N., R. 27 E.

Ap—0 to 4 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; disseminated lime; strongly effervescent; slightly alkaline; abrupt smooth boundary.

C1—4 to 9 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

C2—9 to 22 inches; light gray (2.5Y 7/2) clay loam with thin strata of loam and silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—22 to 60 inches; light gray (2.5Y 7/2) clay loam with thin strata of loam and sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 10 to 27 percent
 Calcium carbonate equivalent: 1 to 10 percent
 Electrical conductivity: 0 to 2 mmhos/cm
 Sodium adsorption ratio: 0 to 4
 Reaction: pH 6.1 to 8.4

C1 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: loam, silt loam, or clay loam
 Clay content: 18 to 35 percent
 Calcium carbonate equivalent: 1 to 10 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 13
 Reaction: pH 7.4 to 9.0

C2 and C3 horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6 or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: loam, silt loam, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
 Clay content: 18 to 35 percent
 Calcium carbonate equivalent: 1 to 10 percent
 Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.4 to 9.0

9A—Havre loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 85 percent

Minor Components

Harlake and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 5 percent

Glendive and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Rare

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

10A—Havre loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 85 percent

Minor Components

Harlake and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 5 percent

Havre and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

13A—Havre loam, calcareous, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 3 percent

Harlake and similar soils: 0 to 3 percent

Glendive and similar soils: 0 to 4 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

14A—Havre, calcareous-Glendive complex, 0 to 2 percent slopes

Setting

Landform:

Havre—Flood plains
Glendive—Flood plains

Slope:

Havre—0 to 2 percent
Glendive—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent
Glendive and similar soils: 40 percent

Minor Components

Havre and similar soils: 0 to 5 percent
Bigsandy and similar soils: 0 to 5 percent
Harlake and similar soils: 0 to 5 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.7 inches

Glendive

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 7.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

14B—Havre, calcareous-Glendive complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

Havre—Flood plains
Glendive—Flood plains

Slope:

Havre—0 to 2 percent
Glendive—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent
Glendive and similar soils: 40 percent

Minor Components

Havre and similar soils: 0 to 10 percent
Bigsandy and similar soils: 0 to 5 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

Glendive

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 7.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

11A—Havre-Glendive complex, 0 to 2 percent slopes

Setting

Landform:

Havre—Flood plains
Glendive—Flood plains

Slope:

Havre—0 to 2 percent
Glendive—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent
Glendive and similar soils: 40 percent

Minor Components

Harlake and similar soils: 0 to 5 percent
Bigsandy and similar soils: 0 to 10 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Rare

Available water capacity: Mainly 9.7 inches

Glendive

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 7.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

11B—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

Havre—Flood plains
Glendive—Flood plains

Slope:

Havre—0 to 2 percent
Glendive—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent
Glendive and similar soils: 40 percent

Minor Components

Harlake and similar soils: 0 to 5 percent
Bigsandy and similar soils: 0 to 5 percent
Havre and similar soils: 0 to 5 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

Glendive

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 7.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

15A—Havre-Harlake complex, calcareous, 0 to 2 percent slopes

Setting

Landform:

Havre—Flood plains
Harlake—Flood plains

Slope:

Havre—0 to 2 percent
Harlake—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent
Harlake and similar soils: 40 percent

Minor Components

Havre and similar soils: 0 to 5 percent
Bigsandy and similar soils: 0 to 5 percent
Harlake and similar soils: 0 to 5 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.7 inches

Harlake

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

12A—Havre-Harlake complex, channeled, 0 to 2 percent slopes

Setting

Landform:

Havre—Flood plains
Harlake—Flood plains

Slope:

Havre—0 to 2 percent
Harlake—0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent
Harlake and similar soils: 40 percent

Minor Components

Glendive and similar soils: 0 to 5 percent
Bigsandy and similar soils: 0 to 5 percent
Havre and similar soils: 0 to 5 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

Harlake

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 7.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

9B—Havre-Yamacall loams, 0 to 4 percent slopes

Setting

Landform:

Havre—Flood plains

Yamacall—Alluvial fans and stream terraces

Slope:

Havre—0 to 2 percent

Yamacall—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent

Yamacall and similar soils: 40 percent

Minor Components

Harlake and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 5 percent

Glendive and similar soils: 0 to 5 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

Yamacall

Surface layer texture: 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 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

16A—Havre-Yamacall loams, calcareous, 0 to 4 percent slopes

Setting

Landform:

Havre—Flood plains

Yamacall—Alluvial fans and stream terraces

Slope:

Havre—0 to 2 percent

Yamacall—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Havre and similar soils: 45 percent

Yamacall and similar soils: 40 percent

Minor Components

Havre and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 3 percent

Bigsandy and similar soils: 0 to 2 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

Yamacall

Surface layer texture: 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 10.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hilger Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Mountains

Parent material: Alluvium or colluvium

Slope range: 4 to 35 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive
Typic Argiborolls

Typical Pedon

Hilger stony loam, 4 to 25 percent slopes, 1,900 feet south and 1,300 feet west of the northeast corner of sec. 8, T. 11 N., R. 22 E.

A—0 to 4 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak fine and very fine granular structure; loose, nonsticky and nonplastic; many fine and very fine roots; 15 percent stones, 10 percent cobbles, 5 percent pebbles; neutral; clear wavy boundary.

Bt1—4 to 9 inches; dark grayish brown (10YR 4/2) very stony loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 25 percent stones, 10 percent cobbles, 10 percent pebbles; common distinct clay films on faces of peds and on surface of coarse fragments; neutral; clear wavy boundary.

Bt2—9 to 18 inches; dark yellowish brown (10YR 4/4) very stony clay loam, dark yellowish brown (10YR 3/4) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; 25 percent stones, 15 percent cobbles, 10 percent pebbles; many distinct clay films on faces of peds and on surface of coarse fragments; neutral; clear wavy boundary.

Bk1—18 to 30 inches; pale brown (10YR 6/3) extremely stony clay loam, brown (10YR 5/3) moist; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; 35 percent stones, 25 percent cobbles, 15 percent pebbles; many fine and medium irregular masses of lime, common distinct lime casts on the underside of coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—30 to 60 inches; pale brown (10YR 6/3) extremely stony loam, brown (10YR 5/3) moist; moderate fine and very fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; 35 percent stones, 25 percent cobbles, 15 percent pebbles; many fine and medium irregular masses of lime, common distinct lime casts on the underside of coarse fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees

Moisture control section: between 4 and 12 inches

Mollic epipedon thickness: 7 to 14 inches

Depth to calcic horizon: 13 to 24 inches

A horizon

Hue: 7.5YR or 10YR

Value: 3 or 4 dry; 2 or 3 moist

Clay content: 15 to 27 percent

Rock fragments: 15 to 35 percent—10 to 25 percent cobbles and stones; 5 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: loam, clay loam, or sandy clay loam

Clay content: 25 to 35 percent

Rock fragments: 35 to 80 percent—35 to 60 percent cobbles, stones, and boulders; 10 to 30 percent pebbles

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2 or 3

Texture: loam, sandy loam, or clay loam

Clay content: 15 to 35 percent

Rock fragments: 35 to 85 percent—25 to 70 percent cobbles, stones, and boulders; 15 to 35 percent pebbles
 Calcium carbonate equivalent: 10 to 30 percent
 Reaction: pH 7.9 to 8.4

252E—Hilger stony loam, 4 to 25 percent slopes

Setting

Landform: Mountains
Slope: 4 to 25 percent
Elevation: 4,200 to 4,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Hilger and similar soils: 85 percent

Minor Components

Blaincreek and similar soils: 0 to 5 percent
 Quinncreek and similar soils: 0 to 5 percent
 Shamut and similar soils: 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 3.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

252D—Hilger-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform: Mountains
Position on landform:
 Hilger—Backslopes and side slopes
 Rock outcrop—Shoulders and summits

Slope: 4 to 35 percent
Elevation: 4,200 to 4,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Hilger and similar soils: 60 percent
 Rock outcrop: 25 percent

Minor Components

Blaincreek and similar soils: 0 to 5 percent
 Quinncreek and similar soils: 0 to 5 percent
 Shamut and similar soils: 0 to 5 percent

Major Component Description

Hilger

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 3.7 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hinterland Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.20 to 0.60 inch/hour)
Landform: Hills, sedimentary plains, and bedrock floored plains
Parent material: Material derived from hard sandstone
Slope range: 1 to 15 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Clayey, smectitic Lithic Argiborolls

Typical Pedon

Hinterland loam, 1 to 6 percent slopes, 200 feet north and 2,600 feet west of the southeast corner of sec. 32, T. 11 N., R. 25 E.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine pores; neutral; clear smooth boundary.

Bt1—3 to 6 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; many very fine roots; many fine and very fine pores; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Bt2—6 to 12 inches; brown (10YR 4/3) channery clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; many very fine roots; many very fine pores; many distinct clay films of faces of peds; 20 percent sandstone channers; neutral; clear smooth boundary.

R—12 inches; hard fractured sandstone with thin clay skins on surface of rock fragments in the upper 6 inches.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or above; is not dry in the moisture control section during June and the first half of July

Mollic epipedon thickness: 7 to 12 inches

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent channers or pebbles

Reaction: pH 6.6 to 7.8

Bt1 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: clay loam or silty clay loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles or channers

Reaction: pH 6.6 to 7.8

Bt2 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: clay loam or clay

Clay content: 35 to 45 percent

Rock fragments: 15 to 35 percent—0 to 5 percent stones and cobbles; 15 to 30 percent pebbles or channers

Reaction: pH 6.6 to 7.8

50B—Hinterland loam, 1 to 6 percent slopes

Setting

Landform: Bedrock-floored plains

Slope: 1 to 6 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Hinterland and similar soils: 85 percent

Minor Components

Yawdim and similar soils: 0 to 5 percent

Delplain and similar soils: 0 to 5 percent

Weingart and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50C—Hinterland loam, 6 to 15 percent slopes

Setting

Landform: Sedimentary plains and hills

Slope: 6 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Hinterland and similar soils: 85 percent

Minor Components

Delplain and similar soils: 0 to 5 percent

Weingart and similar soils: 0 to 5 percent

Warhorse and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50D—Hinterland-Delplain complex, 8 to 25 percent slopes

Setting

Landform:

Hinterland—Hills

Delplain—Hills

Position on landform:

Hinterland—Backslopes, footslopes, and side slopes

Delplain—Shoulders and summits

Slope:

Hinterland—8 to 15 percent

Delplain—8 to 25 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Hinterland and similar soils: 45 percent

Delplain and similar soils: 40 percent

Minor Components

Rentsac and similar soils: 0 to 5 percent

Weingart and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Hinterland

Surface layer texture: Clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Delplain

Surface layer texture: Channery clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hughesville Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Mountains

Parent material: Colluvium or residuum

Slope range: 2 to 25 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, carbonatic Udic
Haploborolls

Typical Pedon

Hughesville very flaggy clay loam, in an area of Hughesville-Tibs-Whitecow complex, 2 to 25 percent slopes, 250 feet north and 400 feet west of the southeast corner of sec. 36, T. 13 N., R. 17 E., Fergus County, Montana.

A—0 to 2 inches; dark grayish brown (10YR 4/2) flaggy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; 15 percent cobbles, 10 percent angular pebbles; slightly alkaline; clear wavy boundary.

Bw—2 to 10 inches; brown (10YR 4/3) very flaggy clay loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine, medium, and coarse roots; 30 percent angular cobbles, 15 percent angular pebbles; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk1—10 to 22 inches; pale brown (10YR 6/3) very flaggy heavy loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; 35 percent angular cobbles, 15 percent angular pebbles; few fine masses of lime; common distinct lime casts on coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—22 to 32 inches; light gray (10YR 7/2) extremely flaggy loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; 35 percent angular cobbles, 10 percent stones, 30 percent angular pebbles; disseminated lime; few fine masses of lime; common distinct lime casts on coarse fragments; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—32 to 38 inches; white (10YR 8/2) extremely flaggy loam, very pale brown (10YR 7/3) moist; weak fine subangular blocky structure; slightly

hard, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; 40 percent angular cobbles, 10 percent stones, 25 percent angular medium pebbles; disseminated lime; few fine masses of lime; common distinct lime casts on coarse fragments; violently effervescent; moderately alkaline.

R—38 inches; fractured hard limestone.

Range in Characteristics

Soil temperature: 41 to 44 degrees F

Moisture control section: 4 to 12 inches, moist in some or all of its parts throughout the year in 6 or more out of 10 years

Mollic epipedon thickness: 7 to 13 inches

Depth to bedrock: 20 to 40 inches

Depth to calcic horizon: 7 to 13 inches

A horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 27 to 35 percent

Rock fragments: 20 to 35 percent—0 to 5 percent stones; 10 to 15 percent angular cobbles; 10 to 15 percent angular pebbles.

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 2.5YR to 2.5Y

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3

Texture: loam, clay loam, or silty clay loam

Clay content: 27 to 35 percent

Rock fragments: 35 to 60 percent—0 to 5 percent stones; 25 to 35 percent cobbles; 10 to 20 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 7.5YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3

Texture: loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 35 to 60 percent—0 to 5 percent stones; 25 to 35 percent cobbles; 10 to 20 percent pebbles

Calcium carbonate equivalent: 40 to 50 percent

Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons

Hue: 10YR to 5Y

Value: 7 or 8 dry; 6 or 7 moist
 Chroma: 2 or 3
 Texture: loam, clay loam, or silty clay loam
 Clay content: 18 to 35 percent
 Rock fragments: 60 to 90 percent—0 to 10 percent stones; 35 to 40 percent cobbles; 25 to 40 percent pebbles
 Calcium carbonate equivalent: 50 to 60 percent
 Reaction: pH 7.9 to 9.0
 Note: The Hughesville soil as mapped in Musselshell County is a taxadjunct to the series. It classifies as a Typic Haploboroll.

232E—Hughesville-Tibs-Whitecow complex, 2 to 25 percent slopes

Setting

Landform:

Hughesville—Mountains
 Tibs—Mountains
 Whitecow—Mountains

Position on landform:

Hughesville—Shoulders and summits
 Tibs—Backslopes
 Whitecow—Backslopes

Slope:

Hughesville—2 to 25 percent
 Tibs—2 to 25 percent
 Whitecow—2 to 25 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Hughesville and similar soils: 30 percent
 Tibs and similar soils: 25 percent
 Whitecow and similar soils: 25 percent

Minor Components

Sheege and similar soils: 0 to 10 percent
 Tomty and similar soils: 0 to 5 percent
 Delette and similar soils: 0 to 5 percent

Major Component Description

Hughesville

Surface layer texture: Very flaggy clay loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.5 inches

Tibs

Surface layer texture: Cobbly clay 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 4.7 inches

Whitecow

Surface layer texture: Flaggy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Kobase Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Ustochrepts

Typical Pedon

Kobase silty clay loam, 0 to 8 percent slopes, 1,500 feet west and 500 feet south of the northeast corner of sec. 28, T. 10 N., R. 24 E.

A—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many fine roots; slightly effervescent; slightly alkaline; clear wavy boundary.

Bw—6 to 15 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk1—15 to 24 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; disseminated lime; few fine masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bk2—24 to 39 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common fine irregular masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bky—39 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common fine irregular masses of lime and gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or higher

Depth to Bk horizon: 12 to 17 inches

Depth to Bky horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm
Sodium adsorption ratio: 0 to 5
Calcium carbonate equivalent: 0 to 10 percent
Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

Texture: silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Texture: silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 0 to 10

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 8 to 13

Calcium carbonate equivalent: 5 to 15 percent

Reaction: 7.9 to 8.4

Bky horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Texture: silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 8 to 13

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

40B—Kobase silty clay loam, 0 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

Zatoville and similar soils: 0 to 5 percent
 Yamacall and similar soils: 0 to 5 percent
 Marvan 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
Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

40C—Kobase silty clay loam, calcareous, 0 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 5 percent
 Zatoville and similar soils: 0 to 5 percent
 Yamacall 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
Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

140B—Kobase-Megonot silty clay loams, 0 to 8 percent slopes

Setting

Landform:
 Kobase—Alluvial fans and stream terraces
 Megonot—Sedimentary plains
Position on landform:
 Kobase—Footslopes and toeslopes
 Megonot—Backslopes, footslopes, and side slopes
Slope:
 Kobase—0 to 8 percent
 Megonot—0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Kobase and similar soils: 45 percent
 Megonot and similar soils: 40 percent

Minor Components

Zatoville and similar soils: 0 to 5 percent
 Orinoco and similar soils: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent

Major Component Description

Kobase

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
Available water capacity: Mainly 9.7 inches

Megonot

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale
 residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

140C—Kobase-Megonot silty clay loams, calcareous, 0 to 8 percent slopes

Setting

Landform:

Kobase—Alluvial fans and stream terraces
 Megonot—Sedimentary plains

Position on landform:

Kobase—Foothills and toeslopes
 Megonot—Backslopes, foothills, and side slopes

Slope:

Kobase—0 to 8 percent
 Megonot—0 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Kobase and similar soils: 45 percent
 Megonot and similar soils: 40 percent

Minor Components

Kobase and similar soils: 0 to 5 percent
 Megonot and similar soils: 0 to 5 percent
 Zatoville and similar soils: 0 to 5 percent

Major Component Description

Kobase

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
Available water capacity: Mainly 9.7 inches

Megonot

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale
 residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

38A—Kobase-Zatoville silty clay loams, 0 to 8 percent slopes

Setting

Landform:

Kobase—Alluvial fans and stream terraces
 Zatoville—Alluvial fans and stream terraces

Slope:

Kobase—0 to 8 percent
 Zatoville—0 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Kobase and similar soils: 45 percent
 Zatoville and similar soils: 40 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Marvan and similar soils: 0 to 5 percent

Marias and similar soils: 0 to 5 percent

Major Component Description

Kobase

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

Available water capacity: Mainly 9.7 inches

Zatoville

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

Salt affected: Saline within 30 inches

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Korchea Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 3,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive, calcareous, frigid Mollic Ustifluvents

Typical Pedon

Korchea loam, in an area of Shambo-Korchea-Barvon loams, 2 to 8 percent slopes, 1,200 feet east and 600

feet north of the southwest corner of sec. 15, T. 6 N., R. 25 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C1—6 to 13 inches; light brownish gray (10YR 6/2) stratified loam and fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C2—13 to 32 inches; light brownish gray (10YR 6/2) stratified fine sandy loam and loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

C3—32 to 60 inches; pale brown (10YR 6/3) stratified fine sandy loam and gravelly fine sandy loam, brown (10YR 5/3) moist; massive; loose, very friable, slightly sticky and slightly plastic; common very fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 6.6 to 8.4

C horizons

Hue: 2.5Y or 10YR

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

Chroma: 2 to 4

Texture: loam, silt loam, silty clay loam, clay loam, fine sandy loam, sandy loam, or very fine sandy loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Kremlin Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,710 to 4,200

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive
Aridic Haploborolls

Typical Pedon

Kremlin loam, 2 to 8 percent slopes, 1,300 feet west and 2,500 feet south of the northeast corner of sec. 13, T. 11 N., R. 25 E.

Ap—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; slightly acid; clear smooth boundary.

Bw1—6 to 10 inches; olive brown (2.5Y 4/4) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, friable, sticky and slightly plastic; common very fine and fine roots; neutral; clear wavy boundary.

Bw2—10 to 15 inches; olive brown (2.5Y 4/4) loam, dark brown (10YR 3/3) moist; strong medium prismatic structure; hard, friable, sticky and slightly plastic; common very fine roots; neutral; clear wavy boundary.

Bk1—15 to 22 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; disseminated lime; few fine masses of lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—22 to 43 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; disseminated lime; few fine irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—43 to 60 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; massive; 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; dry in some part six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Mollic epipedon thickness: 7 to 15 inches

Depth to Bk horizon: 10 to 24 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.1 to 7.8

Bw horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loam, silt loam, or clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

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

Clay content: 18 to 30 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

Clay content: 18 to 30 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: strongly or violently

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

BC horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, silt loam, clay loam, or sandy clay loam
 Clay content: 18 to 30 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 7.4 to 8.4

91A—Kremlin loam, 0 to 2 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Kremlin and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 5 percent
 Eapa and similar soils: 0 to 5 percent
 Frazer and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

91B—Kremlin loam, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Kremlin and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 5 percent
 Eapa and similar soils: 0 to 5 percent
 Frazer and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Kuro Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills and sedimentary plains
Parent material: Residuum
Slope range: 4 to 25 percent
Elevation range: 4,200 to 4,700 feet
Annual precipitation: 15 to 16 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Clayey, mixed, superactive, calcareous, frigid, shallow Typic Ustorthents

Typical Pedon

Kuro silty clay loam, in an area of Kuro-Wayden-Rock outcrop complex, 4 to 35 percent slopes, 900 feet west and 2,400 feet south of the northeast corner of sec. 5, T. 11 N., R. 22 E.

A—0 to 3 inches; light reddish brown (5YR 6/3) silty clay loam, dark reddish brown (5YR 3/3) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C1—3 to 8 inches; light reddish brown (5YR 6/3) silty clay loam, dark reddish brown (5YR 3/3) moist; strong fine platy structure; hard, firm, sticky and plastic; many fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C2—8 to 15 inches; reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/3) moist; strong fine and medium platy structure; very hard, firm, sticky and plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

Cr—15 to 60 inches; semiconsolidated shale.

Range in Characteristics

Soil temperature: 42 to 47 degrees

Moisture control section: between 4 and 12 inches

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 10R, 5YR, or 2.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 30 to 40 percent

Rock fragments: 0 to 15 percent shale fragments

Calcium carbonate equivalent: 0 to 5

Reaction: pH 6.6 to 7.8

C horizons

Hue: 10R, 5YR, or 2.5YR

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

Chroma: 2, 3, or 4

Texture: clay loam or silty clay loam

Clay content: 35 to 45 percent

Rock fragments: 0 to 35 percent shale fragments

Calcium carbonate equivalent: 1 to 5

Reaction: pH 7.4 to 8.4

260F—Kuro-Wayden-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform:

Kuro—Sedimentary plains and hills

Wayden—Hills

Position on landform:

Kuro—Backslopes

Wayden—Shoulders and summits

Rock outcrop—Shoulders and summits

Slope:

Kuro—4 to 15 percent

Wayden—8 to 25 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 16 inches

Frost-free period: 90 to 135 days

Composition

Major Components

Kuro and similar soils: 40 percent

Wayden and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Castner and similar soils: 0 to 5 percent

Major Component Description

Kuro

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

Wayden

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Rock outcrop

Definition: Areas of exposed shale bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lamedeer Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills and sedimentary plains

Parent material: Alluvium or colluvium

Slope range: 2 to 45 percent

Elevation range: 4,200 to 4,600 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Ustochrepts

Typical Pedon

Lamedeer channery loam, in an area of Lamedeer-Ringling channery loams, 2 to 8 percent slopes, 1,800 feet west and 2,100 feet south of the northeast corner of sec. 32, T. 7 N., R. 27 E.

A—0 to 5 inches; reddish brown (5YR 4/3) channery loam, dark reddish brown (5YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; 20 percent channers; neutral; clear smooth boundary.

Bw1—5 to 19 inches; reddish brown (5YR 4/4) channery loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 20 percent channers; neutral; clear smooth boundary.

Bw2—19 to 34 inches; reddish brown (5YR 5/4) very channery loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; 35 percent

channers, 15 percent flagstones; slightly alkaline; gradual wavy boundary.

Bk—34 to 60 inches; light reddish brown (2.5YR 6/4) extremely channery loam, reddish brown (2.5YR 5/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; 40 percent channers, 25 percent angular flagstones; many faint lime casts on undersides of coarse fragments; disseminated lime; slightly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: between the depths of 4 and 12 inches

Depth to calcic horizon: 30 to 40 inches

A horizon

Hue: 5YR or 7.5YR

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

Chroma: 2 or 3

Clay content: 12 to 23 percent

Rock fragments: 15 to 35 percent channers

Reaction: pH 6.1 to 7.3

Bw1 horizon

Hue: 5YR or 7.5YR

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

Chroma: 3 or 4

Clay content: 15 to 25 percent

Rock fragments: 15 to 50 percent channers

Reaction: pH 6.6 to 7.8

Bw2 horizon

Hue: 5YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture, less than 2 mm: loam or sandy loam

Clay content: 15 to 20 percent

Rock fragments: 50 to 70 percent—15 to 25 percent flagstones; 35 to 45 percent channers

Reaction: pH 7.4 to 7.8

Bk horizon

Hue: 2.5YR, 5YR, or 7.5YR

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

Chroma: 2, 3, or 4

Texture, less than 2 mm: loam or sandy loam

Clay content: 8 to 20 percent

Rock fragments: 50 to 70 percent—15 to 25 percent flagstones; 35 to 45 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

245C—Lamedeer-Ringling channery loams, 2 to 8 percent slopes**Setting***Landform:*

Lamedeer—Sedimentary plains

Ringling—Sedimentary plains

Slope:

Lamedeer—2 to 8 percent

Ringling—2 to 8 percent

Elevation: 4,200 to 4,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 105 to 135 days**Composition****Major Components**

Lamedeer and similar soils: 65 percent

Ringling and similar soils: 25 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Birney and similar soils: 0 to 5 percent

Major Component Description**Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 5.1 inches**Ringling***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained*Dominant parent material:* Scoria residuum*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 1.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

245F—Lamedeer-Ringling channery loams, 4 to 45 percent slopes**Setting***Landform:*

Lamedeer—Hills

Ringling—Sedimentary plains and hills

Slope:

Lamedeer—15 to 45 percent

Ringling—4 to 45 percent

Elevation: 4,200 to 4,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 105 to 135 days**Composition****Major Components**

Lamedeer and similar soils: 50 percent

Ringling and similar soils: 35 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Coors and similar soils: 0 to 5 percent

Birney and similar soils: 0 to 5 percent

Major Component Description**Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 5.1 inches**Ringling***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained*Dominant parent material:* Scoria residuum*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 1.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

246F—Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes

Setting

Landform:

Lamedeer—Hills

Ringling—Sedimentary plains and hills

Slope:

Lamedeer—15 to 45 percent

Ringling—4 to 45 percent

Elevation: 4,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Lamedeer and similar soils: 50 percent

Ringling and similar soils: 35 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Coors and similar soils: 0 to 5 percent

Birney and similar soils: 0 to 5 percent

Major Component Description

Lamedeer

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.1 inches

Ringling

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Scoria residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 1.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lostriver Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, calcareous, frigid
Aridic Ustifluvents

Typical Pedon

Lostriver silty clay, in an area of Lostriver-Bullhook complex, 0 to 2 percent slopes, 900 feet east and 1,200 feet north of the southwest corner of sec. 11, T. 11 N., R. 26 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse platy structure parting to moderate fine and medium granular; hard, firm, sticky and plastic; many very fine to coarse roots; moderately alkaline; abrupt smooth boundary.

C—3 to 7 inches; grayish brown (2.5Y 5/2) silty clay with thin strata of clay loam and silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; few very fine to medium roots; moderately alkaline; gradual smooth boundary.

Cyz—7 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin strata of clay loam and silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, very sticky and plastic; few very fine and fine roots; many fine irregular masses of gypsum and other salts; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or higher

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Clay content: 40 to 55 percent

Electrical conductivity: 2 to 8 mmhos/cm
 Sodium adsorption ratio: 8 to 13
 Calcium carbonate equivalent: 0 to 5 percent
 Reaction: pH 7.4 to 9.4

C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay loam, silty clay loam, or silty clay
 with or without thin strata of loam, clay loam,
 or silty clay loam
 Clay content: 35 to 55 percent
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 20
 Calcium carbonate equivalent: 0 to 5 percent
 Reaction: pH 7.4 to 9.6

Cyz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: clay loam, silty clay loam, or silty clay
 with or without thin strata of loam, clay loam,
 or silty clay
 Clay content: 35 to 55 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 30
 Gypsum: 2 to 5 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 9.6

7A—Lostriver silty clay, 0 to 2 percent slopes**Setting**

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Lostriver and similar soils: 85 percent

Minor Components

Harlake and similar soils: 0 to 5 percent
 Bigsandy and similar soils: 0 to 10 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Salt affected: Saline within 30 inches
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

7B—Lostriver-Bullhook complex, 0 to 2 percent slopes**Setting**

Landform:
 Lostriver—Flood plains
 Bullhook—Flood plains
Slope:
 Lostriver—0 to 2 percent
 Bullhook—0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Lostriver and similar soils: 45 percent
 Bullhook and similar soils: 40 percent

Minor Components

Havre and similar soils: 0 to 5 percent
 Bigsandy and similar soils: 0 to 5 percent
 Harlake and similar soils: 0 to 5 percent

Major Component Description**Lostriver**

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 8.5 inches

Bullhook

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 8.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Macar Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.60 to 2.00 inches/hr)

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 2 to 8 percent

Elevation range: 3,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost free period: 90 to 135 days

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

Typical Pedon

Macar loam, in an area of Doney-Cabba-Macar loams, 4 to 15 percent slopes, 190 feet west and 600 feet south of the northeast corner of sec. 9, T. 5 N., R. 24 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, sticky and plastic; common very fine to coarse roots; neutral; clear smooth boundary.

Bw—5 to 11 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine

and medium roots; slightly alkaline; clear smooth boundary.

Bk1—11 to 13 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; few fine soft masses of lime; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—13 to 16 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; many fine and medium soft masses of lime; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

BC—16 to 28 inches; light gray (10YR 7/2) stratified loam and sandy loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

C—28 to 60 inches; very pale brown (10YR 7/3) stratified loam and sandy loam, brown (10YR 5/3) moist; massive; soft, friable, nonsticky and nonplastic; disseminated lime; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Depth to the Bk horizon: 11 to 24 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Note: The A horizon does not meet the requirements for a mollic epipedon after mixing to 7 inches.

Bw horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, 4, or 6

Texture: loam or clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, 4, or 6
Texture: clay loam or loam
Clay content: 18 to 35 percent
Rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, 4, or 6
Texture: clay loam, loam, sandy clay loam, or silty clay loam
Clay content: 18 to 35 with 35 to 55 percent fine sand and coarser
Rock fragments: 0 to 10 percent pebbles
Calcium carbonate equivalent: 8 to 15 percent
Reaction: pH 7.4 to 8.4

BC and C horizons

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, 4, or 6
Texture: loam, silty clay loam, or sandy clay loam consisting of strata of fine sandy loam and sandy clay loam
Clay content: 15 to 30 percent
Rock fragments: 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 12 percent
Reaction: pH 7.4 to 9.0

230C—Macar loam, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 4,200 to 4,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 135 days

Composition**Major Components**

Macar and similar soils: 90 percent

Minor Components

Shambo and similar soils: 0 to 5 percent
Doney and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 9.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Macmeal Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Hills
Parent material: Alluvium or colluvium
Slope range: 4 to 35 percent
Elevation range: 4,200 to 4,700 feet
Annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs.

Typical Pedon

Macmeal channery loam, in an area of Macmeal-Rock outcrop complex, 4 to 35 percent slopes, 2,300 feet east and 400 feet north of the southwest corner of sec. 7, T. 11 N., R. 22 E.

A—0 to 4 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; 25 percent channers, few flagstones; slightly acid; clear smooth boundary.

E—4 to 11 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 fine and very fine roots; 25 percent channers, few flagstones; slightly acid; clear smooth boundary.

Bt1—11 to 22 inches; yellowish brown (10YR 5/4) very channery clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard,

firm, slightly sticky and slightly plastic; few fine roots; common distinct clay films on faces of peds; 55 percent channers, 5 percent flagstones; slightly acid; clear smooth boundary.

Bt2—22 to 36 inches; yellowish brown (10YR 5/4) very channery clay loam, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine roots; common faint clay films on faces of peds; 30 percent channers, 20 percent flagstones; neutral; gradual smooth boundary.

Btk—36 to 48 inches; yellowish brown (10YR 5/4) very flaggy clay loam, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 30 percent channers, 30 percent flagstones; common distinct clay films on faces of peds; many fine irregular masses of lime; common distinct lime casts on undersides of fragments; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk—48 to 60 inches; light gray (10YR 7/2) extremely flaggy clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; 35 percent channers, 30 percent flagstones; many fine and medium irregular masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 44 degrees F

Moisture control section: between 4 and 12 inches

A horizon

Hue: 10YR or 7.5YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 25 percent

Rock fragments: 15 to 35 percent—0 to 10 percent cobbles or flagstones; 15 to 25 percent pebbles or channers

Reaction: pH 6.1 to 7.3

E horizon

Hue: 10YR or 7.5YR

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

Chroma: 2 or 3

Clay content: 10 to 25 percent

Rock fragments: 15 to 35 percent—0 to 10 percent cobbles or flagstones; 15 to 25 percent pebbles or channers

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 27 to 35 percent

Rock fragments: 5 to 20 percent cobbles or flagstones; 30 to 60 percent pebbles or channers

Reaction: pH 6.1 to 7.3

Btk and Bk horizons

Hue: 10YR or 7.5YR

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

Chroma: 2, 3, or 4

Clay content: 27 to 35 percent

Rock fragments: 35 to 80 percent—10 to 30 percent cobbles or flagstones; 25 to 50 percent pebbles or channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

250E—Macmeal-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform: Hills

Position on landform:

Macmeal—Backslopes and side slopes

Rock outcrop—Shoulders and summits

Slope: 4 to 35 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Macmeal and similar soils: 60 percent

Rock outcrop: 25 percent

Minor Components

Trapps and similar soils: 0 to 5 percent

Geohrock and similar soils: 0 to 10 percent

Major Component Description

Macmeal

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.5 inches

Rock outcrop

Definition: Areas of exposed bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marias Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (0.01 to 0.06 inch/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Chromic Udic Haplusterts

Typical Pedon

Marias silty clay, 0 to 4 percent slopes, 1,000 feet south and 2,000 feet west of the northeast corner of sec. 23, T. 11 N., R. 27 E.

Ap—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong very fine granular structure; loose, friable, very sticky and plastic; many fine and very fine roots; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—4 to 9 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to moderate coarse angular blocky; very hard, firm, sticky and very plastic; many fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bss—9 to 28 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate coarse angular blocky structure parting to strong fine angular blocky; extremely hard, firm, sticky and very plastic; common slickensides and pressure faces; many fine and very fine roots;

slightly effervescent; strongly alkaline; gradual smooth boundary.

By—28 to 60 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; extremely hard, firm, sticky and very plastic; many fine and very fine roots; common large and medium irregular masses of gypsum; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to By horizon: 20 to 45 inches

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 1 to 4

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.4 to 8.4.

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 1 to 4

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

Bss horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: clay or silty clay

Clay content: 40 to 60 percent

Slickensides: common or many

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 1 to 4

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

By horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3
 Texture: clay or silty clay
 Clay content: 40 to 60 percent
 Gypsum: 1 to 6 percent
 Electrical conductivity: 2 to 8 mmhos/cm
 Sodium adsorption ratio: 4 to 13
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.9 to 9.0

63A—Marias silty clay, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Marias and similar soils: 85 percent

Minor Components

Marvan and similar soils: 0 to 5 percent
 Ethridge and similar soils: 0 to 5 percent
 Vanda and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
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 8.5 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills

Parent material: Semiconsolidated sandy sedimentary beds

Slope range: 0 to 15 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive
Aridic Argiborolls

Typical Pedon

Marmarth fine sandy loam, in an area of Marmarth-Cabbart complex, 2 to 8 percent slopes, 1,600 feet south and 1,000 feet west of the northeast corner of sec. 11, T. 10 N., R. 26 E.

Ap—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; neutral; abrupt smooth boundary.

Bt—4 to 8 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common faint clay films in root channels and on faces of peds; few fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Btk—8 to 13 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common faint clay films in root channels and on faces of peds; few very fine roots; few fine masses of lime; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—13 to 31 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure parting to single grain; loose, nonsticky and nonplastic; few very fine roots; disseminated lime; common medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—31 to 60 inches; semiconsolidated sandy sedimentary beds.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches
Depth to Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR
 Value: 3, 4, or 5 moist
 Chroma: 2 or 3
 Texture: loam or fine sandy loam
 Clay content: 10 to 27 percent
 Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y
 Value: 3, 4, 5, or 6 moist
 Chroma: 2 to 4
 Texture: loam, clay loam, or sandy clay loam
 Clay content: 18 to 35 percent
 Reaction: pH 6.1 to 7.8

Btk and Bk horizons

Hue: 2.5Y or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 to 4
 Texture: loam, fine sandy loam, or clay loam
 Clay content: 15 to 30 percent
 Calcium carbonate equivalent: 5 to 15
 Reaction: pH 7.4 to 8.4

54A—Marmarth fine sandy loam, 0 to 8 percent slopes**Setting**

Landform: Sedimentary plains
Slope: 0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Marmarth and similar soils: 90 percent

Minor Components

Eapa and similar soils: 0 to 5 percent
 Tanna and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

154C—Marmarth-Cabbart loams, 2 to 8 percent slopes**Setting***Landform:*

Marmarth—Sedimentary plains
 Cabbart—Sedimentary plains

Position on landform:

Marmarth—Backslopes, footslopes, and side slopes
 Cabbart—Shoulders and summits

Slope:

Marmarth—2 to 8 percent
 Cabbart—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Marmarth and similar soils: 45 percent
 Cabbart and similar soils: 40 percent

Minor Components

Tanna and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Amherst and similar soils: 0 to 5 percent

Major Component Description**Marmarth**

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marvan Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (0.01 to 0.06 inch/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Sodic Haplusterts

Typical Pedon

Marvan silty clay, 0 to 8 percent slopes, 2,200 feet north and 1,800 feet west of the southeast corner of sec. 5, T. 9 N., R. 30 E.

A—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium and fine granular structure; slightly hard, firm, sticky and plastic; few fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—2 to 9 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure parting to strong medium subangular blocky; very hard, very firm, very sticky and plastic; few fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bss—9 to 17 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong

coarse subangular blocky structure; very hard, very firm, very sticky and plastic; few slickensides; few fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bssy—17 to 30 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; very hard, very firm, very sticky and plastic; few slickensides; few very fine roots; common fine irregular masses and seams of gypsum; moderately alkaline; diffuse wavy boundary.

Byz—30 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; very hard, very firm, very sticky and plastic; common fine irregular masses and seams of gypsum and other salts; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bssy horizon: 10 to 24 inches

A horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 0 to 4

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.4 to 8.4

Bw and Bss horizons

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay or silty clay

Clay content: 45 to 60 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 4 to 13

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

Bssy horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay or silty clay

Clay content: 45 to 60 percent
 Gypsum: 1 to 5 percent
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 38
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.9 to 9.0

Byz horizon

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: clay or silty clay
 Clay content: 45 to 60 percent
 Gypsum: 1 to 5 percent
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 38
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.9 to 9.0

64B—Marvan silty clay, 0 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Marvan and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 5 percent
 Marias and similar soils: 0 to 5 percent
 Creed and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

64A—Marvan-Vanda silty clays, 0 to 8 percent slopes**Setting***Landform:*

Marvan—Alluvial fans and stream terraces
 Vanda—Alluvial fans and stream terraces

Slope:

Marvan—0 to 8 percent
 Vanda—0 to 8 percent

Elevation: 2,710 to 4,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 105 to 135 days**Composition****Major Components**

Marvan and similar soils: 45 percent
 Vanda and similar soils: 40 percent

Minor Components

Marias and similar soils: 0 to 5 percent
 Creed and similar soils: 0 to 5 percent
 Gerdrum and similar soils: 0 to 5 percent

Major Component Description**Marvan**

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.9 inches

Vanda

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

McKenzie Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (0.01 to 0.06 inch/hour)
Landform: Closed depressions
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Chromic Endoaquerts

Typical Pedon

McKenzie silty clay, 0 to 2 percent slopes, 1,300 feet east and 1,700 feet south of the northwest corner of sec. 23, T. 9 N., R. 24 E.

A—0 to 4 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; hard, very firm, sticky and very plastic; moderate medium subangular blocky structure; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bg—4 to 25 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse columnar structure; very hard, very firm, sticky and very plastic; few fine and very fine roots; few fine yellow (2.5Y 7/8) redox concentrations; slightly effervescent; strongly alkaline; clear smooth boundary.

Cg1—25 to 45 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium and coarse columnar structure; very hard, very firm, sticky and very plastic; few very fine roots; few slickensides; many fine yellow (2.5Y 7/8) redox concentrations; few fine irregular masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Cg2—45 to 60 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; massive; very hard, very firm, sticky and very plastic; common fine yellow (2.5Y 7/8) redox concentrations; few fine and very fine masses of gypsum and soluble salts; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Depth to seasonal high water table: 12 to 24 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1 or 2

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 6.6 to 9.0

Bg horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 3 to 15 percent

Reaction: pH 6.6 to 9.0

Cg horizons

Hue: 2.5Y or 5Y

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

Chroma: 1, 2, or 3

Texture: clay or silty clay

Clay content: 40 to 60 percent

Gypsum: 0 to 4 percent

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 3 to 15 percent

Reaction: pH 7.9 to 9.0

21A—McKenzie silty clay, 0 to 2 percent slopes

Setting

Landform: Closed depressions

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

McKenzie and similar soils: 90 percent

Minor Components

Marvan and similar soils: 0 to 5 percent

Gerdrum and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay

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: Perched

Salt affected: Saline 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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Megonot Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Sedimentary plains and hills

Parent material: Residuum

Slope range: 0 to 15 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Ustochrepts

Typical Pedon

Megonot silty clay loam in an area of Megonot-Yawdim silty clay loams, 4 to 15 percent slopes, 1,800 feet west and 600 feet north of the southeast corner of sec. 1, T. 11 N., R. 25 E.

Ap—0 to 10 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; many fine and

very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—10 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; many fine and very fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—18 to 35 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; few fine irregular masses of lime and gypsum; 15 percent soft shale fragments; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—35 to 60 inches; semiconsolidated shale.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above

Rock fragments: 0 to 15 percent hard shale fragments

Depth to Cr horizon: 20 to 40 inches

Depth to secondary lime: 11 to 27 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 35 to 45 percent

Coarse fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 35 to 45 percent

Coarse fragments: 0 to 15 percent hard pebbles,

0 to 15 percent soft pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.4 to 8.4

Bky horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay loam, clay loam, or silty clay
 Clay content: 35 to 45 percent
 Coarse fragments: 0 to 15 percent hard pebbles,
 0 to 15 percent soft pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Gypsum: 1 to 5 percent
 Reaction: pH 7.4 to 8.4

68C—Megonot-Yawdim silty clay loams, 4 to 15 percent slopes

Setting

Landform:

Megonot—Sedimentary plains and hills
 Yawdim—Sedimentary plains and hills

Position on landform:

Megonot—Backslopes, footslopes, and side slopes
 Yawdim—Backslopes and side slopes

Slope:

Megonot—4 to 15 percent
 Yawdim—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Megonot and similar soils: 45 percent
 Yawdim and similar soils: 40 percent

Minor Components

Abor and similar soils: 0 to 5 percent
 Volborg and similar soils: 0 to 5 percent
 Neldore and similar soils: 0 to 5 percent

Major Component Description

Megonot

Surface layer texture: Silty clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Semiconsolidated shale
 residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: Mainly 4.6 inches

Yawdim

Surface layer texture: Silty clay loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Semiconsolidated shale
 residuum
 Native plant cover type: Rangeland
 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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Musselshell Series

Depth class: Very deep (greater than 60 inches)
 Drainage class: Well drained
 Permeability: Moderate (0.6 to 2.0 inches/hour)
 Landform: Relict stream terraces
 Parent material: Alluvium
 Slope range: 0 to 8 percent
 Elevation range: 2,710 to 4,200 feet
 Annual precipitation: 10 to 14 inches
 Frost-free period: 105 to 135 days

Taxonomic Class: Coarse-loamy, carbonatic, frigid
 Haplocalcidic Ustochrepts

Typical Pedon

Musselshell loam, in an area of Crago-Musselshell-Attewan complex, 0 to 2 percent slopes, 1,100 feet north and 500 feet west of the southeast corner of sec. 19, T. 10 N., R. 24 E.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, very friable, nonsticky and slightly plastic; many fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—4 to 10 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many fine roots; many fine and very fine irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—10 to 20 inches; white (10YR 8/1) loam, light gray (10YR 7/1) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common fine roots; many fine irregular masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2C—20 to 60 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine roots; 5 percent cobbles, 45 percent pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: 8 to 24 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is higher than 41 degrees F

A horizon

Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2, 3, or 4
Clay content: 20 to 27 percent
Rock fragments: 0 to 20 percent cobbles, 0 to 15 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, 6, or 7 moist
Chroma: 1, 2, 3, or 4
Texture: loam or silt loam
Clay content: 10 to 27 percent
Rock fragments: 0 to 35 percent; 0 to 10 percent cobbles, 0 to 25 percent pebbles
Calcium carbonate equivalent: 40 to 60 percent
Reaction: pH 7.9 to 9.0

2C horizon

Hue: 10YR or 2.5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: fine sandy loam, sandy loam, or loam
Clay content: 10 to 18 percent
Rock fragments: 35 to 60 percent; 5 to 10 percent cobbles, 30 to 50 percent pebbles
Calcium carbonate equivalent: 40 to 60 percent
Reaction: pH 7.9 to 9.0

97A—Musselshell-Crago cobbly loams, 0 to 4 percent slopes

Setting

Landform:

Musselshell—Relict stream terraces
Crago—Relict stream terraces

Slope:

Musselshell—0 to 4 percent
Crago—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Musselshell and similar soils: 45 percent
Crago and similar soils: 40 percent

Minor Components

Attewan and similar soils: 0 to 5 percent
Niart and similar soils: 0 to 5 percent
Rothiemay and similar soils: 0 to 5 percent

Major Component Description

Musselshell

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.4 inches

Crago

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

97B—Musselshell-Crago complex, 4 to 8 percent slopes

Setting

Landform:

Musselshell—Relict stream terraces
Crago—Relict stream terraces

Slope:

Musselshell—4 to 8 percent
Crago—4 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Musselshell and similar soils: 45 percent
Crago and similar soils: 40 percent

Minor Components

Attewan and similar soils: 0 to 5 percent
Verson and similar soils: 0 to 5 percent
Niart and similar soils: 0 to 5 percent

Major Component Description

Musselshell

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.5 inches

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Limestone alluvium

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Neldore Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated shale residuum

Slope range: 2 to 45 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Clayey, smectitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Neldore silty clay, in an area of Neldore-Abor silty clays, 4 to 15 percent slopes, 1,600 feet south and 1,400 west of the northeast corner of sec. 17, T. 11 N., R. 31 E.

A—0 to 3 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to weak fine granular; hard, firm, sticky and plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

C1—3 to 6 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; common fine and very fine roots; approximately 5 percent soft shale fragments; slightly alkaline; gradual wavy boundary.

C2—6 to 14 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine and very fine roots; approximately 65 percent soft shale fragments; moderately acid; diffuse wavy boundary.

Cr—14 to 60 inches; gray (10YR 5/1) semiconsolidated shale.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or above

Depth to Cr horizon: 10 to 20 inches

Soil phases: saline

A horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 1 or 2
 Clay content: 40 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm; saline phase is 2 to 4 mmhos/cm
 Reaction: pH 5.6 to 8.4

C1 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 or 2
 Texture: clay or silty clay
 Clay content: 40 to 60 percent
 Rock fragments: 5 to 35 percent—5 to 25 percent soft shale fragments, 0 to 10 percent hard shale fragments
 Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm
 Reaction: pH 5.6 to 8.4; saline phase pH 7.4 to 8.4

C2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 or 2
 Texture: clay or silty clay
 Clay content: 40 to 60 percent
 Rock fragments: 65 to 90 percent shale fragments—65 to 75 percent soft shale fragments, 0 to 15 percent hard shale fragments
 Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm
 Gypsum: 1 to 3 percent
 Reaction: pH 5.6 to 8.4; saline phase pH 7.4 to 8.4

62C—Neldore silty clay, 4 to 25 percent slopes**Setting**

Landform: Sedimentary plains and hills
Slope: 4 to 25 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Neldore and similar soils: 85 percent

Minor Components

Abor and similar soils: 0 to 5 percent
 Volborg and similar soils: 0 to 5 percent
 Neldore, saline soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60E—Neldore-Abor silty clays, 15 to 45 percent slopes**Setting**

Landform: Uplands
Slope: 15 to 45 percent
Elevation: 1,900 to 4,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Neldore and similar soils: 55 percent
 Abor and similar soils: 30 percent

Minor Components

Rock outcrop and similar soils: 5 percent
 Very shallow soils and similar soils: 5 percent
 Weingart and similar soils: 5 percent

Major Component Description**Neldore**

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Dominant parent material: Consolidated shale residuum
Drainage class: Well drained

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60D—Neldore-Abor silty clays, 4 to 15 percent slopes

Setting

Landform:

Neldore—Sedimentary plains and hills
 Abor—Sedimentary plains and hills

Position on landform:

Neldore—Shoulders and summits
 Abor—Backslopes, footslopes, and side slopes

Slope:

Neldore—4 to 15 percent
 Abor—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Neldore and similar soils: 50 percent
 Abor and similar soils: 40 percent

Minor Components

Neldore, saline soils: 0 to 5 percent
 Volborg and similar soils: 0 to 5 percent

Major Component Description

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

61D—Neldore-Neldore, saline silty clays, 4 to 25 percent slopes

Setting

Landform:

Neldore—Sedimentary plains and hills
 Neldore, saline—Sedimentary plains and hills

Slope:

Neldore—4 to 25 percent
 Neldore, saline—4 to 25 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Neldore and similar soils: 50 percent
 Neldore, saline and similar soils: 40 percent

Minor Components

Abor and similar soils: 0 to 5 percent
 Volborg and similar soils: 0 to 5 percent

Major Component Description**Neldore**

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

Neldore, saline

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale
 residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

62E—Neldore-Rock outcrop complex, 15 to 45 percent slopes**Setting**

Landform: Hills
Position on landform:
 Neldore—Backslopes and side slopes
 Rock outcrop—Shoulders and summits
Slope: 15 to 45 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Neldore and similar soils: 60 percent
 Rock outcrop: 30 percent

Minor Components

Abor and similar soils: 0 to 5 percent
 Volborg and similar soils: 0 to 5 percent

Major Component Description**Neldore**

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

Rock outcrop

Definition: Areas of exposed shale bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

61E—Neldore-Volborg silty clays, 4 to 25 percent slopes**Setting**

Landform:
 Neldore—Sedimentary plains and hills
 Volborg—Sedimentary plains and hills
Position on landform:
 Neldore—Backslopes, footslopes, and side slopes
 Volborg—Backslopes and side slopes
Slope:
 Neldore—4 to 25 percent
 Volborg—4 to 25 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Neldore and similar soils: 50 percent
 Volborg and similar soils: 40 percent

Minor Components

Abor and similar soils: 0 to 5 percent
Neldore, saline soils: 0 to 5 percent

Major Component Description**Neldore**

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

Volborg

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

62D—Neldore-Yawdim silty clays, 4 to 25 percent slopes**Setting***Landform:*

Neldore—Sedimentary plains and hills
Yawdim—Sedimentary plains and hills

Slope:

Neldore—4 to 25 percent
Yawdim—4 to 25 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Neldore and similar soils: 45 percent
Yawdim and similar soils: 40 percent

Minor Components

Abor and similar soils: 0 to 5 percent
Volborg and similar soils: 0 to 5 percent
Neldore, saline soils: 0 to 5 percent

Major Component Description**Neldore**

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

Yawdim

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Niart Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, carbonatic Aridic Calciborolls

Typical Pedon

Niart loam, in an area of Attewan-Niart loams, 0 to 4 percent slopes, 1,500 feet south and 1,100 feet west of the northeast corner of sec. 15, T. 10 N., R. 22 E.

Ap1—0 to 2 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; 5 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Ap2—2 to 6 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; 5 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—6 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; 5 percent pebbles; disseminated lime; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—17 to 24 inches; white (10YR 8/2) gravelly clay loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 25 percent pebbles; common distinct lime casts on rock fragments; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk3—24 to 34 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; loose, nonsticky and nonplastic; 5 percent cobbles, 45 percent pebbles; common distinct lime casts on rock fragments; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; diffuse wavy boundary.

2C—34 to 60 inches; very pale brown (10YR 7/3) extremely gravelly loam, pale brown (10YR 6/3) moist; massive; loose, nonsticky and nonplastic; 5 percent cobbles, 70 percent pebbles; common distinct lime casts on rock fragments; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: moist in some part in most years more than half the time from April through October.

Mollic epipedon thickness: 7 to 10 inches

Depth to Bk1 horizon: 6 to 17 inches

Depth to 2Bk3 horizon: 19 to 40 inches

Ap horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 5 to 45 percent—0 to 5 percent cobbles, 5 to 40 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 20 to 30 percent

Rock fragments: 5 to 30 percent—0 to 5 percent cobbles, 5 to 25 percent pebbles

Calcium carbonate equivalent: 40 to 55 percent

Reaction: pH 7.9 to 9.0

2Bk3 and 2C horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, sandy clay loam, or sandy loam

Clay content: 15 to 30 percent

Rock fragments: 35 to 80 percent—5 to 10 percent cobbles, 30 to 70 percent pebbles

Calcium carbonate equivalent: 40 to 55 percent

Reaction: pH 7.9 to 9.0

98A—Niart cobbly loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Niart and similar soils: 85 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent

Crago and similar soils: 0 to 5 percent
 Rothiemay and similar soils: 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: Alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

98B—Niart-Crago complex, 0 to 4 percent slopes

Setting

Landform:
 Niart—Relict stream terraces
 Crago—Relict stream terraces
Slope:
 Niart—0 to 4 percent
 Crago—0 to 4 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Niart and similar soils: 45 percent
 Crago and similar soils: 40 percent

Minor Components

Rothiemay and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent
 Attewan and similar soils: 0 to 5 percent

Major Component Description

Niart

Surface layer texture: 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

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

98C—Niart-Crago complex, 4 to 15 percent slopes

Setting

Landform:
 Niart—Relict stream terraces
 Crago—Relict stream terraces
Slope:
 Niart—4 to 15 percent
 Crago—4 to 15 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Niart and similar soils: 45 percent
 Crago and similar soils: 40 percent

Minor Components

Rothiemay and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent
 Attewan and similar soils: 0 to 5 percent

Major Component Description

Niart

Surface layer texture: 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

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

98D—Niart-Rothiemay loams, 0 to 4 percent slopes

Setting

Landform:
 Niart—Relict stream terraces
 Rothiemay—Alluvial fans and stream terraces
Slope:
 Niart—0 to 4 percent
 Rothiemay—0 to 4 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Niart and similar soils: 45 percent
 Rothiemay and similar soils: 40 percent

Minor Components

Crago and similar soils: 0 to 5 percent
 Tetonview and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent

Major Component Description

Niart

Surface layer texture: 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

Rothiemay

Surface layer texture: 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 9.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Nobe Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, calcareous, frigid
 Vertic Ustorthents

Typical Pedon

Nobe silty clay loam, in an area of Nobe-Absher complex, 0 to 4 percent slopes, 2,100 feet north and 2,400 feet west of the southeast corner of sec. 11, T. 9 N., R. 24 E.

E—0 to 1 inches; light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; weak fine granular structure with a thin (1/4 inch thick) vesicular crust; hard, firm, sticky and plastic; few fine and very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

By—1 to 18 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; granular structure (flocculation caused by soluble salts); very hard, friable, sticky and plastic; few fine and very fine roots; common fine irregular masses and seams of gypsum; strongly effervescent; moderately alkaline; clear smooth boundary.

Byz1—18 to 32 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; common fine irregular masses and seams of gypsum and other salts; strongly effervescent; strongly alkaline; diffuse wavy boundary.

Byz2—32 to 60 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; few fine irregular masses of gypsum and common fine irregular masses and seams of salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 to 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F

Depth to saturated zone: 24 to 42 inches for 1 to 4 months in the spring. The soil is moist below 42 inches when not saturated or frozen.

E horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Clay content: 27 to 40 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 15

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 6.6 to 8.4

By and Byz1 horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 32 mmhos/cm

Gypsum: 2 to 5 percent

Sodium adsorption ratio: 15 to 40 percent

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 9.6

Byz2 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 32 mmhos/cm
Gypsum: 2 to 5 percent
Sodium adsorption ratio: 15 to 70
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.9 to 9.6

22B—Nobe-Absher complex, 0 to 4 percent slopes

Setting

Landform:

Nobe—Alluvial fans and stream terraces

Absher—Alluvial fans and stream terraces

Position on landform:

Nobe—Microhighs

Absher—Microlows

Slope:

Nobe—0 to 4 percent

Absher—0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Nobe and similar soils: 45 percent

Absher and similar soils: 40 percent

Minor Components

Vanda and similar soils: 0 to 5 percent

Gerdrum and similar soils: 0 to 5 percent

McKenzie and similar soils: 0 to 5 percent

Major Component Description

Nobe

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: None

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 4.0 inches

Absher

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 3.8 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Orinoco Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated shale residuum

Slope range: 2 to 35 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, calcareous, frigid
Vertic Ustorthents

Typical Pedon

Orinoco silty clay loam, in an area of Yawdim-Orinoco silty clay loams, 4 to 15 percent slopes, 2,000 feet north and 1,200 feet west of the southeast corner of sec. 1, T. 11 N., R. 25 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; hard, friable, sticky and plastic; many fine and very fine roots; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bw—3 to 7 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many fine and very fine roots; few fine irregular seams and masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bky—7 to 16 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common fine and very fine roots; few

fine irregular seams and masses of lime and gypsum; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—16 to 24 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, sticky and plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Cr—24 to 60 inches; light brownish gray (10YR 6/2) semiconsolidated shale.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when soil temperature at 20 inches is 41 degrees F

Depth to bedrock: 20 to 40 inches

Depth to Bky horizon: 6 to 10 inches

A horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 30 to 40 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Texture: silty clay loam or silty clay

Clay content: 35 to 45 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 5 to 15

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

Bky horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: silty clay loam, clay, or silty clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 5 to 15

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR or 2.5Y

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

Chroma: 1 or 2
 Texture: silty clay loam, clay, or silty clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 15 to 30
 Gypsum: 1 to 5 percent
 Calcium carbonate equivalent: 1 to 5 percent
 Reaction: pH 6.6 to 8.4

69C—Orinoco-Yawdim silty clay loams, 4 to 15 percent slopes

Setting

Landform:

Orinoco—Sedimentary plains and hills
 Yawdim—Sedimentary plains and hills

Position on landform:

Orinoco—Backslopes, footslopes, and side slopes
 Yawdim—Backslopes and side slopes

Slope:

Orinoco—4 to 15 percent
 Yawdim—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Orinoco and similar soils: 45 percent
 Yawdim and similar soils: 40 percent

Minor Components

Neldore and similar soils: 0 to 5 percent
 Abor and similar soils: 0 to 5 percent
 Weingart and similar soils: 0 to 5 percent

Major Component Description

Orinoco

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.1 inches

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Rentsac Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Bedrock floored plains, sedimentary plains, and hills
Parent material: Sandstone residuum
Slope range: 2 to 45 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, calcareous, frigid Lithic Ustorthents

Typical Pedon

Rentsac fine sandy loam, 2 to 8 percent slopes, 1,400 feet east and 10 feet south of the northwest corner of sec. 31, T. 11 N., R. 25 E.

A—0 to 2 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; 10 percent sandstone channers; neutral; clear smooth boundary.

Bk1—2 to 7 inches; light brownish gray (10YR 6/3) channery loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; 25 percent sandstone channers; disseminated lime; few distinct lime casts on coarse fragments; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—7 to 12 inches; pale brown (10YR 6/3) extremely channery loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; 55 percent channers and 10 percent flagstones; disseminated lime; common distinct lime casts on the undersides of coarse fragments; strongly effervescent; slightly alkaline; clear smooth boundary.

R—12 inches; brown (10YR 5/3) hard sandstone.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 8 inches and the lithic contact, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 7 to 18 percent

Rock fragments: 0 to 15 percent pebbles and channers

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, sandy loam, or fine sandy loam

Clay content: 7 to 18 percent

Rock fragments: 0 to 80 percent—0 to 45 percent stones and flagstones; 0 to 55 percent pebbles and channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2, 3, 4, or 6

Texture: loam or sandy loam

Clay content: 7 to 18 percent

Rock fragments: 35 to 70 percent—0 to 35 percent cobbles and flagstones; 25 to 55 percent pebbles and channers

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

89C—Rentsac fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Bedrock-floored plains

Slope: 2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Rentsac and similar soils: 85 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent

Blacksheep and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

189C—Rentsac-Cabbart complex, 2 to 15 percent slopes

Setting

Landform:

Rentsac—Sedimentary plains and hills

Cabbart—Sedimentary plains and hills

Slope:

Rentsac—2 to 15 percent

Cabbart—2 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Rentsac and similar soils: 45 percent
Cabbart and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
Delpoint and similar soils: 0 to 5 percent
Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Rentsac

Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.0 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

189E—Rentsac-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform: Hills
Position on landform:
Rentsac—Backslopes and side slopes
Rock outcrop—Shoulders and summits
Slope: 15 to 45 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Rentsac and similar soils: 60 percent
Rock outcrop: 25 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
Blacksheep and similar soils: 0 to 5 percent
Yawdim and similar soils: 0 to 5 percent

Major Component Description

Rentsac

Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.0 inches

Rock outcrop

Definition: Areas of exposed sandstone bedrock
A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ridge Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated sandy sedimentary beds
Slope range: 4 to 45 percent
Elevation range: 3,200 to 4,600 feet
Annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Loamy, mixed, superactive, frigid, shallow Typic Ustochrepts

Typical Pedon

Ridge sandy loam, in an area of Ridge-Dast sandy loams, 8 to 45 percent slopes, 500 feet east and

1,200 feet north of the southwest corner of sec. 22, T. 8 N., R. 27 E.

A—0 to 4 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure parting to single grain; slightly hard, loose, nonsticky and nonplastic; many fine and very fine and few medium roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—4 to 12 inches; light brownish gray (10YR 6/2) sandy loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine and few medium roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—12 to 16 inches; light brownish gray (10YR 6/2) sandy loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; soft, loose, nonsticky and nonplastic; many fine and very fine and few medium roots; 10 percent pebbles; common distinct lime casts on undersides of rock fragments; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—16 to 60 inches; semiconsolidated sandy sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: 8 to 16 inches

Depth to Bk horizon: 10 to 16 inches

Depth to Cr horizon: 12 to 20 inches

A horizon

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

Chroma: 2, 3, or 4

Clay content: 5 to 20 percent

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 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

Texture: sandy loam or loam

Clay content: 5 to 20 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR to 5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam or loam

Clay content: 5 to 20 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

242F—Ridge-Dast sandy loams, 8 to 45 percent slopes

Setting

Landform:

Ridge—Hills

Dast—Hills

Position on landform:

Ridge—Backslopes and side slopes

Dast—Backslopes, footslopes, and side slopes

Slope:

Ridge—15 to 45 percent

Dast—8 to 25 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Ridge and similar soils: 45 percent

Dast and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Cabba and similar soils: 0 to 5 percent

Doney and similar soils: 0 to 5 percent

Major Component Description

Ridge

Surface layer texture: Sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.2 inches

Dast

Surface layer texture: Sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

240E—Ridge-Dast-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform:

Ridge—Sedimentary plains and hills

Dast—Sedimentary plains and hills

Position on landform:

Ridge—Backslopes, footslopes, and side slopes

Dast—Backslopes, footslopes, and side slopes

Rock outcrop—Shoulders and summits

Slope:

Ridge—4 to 15 percent

Dast—4 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Ridge and similar soils: 35 percent

Dast and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Doney and similar soils: 0 to 5 percent

Wayden and similar soils: 0 to 5 percent

Major Component Description

Ridge

Surface layer texture: Sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.2 inches

Dast

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.2 inches

Rock outcrop

Definition: Areas of exposed sandstone bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ringling Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Excessively drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour) above the fragmental material and rapid (6.0 to 20.0 inches/hour) in the fragmental material

Landform: Hills and sedimentary plains

Parent material: Scoria residuum

Slope range: 2 to 45 percent

Elevation range: 4,200 to 4,600 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Loamy-skeletal over fragmental, mixed, superactive Typic Haploborolls

Typical Pedon

Ringling channery loam, in an area of Lamedeer-Ringling channery loams, 2 to 8 percent slopes, 1,600 feet west and 2,650 north of the southeast corner of sec. 32, T. 8 N., R. 27 E.

A—0 to 5 inches; reddish brown (5YR 4/3) channery loam, dark reddish brown (5YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many

very fine roots; 30 percent channers; neutral; clear smooth boundary.

Bw—5 to 14 inches; reddish brown (5YR 4/4) very channery loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, very friable; slightly sticky and slightly plastic; many very fine roots; 5 percent flagstones, 35 percent channers; slightly alkaline; clear smooth boundary.

Bk—14 to 20 inches; reddish brown (5YR 5/3) very channery loam, reddish brown (5YR 4/3) moist; weak very fine granular structure; soft, loose, slightly sticky and slightly plastic; common very fine roots; 50 percent channers and 5 percent flagstones; common distinct lime casts on coarse fragments; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

2Ck—20 to 39 inches; light red (10R 6/8) highly fractured baked sandstone and shale with less than 5 percent fine material in the voids; few very fine roots along faces of fragments; common distinct lime casts on coarse fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

3C—39 to 60 inches; pink (5YR 7/3) highly fractured baked sandstone and shale; less than 3 percent fine material in the voids; few very fine roots along faces of fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: between 8 and 24 inches

Mollic epipedon thickness: 7 to 14 inches

Depth to fragmental material: 12 to 20 inches

A horizon

Hue: 7.5YR, 5YR, 2.5YR, or 10R

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 25 percent

Rock fragments: 15 to 35 percent—0 to 5 percent flagstones, 15 to 30 percent channers

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 7.5YR, 5YR, 2.5YR, or 10R

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 10 to 25 percent

Rock fragments: 35 to 80 percent—5 to 25 percent flagstones, 30 to 55 percent channers

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 7.5YR, 5YR, 2.5YR, or 10R

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 10 to 25 percent

Rock fragments: 35 to 80 percent—5 to 25 percent flagstones, 30 to 55 percent channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 7.8

2Ck horizon

Clay content: 0 to 5 percent

Rock fragments: 95 to 100 percent—90 to 95 percent flagstones, 5 to 10 percent channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 8.4

3C horizon

Clay content: 0 to 5 percent

Rock fragments: 95 to 100 percent—90 to 95 percent flagstones, 5 to 10 percent channers and shale

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 8.4

3A—Riverwash

Setting

Landform: Flood plains

Slope: 0 to 1 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Riverwash: 85 percent

Minor Components

Glendive and similar soils: 0 to 7 percent

Havre and similar soils: 0 to 5 percent

Bigsandy and similar soils: 0 to 3 percent

Major Component Description

Definition: Unstabilized areas of sandy, silty, clayey, or gravelly sediments

2E—Rock outcrop

Composition

Major Components

Rock outcrop: 85 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
Cambert and similar soils: 0 to 10 percent

Major Component Description

Definition: Areas of exposed bedrock

Rothiemay Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inches/hour)
Landform: Alluvial fans and relict stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive
Aridic Calciborolls

Typical Pedon

Rothiemay loam in an area of Rothiemay-Crago complex, 4 to 15 percent slopes, 300 feet east and 1,900 feet north of the southwest corner of sec. 12, T. 11 N., R. 24 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to strong very fine subangular blocky; slightly hard, very friable, sticky and slightly plastic; common fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Bw—6 to 15 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; strong medium subangular blocky structure; hard, friable, sticky and slightly plastic; common fine and very fine roots; slightly effervescent; slightly alkaline; clear wavy boundary.

Bk1—15 to 25 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; strong coarse subangular blocky structure; hard, friable,

sticky and slightly plastic; common fine and very fine roots; few fine irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—26 to 36 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; few fine roots; 10 percent pebbles; continuous fine lime coatings on pebbles; many fine irregular masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk3—36 to 60 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; 10 percent pebbles; continuous fine lime coatings on pebbles; many fine irregular soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: between 4 and 12 inches, dry in some part for six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is higher than 41 degrees F
Mollic epipedon thickness: 7 to 10 inches
Depth to calcic horizon: 13 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y
Chroma: 1 or 2
Clay content: 15 to 27 percent
Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent: 1 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: loam or clay loam
Clay content: 18 to 35 percent with less than 35 percent fine and coarser sand
Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles
Calcium carbonate equivalent: 5 to 20 percent
Reaction: pH 7.4 to 8.4

Bk1, Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: loam, clay loam, or sandy clay loam
 Clay content: 18 to 35 percent with less than 35 percent fine and coarser sand
 Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles
 Calcium carbonate equivalent: 15 to 40 percent
 Reaction: pH 7.9 to 9.0

Bk3 horizon

Hue: 10YR or 2.5Y
 Value: 6, 7, or 8 dry; 5, 6, or 7 moist
 Chroma: 2 or 3
 Texture: loam, clay loam, or sandy clay loam
 Clay content: 18 to 35 percent with less than 35 percent fine and coarser sand
 Rock fragments: 5 to 35 percent
 Calcium carbonate equivalent: 15 to 60 percent
 Reaction: pH 7.9 to 9.0

142A—Rothiemay loam, calcareous, 0 to 2 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Rothiemay, calcareous and similar soils: 85 percent

Minor Components

Niart and similar soils: 0 to 5 percent
 Binna and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 9.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

142B—Rothiemay loam, calcareous, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Rothiemay and similar soils: 85 percent

Minor Components

Niart and similar soils: 0 to 5 percent
 Binna and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 9.2 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

142C—Rothiemay-Crago complex, 4 to 15 percent slopes**Setting**

Landform:
 Rothiemay—Alluvial fans and stream terraces
 Crago—Relict stream terraces
Slope:
 Rothiemay—4 to 15 percent
 Crago—4 to 15 percent

Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Rothiemay and similar soils: 45 percent
 Crago and similar soils: 40 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent
 Niart and similar soils: 0 to 5 percent
 Binna and similar soils: 0 to 5 percent

Major Component Description

Rothiemay

Surface layer texture: 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 9.2 inches

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Savage Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces
Parent material: Alluvium
Slope range: 2 to 8 percent
Elevation range: 3,200 to 4,600 feet
Annual precipitation: 15 to 19 inches
Frost free period: 105 to 135 days

Taxonomic Class: Fine, smectitic Vertic Argiborolls

Typical Pedon

Savage loam, 2 to 8 percent slopes, 180 feet south and 50 feet west of the northeast corner of sec. 4, T. 11 N., R. 22 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt—5 to 17 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine roots; continuous faint clay films on faces of peds; slightly alkaline; clear wavy boundary.

Btk—17 to 24 inches; pale brown (10YR 6/3) silty clay, brown (10YR 4/3) moist; strong coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; common fine and very fine roots; continuous faint clay films on faces of peds; few fine irregular masses of lime; slightly alkaline; slightly effervescent; clear wavy boundary.

Bk1—24 to 35 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common fine roots; many fine and medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—35 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; few fine roots; common fine and medium irregular 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: 7 to 16 inches (may include part or all of the argillic horizon)
Depth to Bk horizon: 12 to 30 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Rock fragments: 0 to 5 percent pebbles
 Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y
 Value: 3, 4, or 5 dry; 2, 3, or 4 moist
 Chroma: 2, 3, or 4
 Texture: silty clay loam or silty clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 6.1 to 8.4

Btk and Bk horizons

Hue: 10R or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: silty clay loam or silty clay
 Clay content: 30 to 45 percent
 Rock fragments: 0 to 10 percent—0 to 5 percent
 cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

251C—Savage loam, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 3,200 to 4,600 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Savage and similar soils: 90 percent

Minor Components

Regent and similar soils: 0 to 5 percent
 Tamaneen 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

Available water capacity: Mainly 9.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Shambo Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 2 to 8 percent

Elevation range: 3,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive
 Typic Haploborolls

Typical Pedon

Shambo loam, 2 to 8 percent slopes, 500 feet south and 150 feet east of the northwest corner of sec. 34, T. 6 N., R. 25 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; slightly alkaline; abrupt smooth boundary.

Bw—7 to 16 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; slightly alkaline; clear smooth boundary.

Bk1—16 to 26 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and very fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; disseminated lime; few fine masses of lime;

strongly effervescent; strongly alkaline; gradual wavy boundary.

Bk₂—26 to 36 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many fine and medium irregular masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

C—36 to 60 inches; light gray (2.5Y 7/2) stratified loam and silt loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; disseminated lime; violently effervescent; strongly alkaline.

Range in Characteristics

Depth to Bk horizon: 10 to 35 inches
Mollic epipedon thickness: 7 to 16 inches

Ap horizon

Value: 3, 4, or 5; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 27 percent
Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y
Value: 4, 5, or 6; 3 or 4 moist
Chroma: 2 to 4
Texture: loam, silt loam, or clay loam
Clay content: 18 to 35 percent
Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: loam, clay loam, silty clay loam, or silt loam.
Clay content: 18 to 35 percent
Sodium adsorption ratio: 1 to 5
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.4 to 9.0

C horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7; 4 to 6 moist
Chroma: 2 to 4
Texture: stratified loam and silt loam
Clay content: 18 to 27 percent
Sodium adsorption ratio: 1 to 5
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.4 to 9.0

294C—Shambo loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 4,200 to 4,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Shambo and similar soils: 90 percent

Minor Components

Straw and similar soils: 0 to 5 percent
Korchea and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

255C—Shambo-Korchea-Barvon loams, 2 to 8 percent slopes

Setting

Landform:

Shambo—Alluvial fans and stream terraces
Korchea—Flood plains
Barvon—Sedimentary plains

Slope:

Shambo—2 to 4 percent
Korchea—2 to 4 percent
Barvon—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Shambo and similar soils: 35 percent
Korchea and similar soils: 30 percent
Barvon and similar soils: 30 percent

Minor Components

Savage and similar soils: 0 to 5 percent

Major Component Description

Shambo

Surface layer texture: 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 10.9 inches

Korchea

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 10.1 inches

Barvon

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Sinnigam Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)

Landform: Hills and bedrock floored plains

Parent material: Residuum

Slope range: 2 to 15 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Clayey-skeletal, mixed, superactive
Lithic Argiborolls

Typical Pedon

Sinnigam very stony clay loam, in an area of Borky-Sinnigam very stony clay loams, 2 to 15 percent slopes, 650 feet west and 1,700 feet south of the northeast corner of sec. 7, T. 11 N., R. 22 E.

A—0 to 5 inches; grayish brown (10YR 5/2) very stony clay loam, very dark grayish brown (10YR 3/2) moist; strong very fine subangular blocky structure; slightly hard, very friable, sticky and plastic; many fine and very fine roots; 30 percent channers and cobbles, 20 percent stones; neutral; clear smooth boundary.

Bt1—5 to 12 inches; grayish brown (10YR 5/2) very stony clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine roots; many faint clay films on faces of peds; 40 percent channers and cobbles, 15 percent stones; neutral; clear smooth boundary.

Bt2—12 to 17 inches; grayish brown (10YR 5/2) very stony clay loam, dark grayish brown (10YR 4/2) moist; strong coarse subangular blocky structure; very hard, friable, sticky and plastic; common very fine roots; many faint clay films on faces of peds; 40 percent channers and cobbles, 15 percent stones; neutral; clear smooth boundary.

R—17 inches; hard fractured sandstone interbedded with shale.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches or between 4 inches and the lithic contact.

Mollic epipedon thickness: 7 to 12 inches

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 35 to 60 percent—10 to 25 percent stones and cobbles, 5 to 35 percent pebbles or channers

Reaction: pH 6.1 to 7.8

Bt1 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Rock fragments: 35 to 70 percent—15 to 35 percent stones and cobbles, 20 to 70 percent pebbles or channers

Reaction: pH 6.1 to 7.8

Bt2 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 4 or 5 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Rock fragments: 35 to 70 percent—15 to 30 percent stones and cobbles, 20 to 70 percent pebbles or channers

Reaction: pH 6.1 to 7.8

Straw Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive
Cumulic Haploborolls

Typical Pedon

Straw loam, in an area of Straw-Korchea loams, 0 to 2 percent slopes, 1,250 feet east and 1,600 feet north of the southwest corner of sec. 2, T. 11 N., R. 22 E.

A1—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

A2—9 to 21 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear wavy boundary.

Bk—21 to 30 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few medium irregular masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

C1—30 to 45 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—45 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; common fine and medium irregular 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; not dry in all parts for 60 or more consecutive days following July 1

Mollic epipedon thickness: 16 to 40 inches

Depth to Bk horizon: 13 to 30 inches

A horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Clay content: 18 to 32 percent

Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 6.6 to 8.4

C1 horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: loam, silt loam, or clay loam
 Clay content: 18 to 32 percent
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 7.4 to 8.4

2C2 horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: stratified loam to loamy sand but mainly sandy loam or loamy sand
 Clay content: 5 to 20 percent
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 2 to 12 percent
 Reaction: pH 7.4 to 8.4

292A—Straw-Korchea loams, 0 to 2 percent slopes**Setting****Landform:**

Straw—Stream terraces
 Korchea—Flood plains

Position on landform:

Straw—Footslopes
 Korchea—Toeslopes

Slope:

Straw—0 to 2 percent
 Korchea—0 to 2 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Straw and similar soils: 45 percent
 Korchea and similar soils: 40 percent

Minor Components

Savage and similar soils: 0 to 5 percent
 Shambo and similar soils: 0 to 5 percent
 Macar and similar soils: 0 to 5 percent

Major Component Description**Straw**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.8 inches

Korchea

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 10.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tanna Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated sedimentary beds
Slope range: 1 to 15 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic Aridic Argiborolls

Typical Pedon

Tanna loam, in an area of Tanna-Cabbart loams, 2 to 8 percent slopes, 1,400 feet south and 1,000 feet west of the northeast corner of sec. 26, T. 9 N., R. 26 E.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; loose, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

Bt—4 to 12 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; many fine and very fine roots; common faint clay films on faces of peds; slightly alkaline; gradual smooth boundary.

Bk1—12 to 17 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; disseminated lime; common fine masses of lime; slightly effervescent; slightly alkaline; diffuse wavy boundary.

Bk2—17 to 25 inches; pale yellow (2.5Y 7/4) loam, light yellowish brown (2.5Y 6/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; disseminated lime; common fine masses of lime; strongly effervescent; strongly alkaline; diffuse wavy boundary.

Cr—25 to 60 inches; light gray (2.5Y 7/2) semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: between 4 and 12 inches

Mollic epipedon thickness: 7 to 12 inches

Depth to Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 10 percent—0 to 5 percent cobbles, 0 to 5 percent channers

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Chroma: 2 or 3

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

Clay content: 35 to 50 percent

Rock fragments: 0 to 10 percent—0 to 5 percent cobbles, 0 to 5 percent channers

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam or silty clay loam

Clay content: 35 to 40 percent

Rock fragments: 0 to 10 percent—0 to 5 percent cobbles, 0 to 5 percent channers

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

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

Clay content: 15 to 40 percent

Rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 10 to 55 percent channers

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

53A—Tanna loam, 1 to 6 percent slopes

Setting

Landform: Sedimentary plains

Slope: 1 to 6 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Tanna and similar soils: 85 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

153C—Tanna-Cabbart loams, 2 to 8 percent slopes

Setting

Landform:

Tanna—Sedimentary plains

Cabbart—Sedimentary plains

Position on landform:

Tanna—Backslopes, footslopes, and side slopes

Cabbart—Shoulders and summits

Slope:

Tanna—2 to 8 percent

Cabbart—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Tanna and similar soils: 45 percent

Cabbart and similar soils: 40 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent

Megonot and similar soils: 0 to 5 percent

Welter and similar soils: 0 to 5 percent

Major Component Description

Tanna

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.3 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tibs Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Mountains

Parent material: Colluvium

Slope range: 2 to 60 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, calcareous, frigid Typic Ustorthents

Typical Pedon

Tibs cobbly clay loam, in an area of Tibs-Whitecow cobbly clay loams, 25 to 60 percent slopes, located in Fergus County, Mt., 1,320 feet west and 1,830 feet north of the southeast corner of sec. 7, T. 12 N., R. 21 E.

A1—0 to 2 inches; reddish brown (5YR 4/3) cobbly clay loam, dark reddish brown (5YR 3/3) moist; strong fine granular structure; soft, very friable, sticky and plastic; many fine, medium, and coarse roots; 20 percent angular cobbles, 10 percent angular pebbles; slightly effervescent; slightly alkaline; abrupt wavy boundary.

A2—2 to 6 inches; reddish brown (2.5YR 4/4) cobbly heavy clay loam, dark reddish brown (2.5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine,

medium, and coarse roots; 25 percent angular cobbles, 10 percent angular pebbles; slightly effervescent; moderately alkaline; clear wavy boundary.

Ck—6 to 12 inches; reddish brown (5YR 4/4) very cobbly clay loam, dark reddish brown (5YR 3/4) moist; strong fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine, medium, and coarse roots; 25 percent angular cobbles, 15 percent angular pebbles; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—12 to 30 inches; reddish brown (2.5YR 5/4) very cobbly clay, reddish brown (2.5YR 4/4) moist; strong fine angular blocky structure; hard, friable, sticky and plastic; many fine, medium, and coarse roots in upper part; common fine, medium, and coarse roots in the lower part; 30 percent angular cobbles, 20 percent angular pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—30 to 60 inches; red (2.5YR 5/6) very cobbly clay, red (2.5YR 4/6) moist; moderate fine subangular blocky structure; hard, friable, very sticky and very plastic; common fine, medium, and coarse roots; 35 percent angular cobbles, 20 percent angular pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 45 degrees F

Moisture control section: between 4 and 12 inches

Depth to k horizon: 5 to 9 inches

A1 horizon

Hue: 2.5YR through 10YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 30 to 40 percent

Rock fragments: 15 to 35 percent—10 to 25 percent angular cobbles; 5 to 10 percent angular pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.1 to 8.4

A2 horizon

Hue: 2.5YR through 10YR

Value: 4 or 5 dry; 3 or 4 moist

Clay content: 30 to 40 percent

Rock fragments: 5 to 35 percent—0 to 25 percent angular cobbles; 5 to 10 percent angular pebbles

Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 6.1 to 8.4

Ck horizon

Hue: 2.5YR through 10YR

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

Texture: clay loam or clay

Clay content: 35 to 55 percent

Rock fragments: 35 to 60 percent—25 to 40 percent angular cobbles; 10 to 20 percent angular pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 8.4

C1 horizon

Hue: 2.5YR through 10YR

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

Texture: clay loam or clay

Clay content: 35 to 55 percent

Rock fragments: 35 to 60 percent—25 to 40 percent angular cobbles; 10 to 20 percent angular pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 8.4

C2 horizon

Hue: 2.5YR through 10YR

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

Chroma: 3, 4, 5, or 6

Texture, less than 2 mm: heavy clay loam or clay

Clay content: 35 to 55 percent

Rock fragments: 40 to 60 percent—30 to 45 percent angular cobbles; 10 to 15 percent angular pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 8.4

234F—Tibs-Whitecow cobbly clay loams, 25 to 60 percent slopes

Setting

Landform:

Tibs—Mountains

Whitecow—Mountains

Position on landform:

Tibs—Backslopes

Whitecow—Backslopes

Slope:

Tibs—25 to 60 percent

Whitecow—25 to 60 percent

Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Tibs and similar soils: 45 percent

Whitecow and similar soils: 35 percent

Minor Components

Hughesville and similar soils: 0 to 5 percent

Sheege and similar soils: 0 to 5 percent

Tomty and similar soils: 0 to 5 percent

Delette and similar soils: 0 to 5 percent

Major Component Description

Tibs

Surface layer texture: Cobbly clay 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 4.7 inches

Whitecow

Surface layer texture: Cobbly clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Twilight Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated sandy sedimentary beds

Slope range: 2 to 25 percent

Elevation range: 2,710 to 4,600 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Aridic Ustochrepts

Typical Pedon

Twilight sandy loam, 2 to 8 percent slopes, 1,800 feet south and 1,400 feet east of the northwest corner of sec. 18, T. 11 N., R. 29 E.

A—0 to 3 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; single grain; loose, nonsticky and nonplastic; few fine roots; neutral; gradual smooth boundary.

Bw—3 to 11 inches; yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—11 to 24 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; disseminated lime; few fine masses of lime; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bk2—24 to 35 inches; light gray (10YR 7/2) fine sandy loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; disseminated lime; many medium masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—35 to 60 inches; very pale brown (10YR 7/3) semiconsolidated sandy sedimentary beds.

Range in Characteristics

Depth to Cr horizon: 20 to 40 inches

Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: fine sandy loam or sandy loam

Clay content: 5 to 20 percent

Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: fine sandy loam or sandy loam
 Clay content: 5 to 18 percent
 Calcium carbonate equivalent: 0 to 3 percent
 Reaction: pH 6.1 to 7.8

Bk horizons

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: fine sandy loam or sandy loam
 Clay content: 5 to 18 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: 7.4 to 8.4

32B—Twilight sandy loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Twilight and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Blacksheep and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

132B—Twilight-Blacksheep sandy loams, 2 to 8 percent slopes

Setting

Landform:

Twilight—Sedimentary plains
 Blacksheep—Sedimentary plains

Position on landform:

Twilight—Backslopes, footslopes, and side slopes
 Blacksheep—Shoulders and summits

Slope:

Twilight—2 to 8 percent
 Blacksheep—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Twilight and similar soils: 45 percent
 Blacksheep and similar soils: 40 percent

Minor Components

Busby and similar soils: 0 to 5 percent
 Chinook and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent

Major Component Description

Twilight

Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

Blacksheep

Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

32D—Twilight-Blacksheep-Rock outcrop complex, 4 to 25 percent slopes

Setting

Landform:

Twilight—Sedimentary plains and hills
Blacksheep—Sedimentary plains and hills

Position on landform:

Twilight—Backslopes, footslopes, and side slopes
Blacksheep—Shoulders and summits
Rock outcrop—Shoulders and summits

Slope:

Twilight—4 to 15 percent
Blacksheep—4 to 25 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Twilight and similar soils: 40 percent
Blacksheep and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components

Delpoint and similar soils: 0 to 5 percent
Cabbart and similar soils: 0 to 5 percent

Major Component Description

Twilight

Surface layer texture: Sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

Blacksheep

Surface layer texture: Sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

Rock outcrop

Definition: Areas of exposed sandstone bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

241E—Twilight-Blacksheep-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform:

Twilight—Sedimentary plains and hills
Blacksheep—Hills

Position on landform:

Twilight—Backslopes, footslopes, and side slopes
Blacksheep—Backslopes and side slopes
Rock outcrop—Shoulders and summits

Slope:

Twilight—4 to 25 percent
Blacksheep—15 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Twilight and similar soils: 35 percent
Blacksheep and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components

Cabba and similar soils: 0 to 5 percent
Doney and similar soils: 0 to 5 percent
Yawdim and similar soils: 0 to 5 percent

Major Component Description

Twilight

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 3.9 inches

Blacksheep

Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.6 inches

Rock outcrop

Definition: Areas of exposed sandstone bedrock

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

UL—Urban land

Composition

Major Components

Urban Land: 100 percent

Major Component Description

Definition: Areas with high levels of development including structures, paving, and highly disturbed soil.

Vanda Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.01 to 0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, calcareous, frigid
 Vertic Ustorthents

Typical Pedon

Vanda silty clay, 0 to 4 percent slopes, 50 feet north and 1,600 feet east of the southwest corner of sec. 26, T. 11 N., R. 22 E.

A—0 to 2 inches; light gray (2.5Y 7/2) silty clay, dark grayish brown (2.5Y 4/2) moist; thin (1/4 to 1/2 inch thick) vesicular crust; moderate coarse platy structure; hard, very firm, sticky and plastic; few fine roots; moderately alkaline; abrupt wavy boundary.

Bz—2 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure parting to strong coarse subangular blocky; very hard, very firm, sticky and plastic; few very fine roots; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cy—12 to 19 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; common fine irregular masses and seams of gypsum; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cyz—19 to 27 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; common fine irregular masses and seams of gypsum and other salts; slightly effervescent; strongly alkaline; diffuse wavy boundary.

Cz—27 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; common fine irregular masses and seams of salts; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days when the soil temperature at a depth of 20 inches is 41 degrees F

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3
 Clay content: 40 to 60 percent
 Electrical conductivity: 2 to 8 mmhos/cm
 Sodium adsorption ratio: 20 to 30
 Calcium carbonate equivalent: 1 to 5 percent
 Reaction: pH 7.9 to 9.6

Bz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay, or silty clay loam
 Clay content: 35 to 60 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 30
 Calcium carbonate equivalent: 1 to 5 percent
 Reaction: pH 7.9 to 9.6

Chorizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay, or silty clay loam
 Clay content: 35 to 60 percent
 Gypsum: 1 to 5 percent with total gypsum less than 150
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 30
 Gypsum: 1 to 5 percent
 Calcium carbonate equivalent: 1 to 5 percent
 Reaction: pH 7.9 to 9.6

25A—Vanda silty clay, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Vanda and similar soils: 85 percent

Minor Components

Gerdrum and similar soils: 0 to 5 percent
 Creed and similar soils: 0 to 5 percent
 Marvan and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Verson Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour) from 0 to 22 inches, moderately rapid below this depth (2.0 to 6.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost free period: 105 to 135 days

Taxonomic Class: Clayey over loamy-skeletal, mixed, superactive Aridic Argiborolls

Typical Pedon

Verson clay loam, 0 to 4 percent slopes, 1,500 feet south and 800 feet east of the northwest corner of sec. 20, T. 11 N., R. 25 E.

A—0 to 4 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; neutral; abrupt smooth boundary.

Bt—4 to 9 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common fine roots; common distinct clay films on faces of peds; slightly

effervescent; slightly alkaline; abrupt smooth boundary.

Btk—9 to 14 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, firm, sticky and plastic; common fine roots; few distinct clay films on faces of peds; few medium irregular masses of lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk—14 to 22 inches; light brownish gray (10YR 6/2) gravelly clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; 20 percent pebbles; many medium and large irregular masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C—22 to 60 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, pale brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; few fine roots to 26 inches; 5 percent cobbles, 75 percent pebbles; continuous distinct lime coatings on coarse fragments; 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 12 inches

Depth to Bk horizon: 11 to 21 inches

Depth to 2C horizon: 15 to 36 inches

A horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

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

Clay content: 35 to 55 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.8

Btk and Bk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, 4, or 6

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

Clay content: 35 to 50 percent

Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 20 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2C horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, 4, or 6

Texture: sandy loam or loam

Clay content: 5 to 25 percent

Rock fragments: 50 to 85 percent—5 to 10 percent cobbles, 45 to 75 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

58A—Verson clay loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Verson and similar soils: 85 percent

Minor Components

Musselshell and similar soils: 0 to 5 percent

Attewan and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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

Available water capacity: Mainly 5.5 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Volborg Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated shale residuum

Slope range: 4 to 25 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Clayey, smectitic, acid, frigid, shallow Aridic Ustorthents

Typical Pedon

Volborg silty clay, in an area of Neldore-Volborg silty clays, 4 to 25 percent slopes, in rangeland, 2,400 feet north and 1,800 feet west of the southeast corner of sec. 19, T. 11 N., R. 25 E.

A—0 to 3 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; weak very fine granular structure; loose, very friable, sticky and plastic; common fine and medium roots; strongly acid; clear smooth boundary.

C1—3 to 13 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; massive; hard, firm, sticky and plastic; few medium and common fine roots; very strongly acid; clear smooth boundary.

C2—13 to 17 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; few medium and fine roots; very strongly acid; clear smooth boundary.

Cr—17 to 60 inches; grayish brown (2.5Y 5/2) semiconsolidated shale.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: between 4 and 12 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the temperature at a depth of 20 inches is 41 degrees F or higher

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Clay content: 40 to 50 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 0 to 5

Reaction: pH 4.5 to 6.5

C horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 3.6 to 5.5

Warhorse Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Sedimentary plains

Parent material: Semiconsolidated shale residuum

Slope range: 1 to 8 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost free period: 105 to 135 days

Taxonomic Class: Clayey, smectitic, frigid, shallow Aridic Haplustalfs

Typical Pedon

Warhorse loam in an area of Weingart-Warhorse loams, 1 to 8 percent slopes, 1,500 feet east and 50 feet north of the southwest corner of sec. 13, T. 9 N., R. 26 E.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt—3 to 12 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots; continuous distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

BC—12 to 16 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist;

massive; hard, firm, sticky and plastic; common fine and very fine roots; 50 percent soft sandstone fragments; moderately alkaline; gradual wavy boundary.

Cr—16 to 60 inches; semiconsolidated sedimentary beds

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Depth to Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

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

Clay content: 35 to 45 percent

Rock fragments: 0 to 10 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 7.8

BC horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

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

Clay content: 30 to 40 percent

Rock fragments: 50 to 90 percent—50 to 80 percent soft shale fragments; 0 to 10 percent hard sandstone fragments

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 0 to 5

Reaction: pH 6.6 to 8.4

W—Water

Composition

Major Components

Water: 100 percent

Major Component Description

Definition: Areas of open water

Wayden Series

Depth class: shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Hills, sedimentary plains

Parent material: Semiconsolidated shale residuum

Slope range: 4 to 60 percent

Elevation range: 3,200 to 4,600 feet

Annual precipitation: 15 to 19 inches

Frost free period: 105 to 135 days

Taxonomic Class: Clayey, smectitic, calcareous, frigid, shallow Typic Ustorthents

Typical Pedon

Wayden silty clay loam in an area of Wayden-Castner complex, 8 to 45 percent slopes, 300 feet east and 1,300 feet north of the southwest corner of sec. 9, T. 11 N., R. 22 E.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark brownish gray (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.

C1—4 to 11 inches; light brownish gray (2.5Y 6/2) silty clay, dark brownish gray (2.5Y 4/2) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—11 to 17 inches; light brownish gray (2.5Y 6/2) silty clay, dark brownish gray (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine and very fine roots; many soft shale chips; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—17 to 60 inches; semiconsolidated shale.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: between 4 and 12 inches

Depth to Cr horizon: 10 to 20 inches

A horizon

Hue: 2.5Y or 5Y
 Value: 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 2 or 3
 Clay content: 30 to 40 percent
 Calcium carbonate equivalent: 0 to 5
 Reaction: pH 7.4 to 9.0

C horizons

Hue: 2.5YR or 5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Clay content: 35 to 50 percent
 Electrical conductivity: 0 to 8 mmhos/cm
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 9.0

261F—Wayden-Castner complex, 8 to 45 percent slopes**Setting***Landform:*

Wayden—Hills
 Castner—Hills

Position on landform:

Wayden—Backslopes
 Castner—Shoulders and summits

Slope:

Wayden—15 to 45 percent
 Castner—8 to 25 percent

Elevation: 4,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 135 days

Composition**Major Components**

Wayden and similar soils: 50 percent
 Castner and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Kuro and similar soils: 0 to 5 percent
 Cabba and similar soils: 0 to 5 percent

Major Component Description**Wayden**

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Castner

Surface layer texture: Channery loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

262E—Wayden-Windham complex, 4 to 25 percent slopes**Setting***Landform:*

Wayden—Sedimentary plains and hills
 Windham—Relict stream terraces

Position on landform:

Wayden—Backslopes and side slopes
 Windham—Shoulders and summits

Slope:

Wayden—4 to 25 percent
 Windham—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Wayden and similar soils: 45 percent
 Windham and similar soils: 40 percent

Minor Components

Cabba and similar soils: 0 to 5 percent
 Judith and similar soils: 0 to 5 percent
 Lap and similar soils: 0 to 5 percent

Major Component Description

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Windham

Surface layer texture: Gravelly 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
Available water capacity: Mainly 3.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Weingart Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (0.01 to 0.06 inch/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated shale residuum
Slope range: 1 to 8 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Natrustalfs

Typical Pedon

Weingart loam in an area of Weingart-Warhorse loams, 1 to 8 percent slopes, 150 feet west and 900 feet north of the southeast corner of sec. 13, T. 9 N., R. 26 E.

E—0 to 2 inches; pale brown (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak fine and very fine platy structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; abrupt wavy boundary.

Btn1—2 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium columnar structure; very hard, firm, sticky and plastic; many fine and medium roots; continuous distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

Btn2—6 to 14 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and few fine roots; continuous distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Bkn—14 to 21 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and few fine roots; common fine irregular masses of lime; slightly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz—21 to 32 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many fine irregular masses of gypsum and other salts; few fine irregular masses of lime; slightly effervescent; strongly alkaline; gradual wavy boundary.

Cr—32 to 60 inches; semiconsolidated sedimentary beds.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature is 41 degrees F or above

Depth to Bkn horizon: 7 to 16 inches

Depth to Bknyz horizon: 10 to 24 inches

Depth to Cr horizon: 20 to 40 inches

E horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Rock fragments: 0 to 10 percent—0 to 10 percent
 stones and cobbles, 0 to 5 percent hard shale,
 0 to 5 percent soft shale
 Reaction: pH 5.6 to 7.8

Btn horizons

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: silty clay loam, clay, silty clay, or sandy
 clay
 Clay content: 35 to 60 percent
 Rock fragments: 0 to 10 percent—0 to 5 percent
 hard shale, 0 to 5 percent soft shale
 Electrical conductivity: 2 to 8 mmhos/cm
 Sodium adsorption ratio: 10 to 30
 Reaction: pH 6.6 to 9.6
 Note: When the SAR is less than 13, there is more
 exchangeable magnesium plus sodium than
 calcium plus exchange acidity.

Bkn horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay loam, silty clay, clay, sandy clay, or
 silty clay loam
 Clay content: 35 to 55 percent
 Rock fragments: 0 to 10 percent—0 to 5 percent
 hard shale, 0 to 5 percent soft shale
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 30
 Gypsum: 0 to 1 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.6

Bknyz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1, 2, 3, or 4
 Texture: clay, silty clay, clay loam, or silty clay
 loam
 Clay content: 35 to 55 percent
 Rock fragments: 0 to 10 percent—0 to 5 percent
 hard shale, 0 to 5 percent soft shale
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 30
 Gypsum: 1 to 5 percent
 Calcium carbonate equivalent: 2 to 12 percent
 Reaction: pH 7.9 to 9.6

26A—Weingart loam, 1 to 8 percent slopes**Setting**

Landform: Sedimentary plains
Slope: 1 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition**Major Components**

Weingart and similar soils: 85 percent

Minor Components

Gerdrum and similar soils: 0 to 2 percent
 Creed and similar soils: 0 to 3 percent
 Warhorse and similar soils: 0 to 5 percent
 Tanna and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale
 residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

26B—Weingart-Warhorse loams, 1 to 8 percent slopes**Setting**

Landform:
 Weingart—Sedimentary plains
 Warhorse—Sedimentary plains

Slope:

Weingart—1 to 8 percent

Warhorse—1 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Weingart and similar soils: 45 percent

Warhorse and similar soils: 40 percent

Minor Components

Tanna and similar soils: 0 to 5 percent

Gerdrum and similar soils: 0 to 5 percent

Creed and similar soils: 0 to 5 percent

Major Component Description**Weingart**

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 3.7 inches

Warhorse

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Whitecow Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Mountains

Parent material: Alluvium or colluvium

Slope range: 2 to 60 percent

Elevation range: 4,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Calcic Ustochrepts

Typical Pedon

Whitecow cobbly clay loam, in an area of Tibs-Whitecow cobbly clay loams, 25 to 60 percent slopes, 800 feet west and 500 feet south of the northeast corner of sec. 6, T. 11 N., R. 22 E.

Oi—undecomposed and slightly decomposed needles and twigs.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) cobbly clay 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 and common medium roots; 5 percent stones, 15 percent cobbles, 10 percent pebbles; strongly effervescent; slightly alkaline; clear smooth boundary.

A2—3 to 6 inches; grayish brown (10YR 5/2) cobbly clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine and common medium roots; 5 percent stones, 15 percent cobbles, 15 percent pebbles; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—6 to 20 inches; very pale brown (10YR 7/3) very gravelly loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; 5 percent stones, 10 percent cobbles, 30 percent pebbles; disseminated lime; common distinct lime casts on underside of coarse fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—20 to 60 inches; very pale brown (10YR 7/3) extremely gravelly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and medium roots; 10 percent stones, 10 percent cobbles, 55 percent pebbles; disseminated lime;

common distinct lime casts on underside of coarse fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 42 degrees F

Moisture control section: between 4 and 12 inches

A horizons

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: loam or clay loam

Clay content: 18 to 35 percent

Rock fragments: 15 to 35 percent—10 to 20 percent stones and cobbles, 5 to 15 percent pebbles and channers

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 18 to 35 percent

Rock fragments: 35 to 70 percent—0 to 30 percent stones and cobbles, 5 to 60 percent pebbles and channers

Calcium carbonate equivalent: 35 to 50 percent

Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, sandy loam, or clay loam

Clay content: 18 to 35 percent

Rock fragments: 60 to 90 percent—5 to 30 percent stones and cobbles, 55 to 70 percent pebbles and channers

Calcium carbonate equivalent: 40 to 50 percent

Reaction: pH 7.4 to 9.0

Windham Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 2 to 15 percent

Elevation range: 3,200 to 4,700 feet

Annual precipitation: 15 to 19 inches

Frost free period: 105 to 135 days

Taxonomic Class: Loamy-skeletal, carbonatic Typic Calciborolls

Typical Pedon

Windham very stony loam, 2 to 15 percent slopes, 500 feet west and 2,400 feet south of the northeast corner of sec. 9, T. 11 N., R. 22 E.

A—0 to 6 inches; dark grayish brown (10YR 4/2) very stony loam, very dark grayish brown (10YR 3/2) moist; moderate coarse granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 15 percent stones, 10 percent limestone cobbles, 15 percent limestone pebbles; continuous distinct lime casts on undersides of cobbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—6 to 11 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; loose, very friable, sticky and nonplastic; many fine and very fine roots; 20 percent limestone pebbles; continuous prominent lime casts and pendants on undersides of pebbles; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—11 to 22 inches; very pale brown (10YR 8/2) very gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; loose, very friable, sticky and nonplastic; few fine and very fine roots; 30 percent limestone pebbles, 10 percent limestone cobbles; continuous prominent lime casts and pendants on the undersides of pebbles and cobbles; common fine masses of lime; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—22 to 60 inches; very pale brown (10YR 7/3) extremely gravelly loam, light yellowish brown (10YR 6/4) moist; massive; loose, very friable, sticky and nonplastic; few fine and very fine roots; 60 percent limestone pebbles, 10 percent cobbles; continuous distinct lime casts on undersides of pebbles and cobbles; common fine masses of lime; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Mollic epipedon thickness: 7 to 16 inches

Depth to calcic horizon: 5 to 10 inches

A horizon

Hue: 7.5YR or 10YR
 Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 1, 2, or 3
 Texture: loam or clay loam
 Clay content: 18 to 35 percent
 Rock fragments: 10 to 75 percent—0 to 15 percent stones, 0 to 10 percent cobbles, 10 to 50 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 4, 5, or 6 dry; 3, 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam or clay loam
 Clay content: 18 to 35 percent
 Rock fragments: 10 to 75 percent—0 to 20 percent cobbles, 10 to 55 percent pebbles
 Calcium carbonate equivalent: 35 to 60 percent
 Reaction: pH 7.9 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: loam, clay loam, or sandy loam
 Clay content: 18 to 35 percent
 Rock fragments: 35 to 75 percent—0 to 20 percent cobbles; 35 to 55 percent pebbles
 Calcium carbonate equivalent: 40 to 60 percent
 Reaction: pH 7.9 to 8.4

Bk3 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: loam, clay loam, or sandy loam
 Clay content: 18 to 35 percent
 Rock fragments: 60 to 80 percent—5 to 20 percent cobbles; 55 to 60 percent pebbles
 Calcium carbonate equivalent: 40 to 60 percent
 Reaction: pH 7.9 to 8.4

291C—Windham very stony loam, 2 to 15 percent slopes

Setting

Landform: Relict stream terraces
Slope: 2 to 15 percent
Elevation: 4,200 to 4,700 feet

Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Windham and similar soils: 90 percent

Minor Components

Maiden and similar soils: 0 to 5 percent
 Judith and similar soils: 0 to 5 percent

Major Component Description

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 2.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Winifred Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills
Parent material: Semiconsolidated shale residuum
Slope range: 15 to 45 percent
Elevation range: 4,200 to 4,700 feet
Annual precipitation: 15 to 19 inches
Frost-free period: 90 to 125 days

Taxonomic Class: Fine, smectitic Vertic Haploborolls

Typical Pedon

Winifred clay loam, in an area of Bitton-Winifred-Castner complex, 15 to 60 percent slopes, 2,100 feet west and 2,200 feet north of the southeast corner of sec. 7, T. 11 N., R. 23 E.

A—0 to 3 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine

and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—3 to 12 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—12 to 21 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and few fine roots; few fine irregular masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—21 to 35 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; strong medium subangular blocky structure; very hard, firm, very sticky and very plastic; few fine and very fine roots; common medium irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—35 to 60 inches; semiconsolidated shale.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches

Mollic epipedon thickness: 7 to 15 inches

Depth to bedrock: 20 to 40 inches

Depth to Bk horizon: 11 to 22 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 27 to 40 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

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

Clay content: 35 to 50 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

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

Clay content: 35 to 50 percent

Rock fragments: 0 to 5 percent pebbles

Sodium adsorption ratio: 1 to 5

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 5 percent

Reaction: pH 7.4 to 9.0

Yamacall Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans, stream terraces, sedimentary plains, and hills

Parent material: Alluvium

Slope range: 0 to 15 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Ustochrepts

Typical Pedon

Yamacall loam, calcareous, 2 to 8 percent slopes, 2,250 feet north and 2,000 feet west of the southeast corner of sec. 21, T. 9 N., R. 27 E.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; moderately alkaline; clear smooth boundary.

Bw—3 to 11 inches; light gray (2.5Y 7/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 25 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; moderate medium prismatic structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

BC—25 to 60 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; massive; few very fine roots; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: between 4 and 12 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 10 to 20 inches

Note: a BC horizon is allowed

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Effervescence: none to strongly

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or silt loam

Clay content: 18 to 35 percent with 15 to 35 percent fine sand and coarser

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Calcium carbonate equivalent: 0 to 15 percent

Effervescence: none to strongly

Reaction: pH 6.6 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or silt loam

Clay content: 18 to 30 percent with 15 to 35 percent fine sand and coarser

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: 1 to 5

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: strongly or violently

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or silt loam

Clay content: 10 to 30 percent with 15 to 35 percent fine sand and coarser

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: 1 to 5

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

34A—Yamacall clay loam, 0 to 2 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Yamacall, calcareous soils: 0 to 5 percent

Kobase and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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

Available water capacity: Mainly 9.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

34B—Yamacall clay loam, 2 to 8 percent slopes**Setting**

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Yamacall and similar soils: 85 percent

Minor Components

Yamacall, calcareous soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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

Available water capacity: Mainly 9.6 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

37A—Yamacall clay loam, calcareous, 0 to 2 percent slopes**Setting**

Landform: Sedimentary plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Yamacall and similar soils: 85 percent

Minor Components

Yamacall, noncalcareous and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

37B—Yamacall clay loam, calcareous, 2 to 8 percent slopes**Setting**

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Yamacall and similar soils: 85 percent

Minor Components

Yamacall, noncalcareous and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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

Available water capacity: Mainly 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

33A—Yamacall loam, 0 to 2 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 5 percent

Yamacall, calcareous soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

33B—Yamacall loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent

Yamacall, calcareous soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 9.7 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41A—Yamacall loam, calcareous, 0 to 2 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 2 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Yamacall, noncalcareous and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41B—Yamacall loam, calcareous, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Yamacall, noncalcareous and similar soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Busby and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: 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 10.0 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

35B—Yamacall-Busby complex, 2 to 8 percent slopes

Setting

Landform:
 Yamacall—Sedimentary plains
 Busby—Sedimentary plains
Slope:
 Yamacall—2 to 8 percent
 Busby—2 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 45 percent
 Busby and similar soils: 40 percent

Minor Components

Yamacall, calcareous soils: 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Twilight and similar soils: 0 to 5 percent

Major Component Description

Yamacall

Surface layer texture: 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 9.7 inches

Busby

Surface layer texture: Fine sandy 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 7.4 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

36B—Yamacall-Delpoint loams, 2 to 8 percent slopes

Setting

Landform:

Yamacall—Sedimentary plains

Delpoint—Sedimentary plains

Slope:

Yamacall—2 to 8 percent

Delpoint—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 45 percent

Delpoint and similar soils: 40 percent

Minor Components

Yamacall, calcareous soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 5 percent

Major Component Description

Yamacall

Surface layer texture: 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 9.7 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41C—Yamacall-Delpoint loams, calcareous, 2 to 8 percent slopes

Setting

Landform:

Yamacall—Sedimentary plains

Delpoint—Sedimentary plains

Slope:

Yamacall—2 to 8 percent

Delpoint—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 45 percent

Delpoint and similar soils: 40 percent

Minor Components

Yamacall, noncalcareous and similar soils: 0 to 5 percent

Delpoint, noncalcareous and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Major Component Description

Yamacall

Surface layer texture: 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 10.1 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

256C—Yamacall-Havre-Delpoint loams, 2 to 8 percent slopes

Setting

Landform:

Yamacall—Sedimentary plains

Havre—Flood plains

Delpoint—Sedimentary plains

Slope:

Yamacall—2 to 6 percent

Havre—2 to 4 percent

Delpoint—4 to 8 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yamacall and similar soils: 35 percent

Havre and similar soils: 30 percent

Delpoint and similar soils: 30 percent

Minor Components

Twilight and similar soils: 0 to 5 percent

Major Component Description

Yamacall

Surface layer texture: 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 9.7 inches

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Rare

Available water capacity: Mainly 9.7 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yawdim Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated shale residuum

Slope range: 4 to 60 percent

Elevation range: 2,710 to 4,200 feet

Annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Taxonomic Class: Clayey, smectitic, calcareous, frigid, shallow Aridic Ustorthents

Typical Pedon

Yawdim silty clay loam, in an area of Yawdim-Abor complex, 4 to 15 percent slopes, 2,400 feet north and 2,500 feet east of the southwest corner of sec. 21, T. 11 N., R. 29 E.

A—0 to 2 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C1—2 to 6 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (10YR 4/2) moist; strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; strongly effervescent; slightly alkaline; clear smooth boundary.

C2—6 to 16 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—16 to 60 inches; light gray (10YR 6/1) semiconsolidated shale.

Range in Characteristics

Depth to Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: silty clay or silty clay loam
Clay content: 27 to 50 percent
Reaction: pH 6.6 to 7.8

C horizon

Hue: 10YR, 2.5Y or 5Y
Value: 5 to 8 dry; 4 to 6 moist
Chroma 1 to 4
Texture: silty clay loam, clay loam, or clay
Clay content: 35 to 50 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

67D—Yawdim silty clay loam, 4 to 25 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 25 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Yawdim and similar soils: 85 percent

Minor Components

Megonot and similar soils: 0 to 5 percent
Abor and similar soils: 0 to 5 percent
Volborg and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

73E—Yawdim-Abor complex, 15 to 60 percent slopes

Setting

Landform:

Yawdim—Hills
Abor—Hills

Position on landform:

Yawdim—Shoulders and summits
Abor—Backslopes

Slope:

Yawdim—15 to 60 percent
Abor—15 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yawdim and similar soils: 45 percent
Abor and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
Neldore and similar soils: 0 to 5 percent
Orinoco and similar soils: 0 to 5 percent

Major Component Description

Yawdim

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

73D—Yawdim-Abor complex, 4 to 15 percent slopes**Setting***Landform:*

Yawdim—Sedimentary plains and hills
 Abor—Sedimentary plains and hills

Position on landform:

Yawdim—Shoulders and summits
 Abor—Backslopes, footslopes, and side slopes

Slope:

Yawdim—4 to 15 percent
 Abor—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Yawdim and similar soils: 45 percent
 Abor and similar soils: 40 percent

Minor Components

Weingart and similar soils: 0 to 5 percent
 Orinoco and similar soils: 0 to 5 percent
 Neldore and similar soils: 0 to 5 percent

Major Component Description**Yawdim**

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95E—Yawdim-Crago complex, 4 to 35 percent slopes**Setting***Landform:*

Yawdim—Sedimentary plains and hills
 Crago—Relict stream terraces

Position on landform:

Yawdim—Backslopes and side slopes
 Crago—Shoulders and summits

Slope:

Yawdim—4 to 35 percent
 Crago—4 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition**Major Components**

Yawdim and similar soils: 45 percent
 Crago and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
 Musselshell and similar soils: 0 to 5 percent
 Attewan and similar soils: 0 to 5 percent

Major Component Description

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Crago

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

167E—Yawdim-Orinoco silty clay loams, 15 to 35 percent slopes

Setting

Landform:

Yawdim—Hills
 Orinoco—Hills

Position on landform:

Yawdim—Shoulders and summits
 Orinoco—Backslopes, footslopes, and side slopes

Slope:

Yawdim—15 to 35 percent
 Orinoco—15 to 35 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Yawdim and similar soils: 45 percent
 Orinoco and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent
 Neldore and similar soils: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Orinoco

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

167D—Yawdim-Orinoco silty clay loams, 4 to 15 percent slopes

Setting

Landform:

Yawdim—Sedimentary plains and hills
 Orinoco—Sedimentary plains and hills

Position on landform:

Yawdim—Shoulders and summits
 Orinoco—Backslopes, footslopes, and side slopes

Slope:

Yawdim—4 to 15 percent
 Orinoco—4 to 15 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Yawdim and similar soils: 45 percent
 Orinoco and similar soils: 40 percent

Minor Components

Megonot and similar soils: 0 to 5 percent
 Neldore and similar soils: 0 to 5 percent
 Cabbart and similar soils: 0 to 5 percent

Major Component Description

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Orinoco

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Zatoville Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium

Slope range: 0 to 8 percent
Elevation range: 2,710 to 4,200 feet
Annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Taxonomic Class: Fine, smectitic, frigid Torric
 Ustochrepts

Typical Pedon

Zatoville silty clay loam, 0 to 8 percent slopes, 1,900 feet south and 1,000 feet east of the northwest corner of sec. 26, T. 11 N., R. 22 E.

Ap—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; moderately alkaline; abrupt smooth boundary.

Bw—2 to 13 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong coarse prismatic structure parting to strong coarse subangular blocky; very hard, very firm, sticky and plastic; common fine roots; moderately alkaline; gradual wavy boundary.

Bk—13 to 19 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common fine irregular masses of lime; slightly effervescent; moderately alkaline; gradual wavy boundary.

By1—19 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common fine and medium irregular masses of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

By2—35 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; very hard, very firm, sticky and plastic; many fine and medium irregular masses and seams of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Moisture control section: between 4 and 12 inches, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil

temperature at a depth of 20 inches is 41 degrees
F or higher

Depth to By horizon: 13 to 24 inches

Ap horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 30 to 40 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 9.0

Bw horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: silty clay loam or silty clay
Clay content: 33 to 45 percent
Electrical conductivity: 0 to 4 mmhos/cm
Calcium carbonate equivalent: 1 to 5
Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: silty clay loam or silty clay
Clay content: 35 to 45 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 1 to 13
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

By horizons

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: silty clay loam or silty clay
Clay content: 35 to 45 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 18 to 30
Gypsum: 10 to 20
Calcium carbonate equivalent: 0 to 10 percent
Reaction: pH 7.9 to 9.0

**38B—Zatoville silty clay loam, 0 to 8
percent slopes**

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 8 percent
Elevation: 2,710 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Composition

Major Components

Zatoville and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent
Marias 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
Salt affected: Saline within 30 inches
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.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**138B—Zatoville-Orinoco silty clay loams,
2 to 8 percent slopes**

Setting

Landform:

Zatoville—Alluvial fans and stream terraces
Orinoco—Sedimentary plains

Position on landform:

Zatoville—Foothills
Orinoco—Backslopes

Slope:

Zatoville—2 to 8 percent
Orinoco—2 to 8 percent

Elevation: 2,710 to 4,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Composition

Major Components

Zatoville and similar soils: 45 percent
Orinoco and similar soils: 40 percent

Minor Components

Kobase and similar soils: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent
 Megonot and similar soils: 0 to 5 percent

Major Component Description**Zatoville**

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
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.6 inches

Orinoco

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.1 inches

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

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

References

- Alexander, R.R. 1966. Site indexes for lodgepole pine with corrections for stand density. U.S. Department of Agriculture, Forest Service. Rocky Mountain Forest and Range Experiment Station Research Paper, RP-24.
- Alt, David D. 1984. Profiles of Montana Geology. Montana Bureau of Mines and Geology, Special Publication 89.
- American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.
- American Society for Testing and Materials (ASTM). 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487-00.
- Dahms, W.G. 1964. Gross and net yields for lodgepole pine. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR, Research Paper PNW-8.
- Myers, C.A. 1966. Yield tables for managed stands of lodgepole pine in Colorado and Wyoming. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Research Paper RM-RP-26.
- Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana. U.S. Department of Agriculture, Forest Service, Intermountain Research Station General Technical Report INT-GTR-34.
- United States Department of Agriculture, Natural Resources Conservation Service. 1996. Keys to soil taxonomy. 7th edition. Soil Survey Staff.
- United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210.
- United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.
- United States Department of Agriculture, Soil Conservation Service. 1993. Soil survey manual. U.S. Dep. Agric. Handb. 18.

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.

Backslope. 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 1 foot wide, 1 foot long, and 1 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 the 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 cobbles, and extremely cobbly soil material is more than 60 percent cobbles.
- 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 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 culmination of 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 resting grazing land 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 individual trees. 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.

Footslope. 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.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

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. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

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:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3

Slightly 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 groundwater 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 $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
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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.
- Strippcropping.** 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 erosion 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, 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 depressional 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 depressional 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.

Water-spreading. 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.

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