



United States
Department of
Agriculture

In cooperation with the
Montana Agricultural
Experiment Station

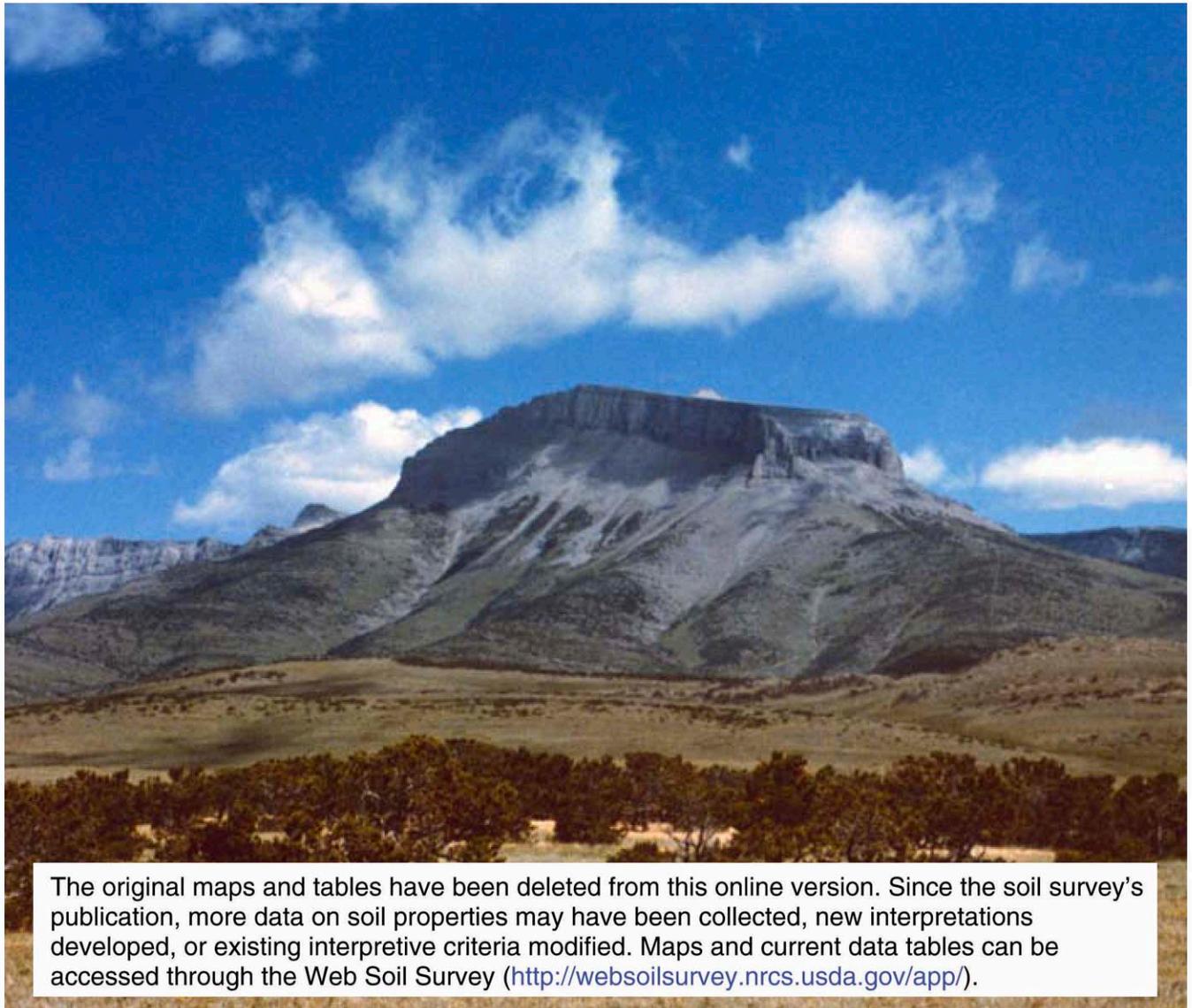


Natural
Resources
Conservation
Service



MT657—Soil Survey of Choteau-Conrad Area; Parts of Teton and Pondera Counties, Montana

Part I



The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>).

How to Use This Soil Survey

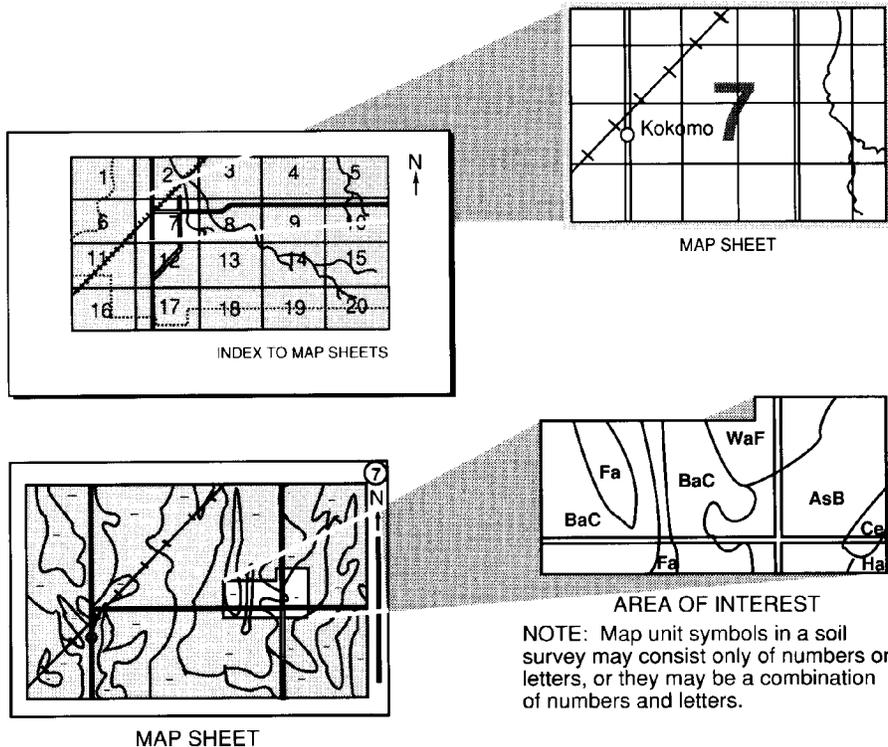
Detailed Soil Maps

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

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (<http://websoilsurvey.nrcs.usda.gov/app/>).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



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 1988. Soil names and descriptions were approved in 1989. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. 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 Teton County Conservation District and the Pondera County Conservation District.

The most current official data are available through the NRCS Soil Data Mart website at <http://soildatamart.nrcs.usda.gov>. 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: A typical area of Hanson very cobbly loam, 0 to 4 percent slopes, is in the foreground. Ear Mountain is in the background.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.

Contents

Part I

How To Use This Soil Survey	i
Index to Taxonomic Units	x
Index to Map Units	xii
Summary of Tables	xvii
Foreword	xix
General Nature of the Survey Area	1
History	1
Industry, Transportation, and Recreation	2
Regional Geology	2
Natural Resources	3
Physiography and Drainage	4
Climate	5
How This Survey Was Made	5
Formation and Classification of the Soils	15
Soil Series and Detailed Soil Map Units	25
<i>Abor Series</i>	26
170C—Abor-Yawdim silty clay loams, 4 to 15 percent slopes	27
170E—Abor-Yawdim silty clay loams, 15 to 35 percent slopes	28
<i>Absher Series</i>	28
214A—Absher clay loam, wet, 0 to 2 percent slopes	29
<i>Acel Series</i>	30
31B—Acel silty clay loam, 0 to 4 percent slopes	31
<i>Adel Series</i>	31
197E—Adel-Doby-Hanson complex, 8 to 35 percent slopes	32
198C—Adel-Gallatin-Shedhorn complex, 0 to 8 percent slopes	33
294E—Adel-Burnette-Bynum complex, 4 to 35 percent slopes	34
394E—Adel-Burnette-Sebud complex, 4 to 35 percent slopes	34
<i>Amor Series</i>	35
174D—Amor-Cabba loams, 2 to 15 percent slopes	36
<i>Arrod Series</i>	36
<i>Assinniboine Series</i>	37
132C—Assinniboine fine sandy loam, 0 to 8 percent slopes	38
<i>Attewan Series</i>	38
116B—Attewan fine sandy loam, 0 to 4 percent slopes	39
216C—Attewan-Wabek complex, 0 to 8 percent slopes	40
<i>Babb Series</i>	40
296E—Babb-Tibson-Adel complex, 4 to 35 percent slopes	41
590E—Babb-Fifer-Cheadle complex, 8 to 45 percent slopes	42
<i>Bascovy Series</i>	43
169C—Bascovy-Neldore complex, 2 to 8 percent slopes	43
<i>Beanlake Series</i>	44
327C—Beanlake-Winspect cobbly loams, 2 to 15 percent slopes	45
427C—Beanlake-Saypo-Winspect complex, 0 to 8 percent slopes	46
527E—Beanlake-Cabba-Castner complex, 8 to 35 percent slopes	46
727C—Beanlake-Manhattan-Winspect complex, 2 to 15 percent slopes	47
<i>Binna Series</i>	48
118B—Binna-Scravo complex, 0 to 4 percent slopes	49
<i>Birchfield Series</i>	49
<i>Burnette Series</i>	51
<i>Bynum Series</i>	51
194E—Bynum-Adel-Doby complex, 4 to 35 percent slopes	52
<i>Cabba Series</i>	53
174E—Cabba-Amor loams, 15 to 35 percent slopes	54
271F—Cabba-Castner-Rock outcrop complex, 25 to 60 percent slopes	54

474F—Cabba-Roundor-Windham complex, 25 to 60 percent slopes	55	576F—Delpoint-Cabbart-Crago complex, 15 to 60 percent slopes	71
574E—Cabba-Wayden-Castner complex, 4 to 35 percent slopes	55	676C—Delpoint-Rothiemay clay loams, 2 to 8 percent slopes	71
<i>Cabbart Series</i>	56	676D—Delpoint-Rothiemay clay loams, 8 to 15 percent slopes	72
173E—Cabbart-Delpoint loams, 15 to 35 percent slopes	57	776C—Delpoint-Cabbart-Rootel loams, 2 to 15 percent slopes	72
273F—Cabbart-Delpoint-Rock outcrop complex, 25 to 70 percent slopes	57	876C—Delpoint-Kremlin-Vanda complex, 2 to 15 percent slopes	73
<i>Castner Series</i>	58	46—Denied access	74
<i>Cheadle Series</i>	59	<i>Doby Series</i>	74
390F—Cheadle-Doby-Rock outcrop complex, 15 to 60 percent slopes	60	<i>Dougcliff Series</i>	75
904F—Cheadle-Adel-Doby complex, 15 to 60 percent slopes	60	<i>Ethridge Series</i>	75
<i>Chinook Series</i>	61	39B—Ethridge silty clay loam, 0 to 4 percent slopes	76
34C—Chinook fine sandy loam, 0 to 8 percent slopes	62	439B—Ethridge clay loam, 0 to 4 percent slopes	77
334C—Chinook-Joplin complex, 2 to 8 percent slopes	62	539B—Ethridge-Nunemaker silty clay loams, 0 to 4 percent slopes	77
434B—Chinook-Kremlin complex, 0 to 4 percent slopes	63	<i>Evanston Series</i>	78
534D—Chinook-Twilight fine sandy loams, 2 to 15 percent slopes	63	53B—Evanston loam, 0 to 4 percent slopes	79
<i>Crago Series</i>	64	<i>Fairfield Series</i>	79
15B—Crago gravelly loam, 0 to 4 percent slopes	65	<i>Fairway Series</i>	80
15C—Crago gravelly loam, 4 to 8 percent slopes	65	125A—Fairway-Meadowcreek loams, 0 to 2 percent slopes, rarely flooded	81
<i>Creed Series</i>	66	<i>Fifer Series</i>	82
131B—Creed-Gerdrum complex, 0 to 4 percent slopes	67	<i>Floweree Series</i>	82
137B—Creed-Absher complex, 0 to 4 percent slopes	67	58B—Floweree silt loam, 0 to 4 percent slopes	83
<i>Delpoint Series</i>	68	458B—Floweree silty clay loam, 0 to 4 percent slopes	84
176C—Delpoint-Cabbart loams, 2 to 15 percent slopes	69	<i>Gallatin Series</i>	84
376F—Delpoint-Cabbart-Hillon complex, 25 to 60 percent slopes	69	<i>Garlet Series</i>	85
476D—Delpoint-Kremlin-Cabbart complex, 4 to 15 percent slopes	70	493E—Garlet-Cheadle-Loberg stony loams, 8 to 45 percent slopes	86
		<i>Gerdrum Series</i>	87
		114A—Gerdrum-Absher clay loams, 0 to 2 percent slopes	88
		<i>Hanson Series</i>	89

195B—Hanson-Raynesford complex, 0 to 4 percent slopes	90	163C—Kevin-Hillon clay loams, 2 to 8 percent slopes	103
495B—Hanson very cobbly loam, 0 to 4 percent slopes	90	<i>Kiev Series</i>	104
403—Haploborolls-Argiborolls complex, 0 to 4 percent slopes, rarely flooded	90	117B—Kiev-Fairfield complex, 0 to 4 percent slopes	105
<i>Harlake Series</i>	91	121B—Kiev-Judith gravelly loams, 0 to 4 percent slopes	105
406—Harlake clay loam, 0 to 4 percent slopes, rarely flooded	92	184D—Kiev-Roundor loams, 2 to 15 percent slopes	106
<i>Havre Series</i>	92	284D—Kiev-Roundor gravelly loams, 2 to 15 percent slopes	106
7A—Havre loam, 0 to 2 percent slopes, rarely flooded	93	475F—Kiev-Roundor-Windham complex, 15 to 45 percent slopes	107
107A—Havre-Ryell loams, 0 to 2 percent slopes, rarely flooded	93	784C—Kiev-Winifred-Vanda complex, 0 to 15 percent slopes	107
400—Havre-Fairway loams, 0 to 4 percent slopes, rarely flooded	94	<i>Kobase Series</i>	108
<i>Hillon Series</i>	94	40B—Kobase silty clay loam, 0 to 4 percent slopes	109
61F—Hillon clay loam, 15 to 60 percent slopes	95	40C—Kobase silty clay loam, 4 to 8 percent slopes	110
161F—Hillon-Yawdim complex, 15 to 45 percent slopes	95	240B—Kobase-Marias complex, 0 to 4 percent slopes	110
163D—Hillon-Kevin clay loams, 8 to 15 percent slopes	96	541C—Kobase-Ethridge clay loams, 4 to 8 percent slopes	110
257E—Hillon-Lambeth complex, 15 to 35 percent slopes	97	<i>Korchea Series</i>	111
<i>Joplin Series</i>	97	108A—Korchea-Ridgelawn loams, 0 to 2 percent slopes, rarely flooded	112
<i>Judith Series</i>	98	208A—Korchea-Straw loams, 0 to 2 percent slopes, rarely flooded	112
20B—Judith loam, 0 to 4 percent slopes	99	<i>Kremlin Series</i>	113
120B—Judith-Kiev loams, 0 to 4 percent slopes	100	22B—Kremlin loam, 0 to 4 percent slopes	114
120C—Judith-Kiev loams, 4 to 8 percent slopes	100	322B—Kremlin clay loam, 0 to 4 percent slopes	114
220B—Judith-Windham complex, 0 to 4 percent slopes	101	322C—Kremlin clay loam, 4 to 8 percent slopes	114
220C—Judith-Windham complex, 4 to 8 percent slopes	101	522C—Kremlin-Delpoint clay loams, 2 to 8 percent slopes	115
620C—Judith-Windham cobbly loams, 0 to 8 percent slopes	102	<i>Lambeth Series</i>	115
<i>Kevin Series</i>	102	<i>Lardell Series</i>	116

3B—Lardell silty clay loam, 0 to 4 percent slopes	117	<i>McKenzie Series</i>	135
<i>Linnet Series</i>	117	38A—McKenzie clay, 0 to 2 percent slopes	135
147C—Linnet-Abor silty clays, 2 to 8 percent slopes	119	<i>Meadowcreek Series</i>	136
<i>Linwell Series</i>	119	<i>Megonot Series</i>	137
179C—Linwell-Winifred clay loams, 2 to 15 percent slopes	120	70B—Megonot silty clay loam, 0 to 4 percent slopes	138
<i>Loberg Series</i>	121	148C—Megonot-Richey-Tanna clay loams, 2 to 8 percent slopes	138
193E—Loberg-Whitore-Garlet stony loams, 8 to 35 percent slopes	121	270C—Megonot-Tanna clay loams, 2 to 8 percent slopes	139
<i>Lonna Series</i>	122	367F—Megonot-Yawdim-Crago complex, 15 to 60 percent slopes	139
158C—Lonna-Floweree silt loams, 2 to 8 percent slopes	123	570D—Megonot-Kobase-Yawdim complex, 8 to 15 percent slopes	140
<i>Lothair Series</i>	124	589F—Megonot-Yawdim-Rock outcrop complex, 25 to 60 percent slopes	141
249D—Lothair-Marias complex, 4 to 15 percent slopes	124	M-W—Miscellaneous water	141
<i>Manhattan Series</i>	125	<i>Neldore Series</i>	141
<i>Marcott Series</i>	126	286F—Neldore-Bascovy-Rock outcrop complex, 25 to 60 percent slopes	142
241A—Marcott silty clay loam, 0 to 2 percent slopes	127	486F—Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes	143
<i>Marias Series</i>	127	<i>Nesda Series</i>	143
44B—Marias silty clay, 0 to 4 percent slopes	128	109B—Nesda, occasionally flooded-Riverwash complex, 0 to 4 percent slopes	144
50B—Marias-Nunemaker complex, 0 to 4 percent slopes	129	<i>Niart Series</i>	145
150B—Marias-Linnet silty clays, 0 to 4 percent slopes	129	115B—Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes	146
<i>Marmarth Series</i>	130	230B—Niart-Crago gravelly loams, 0 to 4 percent slopes	146
377C—Marmarth-Delpoint-Cabbart complex, 2 to 8 percent slopes	130	230C—Niart-Crago gravelly loams, 4 to 8 percent slopes	147
477C—Marmarth-Evanston-Delpoint complex, 2 to 15 percent slopes	131	330B—Niart gravelly loam, 0 to 4 percent slopes	147
<i>Marvan Series</i>	132	<i>Nishon Series</i>	148
45B—Marvan clay, 0 to 4 percent slopes	133	52A—Nishon silt loam, 0 to 2 percent slopes	149
145A—Marvan, wet-Nobe silty clays, 0 to 2 percent slopes	133	<i>Nobe Series</i>	149
540B—Marvan silty clay, wet, 0 to 4 percent slopes	134	<i>Nunemaker Series</i>	150
722C—Marvan, wet-Trudau complex, 0 to 8 percent slopes	134	250B—Nunemaker silty clay loam, 0 to 4 percent slopes	151

250C—Nunemaker silty clay loam, 4 to 8 percent slopes	152	623C—Rothiemay-Delpoint gravelly clay loams, 2 to 8 percent slopes	166
550C—Nunemaker-Marias complex, 4 to 8 percent slopes	152	623D—Rothiemay-Delpoint gravelly clay loams, 8 to 15 percent slopes	167
650C—Nunemaker-Ethridge silty clay loams, 4 to 8 percent slopes	153	630B—Rothiemay, calcareous-Niart gravelly clay loams, 0 to 4 percent slopes	167
<i>Pendroy Series</i>	153	630C—Rothiemay-Niart gravelly clay loams, 4 to 8 percent slopes	168
46A—Pendroy clay, 0 to 2 percent slopes	154	723B—Rothiemay-Niart gravelly clay loams, 0 to 4 percent slopes	168
800—Pits, gravel	154	<i>Roundor Series</i>	169
<i>Pylon Series</i>	154	<i>Ryell Series</i>	170
80B—Pylon silty clay loam, 0 to 4 percent slopes	155	111A—Ryell-Rivra complex, 0 to 2 percent slopes, occasionally flooded	171
<i>Raynesford Series</i>	156	207A—Ryell-Havre loams, 0 to 2 percent slopes, occasionally flooded	171
<i>Rentsac Series</i>	157	211A—Ryell-Rivra complex, 0 to 2 percent slopes, rarely flooded	172
<i>Richey Series</i>	157	<i>Saypo Series</i>	172
41B—Richey silty clay loam, 0 to 4 percent slopes	158	68A—Saypo clay loam, 0 to 2 percent slopes, rarely flooded	173
<i>Ridgelawn Series</i>	158	168A—Saypo-Truchot clay loams, 0 to 2 percent slopes, rarely flooded	174
308A—Ridgelawn-Nesda-Korchea complex, 0 to 2 percent slopes, occasionally flooded	159	268A—Saypo-Tetonview complex, 0 to 2 percent slopes, rarely flooded	174
500—Riverwash	160	368A—Saypo clay loam, saline, 0 to 2 percent slopes, rarely flooded	175
<i>Rivra Series</i>	160	468A—Saypo-Tetonview complex, saline, 0 to 2 percent slopes, rarely flooded	175
110B—Rivra, occasionally flooded-Riverwash complex, 0 to 4 percent slopes	161	823A—Saypo clay loam, sodic, 0 to 2 percent slopes, rarely flooded	176
<i>Rootel Series</i>	161	923B—Saypo-Niart clay loams, 0 to 4 percent slopes	176
177C—Rootel-Marmarth loams, 2 to 8 percent slopes	162	<i>Scobey Series</i>	177
277B—Rootel-Rentsac complex, 0 to 4 percent slopes	162	164B—Scobey-Kevin clay loams, 0 to 4 percent slopes	178
<i>Rothiemay Series</i>	163	263C—Scobey-Kevin clay loams, 4 to 8 percent slopes	178
23B—Rothiemay clay loam, 0 to 4 percent slopes	164	264B—Scobey-Acel complex, 0 to 4 percent slopes	179
123B—Rothiemay-Niart clay loams, 0 to 4 percent slopes	165		
223D—Rothiemay-Crago complex, 4 to 15 percent slopes	165		
523B—Rothiemay gravelly clay loam, 0 to 4 percent slopes	166		
523C—Rothiemay gravelly clay loam, 4 to 8 percent slopes	166		

364D—Scobey-Hillon clay loams, 2 to 15 percent slopes	179	356A—Truchot-Tetonview-Saypo complex, 0 to 2 percent slopes, rarely flooded	198
<i>Scravo Series</i>	180	<i>Trudau Series</i>	199
218B—Scravo gravelly loam, 0 to 4 percent slopes	181	222B—Trudau loam, 0 to 4 percent slopes	200
<i>Sebud Series</i>	181	<i>Twilight Series</i>	200
<i>Shambo Series</i>	182	181E—Twilight-Yetull-Rock outcrop complex, 8 to 25 percent slopes	201
384C—Shambo-Amor loams, 2 to 8 percent slopes	183	281C—Twilight-Chinook-Yetull complex, 2 to 8 percent slopes	202
384D—Shambo-Amor loams, 8 to 15 percent slopes	183	381C—Twilight-Rentsac complex, 2 to 8 percent slopes	202
<i>Shawmut Series</i>	184	700—Urban land	203
126B—Shawmut-Windham gravelly loams, 0 to 4 percent slopes	185	<i>Utica Series</i>	203
<i>Shedhorn Series</i>	185	128B—Utica-Windham very gravelly loams, 0 to 4 percent slopes	204
<i>Starley Series</i>	186	<i>Vanda Series</i>	204
291F—Starley-Rock outcrop-Rubble land complex, 25 to 70 percent slopes	187	160A—Vanda-Marvan clays, 0 to 2 percent slopes	205
<i>Straw Series</i>	187	<i>Varney Series</i>	206
<i>Tanna Series</i>	188	124B—Varney-Rothiemay clay loams, 0 to 4 percent slopes	207
82B—Tanna clay loam, 0 to 4 percent slopes	189	224B—Varney-Rothiemay gravelly clay loams, 0 to 4 percent slopes	207
<i>Telstad Series</i>	189	<i>Wabek Series</i>	208
162C—Telstad-Joplin loams, 4 to 8 percent slopes	190	W—Water	208
165B—Telstad-Joplin loams, 0 to 4 percent slopes	191	<i>Wayden Series</i>	208
<i>Teton Series</i>	191	187F—Wayden-Cabba-Winifred complex, 15 to 45 percent slopes	209
196E—Teton-Tibson-Cheadle complex, 4 to 35 percent slopes	192	<i>Whitore Series</i>	210
<i>Tetonview Series</i>	193	191F—Whitore-Starley stony loams, 15 to 45 percent slopes	211
55A—Tetonview loam, 0 to 2 percent slopes ...	194	596E—Whitore-Babb-Tibson complex, 8 to 45 percent slopes	211
119A—Tetonview-Birchfield complex, 0 to 2 percent slopes	195	693F—Whitore-Garlet-Starley stony loams, 15 to 60 percent slopes	212
<i>Tibson Series</i>	195	696E—Whitore-Teton-Tibson complex, 8 to 35 percent slopes	213
<i>Truchot Series</i>	196	<i>Windham Series</i>	213
56A—Truchot clay loam, 0 to 2 percent slopes	197	29B—Windham gravelly loam, 0 to 4 percent slopes	214
156A—Truchot-Saypo clay loams, 0 to 2 percent slopes, rarely flooded	198		

29C—Windham gravelly loam, 4 to 8 percent slopes	214	Crop Yield Estimates	13
<i>Winginaw Series</i>	215	Pasture and Hayland Management	13
102A—Winginaw-Birchfield mucky peats, 0 to 2 percent slopes	216	Land Capability Classification	14
202A—Winginaw-Dougcliff mucky peats, 0 to 2 percent slopes	216	Prime Farmland and Other Important Farmland	14
<i>Winifred Series</i>	217	Erosion Factors	16
285C—Winifred-Wayden-Cabba complex, 2 to 15 percent slopes	218	Windbreaks and Environmental Plantings	16
<i>Winspect Series</i>	218	Range	83
327E—Winspect-Beanlake cobbly loams, 15 to 35 percent slopes	219	Range Condition	84
<i>Yamacall Series</i>	220	Rangeland Management	84
151C—Yamacall-Delpoint loams, 2 to 8 percent slopes	221	Woodland Understory Vegetation	85
151D—Yamacall-Delpoint, loams, 8 to 15 percent slopes	221	Forest Land	127
<i>Yawdim Series</i>	222	Woodland Ordination System	127
189E—Yawdim-Delpoint-Rock outcrop complex, 8 to 35 percent slopes	223	Forest Land Management and Productivity	128
<i>Yetull Series</i>	223	Main Forest Access Road Limitations and Hazards	129
42C—Yetull loamy fine sand, 0 to 15 percent slopes	224	Recreation	139
References	225	Wildlife Habitat	167
Glossary	227	Elements of Wildlife Habitat	167
Part II		Kinds of Wildlife Habitat	167
How To Use This Soil Survey	i	Wildlife of the Teton and Pondera County Areas	168
Detailed Soil Map Unit Legend	iv	Engineering	171
Summary of Tables	ix	Building Site Development	171
Agronomy	9	Sanitary Facilities	172
Crops and Pasture	9	Waste Management	173
Cropland Limitations and Hazards	11	Construction Materials	174
		Water Management	175
		Soil Properties	285
		Engineering Index Properties	285
		Physical and Chemical Properties	286
		Water Features	288
		Soil Features	289
		References	443
		Glossary	445

Index to Taxonomic Units

Abor Series	26	Kevin Series	102
Absher Series	28	Kiev Series	104
Acel Series	30	Kobase Series	108
Adel Series	31	Korchea Series	111
Amor Series	35	Kremlin Series	113
Arrod Series	36	Lambeth Series	115
Assinniboine Series	37	Lardell Series	116
Attewan Series	38	Linnet Series	117
Babb Series	40	Linwell Series	119
Bascovy Series	43	Loberg Series	121
Beanlake Series	44	Lonna Series	122
Binna Series	48	Lothair Series	124
Birchfield Series	49	Manhattan Series	125
Burnette Series	51	Marcott Series	126
Bynum Series	51	Marias Series	127
Cabba Series	53	Marmarth Series	130
Cabbart Series	56	Marvan Series	132
Castner Series	58	McKenzie Series	135
Cheadle Series	59	Meadowcreek Series	136
Chinook Series	61	Megonot Series	137
Crago Series	64	Neldore Series	141
Creed Series	66	Nesda Series	143
Delpoint Series	68	Niart Series	145
Doby Series	74	Nishon Series	148
Dougcliff Series	75	Nobe Series	149
Ethridge Series	75	Nunemaker Series	150
Evanston Series	78	Pendroy Series	153
Fairfield Series	79	Pylon Series	154
Fairway Series	80	Raynesford Series	156
Fifer Series	82	Rentsac Series	157
Floweree Series	82	Richey Series	157
Gallatin Series	84	Ridgelawn Series	158
Garlet Series	85	Rivra Series	160
Gerdrum Series	87	Rootel Series	161
Hanson Series	89	Rothiemay Series	163
Harlake Series	91	Roundor Series	169
Havre Series	92	Ryell Series	170
Hillon Series	94	Saypo Series	172
Joplin Series	97	Scobey Series	177
Judith Series	98	Scravo Series	180

Sebud Series	181	Utica Series	203
Shambo Series	182	Vanda Series	204
Shawmut Series	184	Varney Series	206
Shedhorn Series	185	Wabek Series	208
Starley Series	186	Wayden Series	208
Straw Series	187	Whitore Series	210
Tanna Series	188	Windham Series	213
Telstad Series	189	Winginaw Series	215
Teton Series	191	Winifred Series	217
Tetonview Series	193	Winspect Series	218
Tibson Series	195	Yamacall Series	220
Truchot Series	196	Yawdim Series	222
Trudau Series	199	Yetull Series	223
Twilight Series	200		

Index to Map Units

3B—Lardell silty clay loam, 0 to 4 percent slopes	117	53B—Evanston loam, 0 to 4 percent slopes	79
7A—Havre loam, 0 to 2 percent slopes, rarely flooded	93	55A—Tetonview loam, 0 to 2 percent slopes	194
15B—Crago gravelly loam, 0 to 4 percent slopes	65	56A—Truchot clay loam, 0 to 2 percent slopes	197
15C—Crago gravelly loam, 4 to 8 percent slopes	65	58B—Floweree silt loam, 0 to 4 percent slopes	83
20B—Judith loam, 0 to 4 percent slopes	99	61F—Hillon clay loam, 15 to 60 percent slopes	95
22B—Kremlin loam, 0 to 4 percent slopes	114	68A—Saypo clay loam, 0 to 2 percent slopes, rarely flooded	173
23B—Rothiemay clay loam, 0 to 4 percent slopes	164	70B—Megonot silty clay loam, 0 to 4 percent slopes	138
29B—Windham gravelly loam, 0 to 4 percent slopes	214	80B—Pylon silty clay loam, 0 to 4 percent slopes	155
29C—Windham gravelly loam, 4 to 8 percent slopes	214	82B—Tanna clay loam, 0 to 4 percent slopes	189
31B—Acel silty clay loam, 0 to 4 percent slopes	31	102A—Winginaw-Birchfield mucky peats, 0 to 2 percent slopes	216
34C—Chinook fine sandy loam, 0 to 8 percent slopes	62	107A—Havre-Ryell loams, 0 to 2 percent slopes, rarely flooded	93
38A—McKenzie clay, 0 to 2 percent slopes	135	108A—Korchea-Ridgelawn loams, 0 to 2 percent slopes, rarely flooded	112
39B—Ethridge silty clay loam, 0 to 4 percent slopes	76	109B—Nesda, occasionally flooded-Riverwash complex, 0 to 4 percent slopes	144
40B—Kobase silty clay loam, 0 to 4 percent slopes	109	110B—Rivra, occasionally flooded-Riverwash complex, 0 to 4 percent slopes	161
40C—Kobase silty clay loam, 4 to 8 percent slopes	110	111A—Ryell-Rivra complex, 0 to 2 percent slopes, occasionally flooded	171
41B—Richey silty clay loam, 0 to 4 percent slopes	158	114A—Gerdrum-Absher clay loams, 0 to 2 percent slopes	88
42C—Yetull loamy fine sand, 0 to 15 percent slopes	224	115B—Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes	146
44B—Marias silty clay, 0 to 4 percent slopes	128	116B—Attewan fine sandy loam, 0 to 4 percent slopes	39
45B—Marvan clay, 0 to 4 percent slopes	133	117B—Kiev-Fairfield complex, 0 to 4 percent slopes	105
46A—Pendroy clay, 0 to 2 percent slopes	154	118B—Binna-Scravo complex, 0 to 4 percent slopes	49
46—Denied access	74		
50B—Marias-Nunemaker complex, 0 to 4 percent slopes	129		
52A—Nishon silt loam, 0 to 2 percent slopes	149		

119A—Tetonview-Birchfield complex, 0 to 2 percent slopes	195	160A—Vanda-Marvan clays, 0 to 2 percent slopes	205
120B—Judith-Kiev loams, 0 to 4 percent slopes	100	161F—Hillon-Yawdim complex, 15 to 45 percent slopes	95
120C—Judith-Kiev loams, 4 to 8 percent slopes	100	162C—Telstad-Joplin loams, 4 to 8 percent slopes	190
121B—Kiev-Judith gravelly loams, 0 to 4 percent slopes	105	163C—Kevin-Hillon clay loams, 2 to 8 percent slopes	103
123B—Rothiemay-Niart clay loams, 0 to 4 percent slopes	165	163D—Hillon-Kevin clay loams, 8 to 15 percent slopes	96
124B—Varney-Rothiemay clay loams, 0 to 4 percent slopes	207	164B—Scobey-Kevin clay loams, 0 to 4 percent slopes	178
125A—Fairway-Meadowcreek loams, 0 to 2 percent slopes, rarely flooded	81	165B—Telstad-Joplin loams, 0 to 4 percent slopes	191
126B—Shawmut-Windham gravelly loams, 0 to 4 percent slopes	185	168A—Saypo-Truchot clay loams, 0 to 2 percent slopes, rarely flooded	174
128B—Utica-Windham very gravelly loams, 0 to 4 percent slopes	204	169C—Bascovy-Neldore complex, 2 to 8 percent slopes	43
131B—Creed-Gerdrum complex, 0 to 4 percent slopes	67	170C—Abor-Yawdim silty clay loams, 4 to 15 percent slopes	27
132C—Assiniboine fine sandy loam, 0 to 8 percent slopes	38	170E—Abor-Yawdim silty clay loams, 15 to 35 percent slopes	28
137B—Creed-Absher complex, 0 to 4 percent slopes	67	173E—Cabbart-Delpoint loams, 15 to 35 percent slopes	57
145A—Marvan, wet-Nobe silty clays, 0 to 2 percent slopes	133	174D—Amor-Cabba loams, 2 to 15 percent slopes	36
147C—Linnet-Abor silty clays, 2 to 8 percent slopes	119	174E—Cabba-Amor loams, 15 to 35 percent slopes	54
148C—Megonot-Richey-Tanna clay loams, 2 to 8 percent slopes	138	176C—Delpoint-Cabbart loams, 2 to 15 percent slopes	69
150B—Marias-Linnet silty clays, 0 to 4 percent slopes	129	177C—Rootel-Marmarth loams, 2 to 8 percent slopes	162
151C—Yamacall-Delpoint loams, 2 to 8 percent slopes	221	179C—Linwell-Winifred clay loams, 2 to 15 percent slopes	120
151D—Yamacall-Delpoint, loams, 8 to 15 percent slopes	221	181E—Twilight-Yetull-Rock outcrop complex, 8 to 25 percent slopes	201
156A—Truchot-Saypo clay loams, 0 to 2 percent slopes, rarely flooded	198	184D—Kiev-Roundor loams, 2 to 15 percent slopes	106
158C—Lonna-Floweree silt loams, 2 to 8 percent slopes	123	187F—Wayden-Cabba-Winifred complex, 15 to 45 percent slopes	209

189E—Yawdim-Delpoint-Rock outcrop complex, 8 to 35 percent slopes	223	230B—Niart-Crago gravelly loams, 0 to 4 percent slopes	146
191F—Whitore-Starley stony loams, 15 to 45 percent slopes	211	230C—Niart-Crago gravelly loams, 4 to 8 percent slopes	147
193E—Loberg-Whitore-Garlet stony loams, 8 to 35 percent slopes	121	240B—Kobase-Marias complex, 0 to 4 percent slopes	110
194E—Bynum-Adel-Doby complex, 4 to 35 percent slopes	52	241A—Marcott silty clay loam, 0 to 2 percent slopes	127
195B—Hanson-Raynesford complex, 0 to 4 percent slopes	90	249D—Lothair-Marias complex, 4 to 15 percent slopes	124
196E—Teton-Tibson-Cheadle complex, 4 to 35 percent slopes	192	250B—Nunemaker silty clay loam, 0 to 4 percent slopes	151
197E—Adel-Doby-Hanson complex, 8 to 35 percent slopes	32	250C—Nunemaker silty clay loam, 4 to 8 percent slopes	152
198C—Adel-Gallatin-Shedhorn complex, 0 to 8 percent slopes	33	257E—Hillon-Lambeth complex, 15 to 35 percent slopes	97
202A—Winginaw-Dougcliff mucky peats, 0 to 2 percent slopes	216	263C—Scobey-Kevin clay loams, 4 to 8 percent slopes	178
207A—Ryell-Havre loams, 0 to 2 percent slopes, occasionally flooded	171	264B—Scobey-Acel complex, 0 to 4 percent slopes	179
208A—Korchea-Straw loams, 0 to 2 percent slopes, rarely flooded	112	268A—Saypo-Tetonview complex, 0 to 2 percent slopes, rarely flooded	174
211A—Ryell-Rivra complex, 0 to 2 percent slopes, rarely flooded	172	270C—Migonot-Tanna clay loams, 2 to 8 percent slopes	139
214A—Absher clay loam, wet, 0 to 2 percent slopes	29	271F—Cabba-Castner-Rock outcrop complex, 25 to 60 percent slopes	54
216C—Attewan-Wabek complex, 0 to 8 percent slopes	40	273F—Cabbart-Delpoint-Rock outcrop complex, 25 to 70 percent slopes	57
218B—Scravo gravelly loam, 0 to 4 percent slopes	181	277B—Rootel-Rentsac complex, 0 to 4 percent slopes	162
220B—Judith-Windham complex, 0 to 4 percent slopes	101	281C—Twilight-Chinook-Yetull complex, 2 to 8 percent slopes	202
220C—Judith-Windham complex, 4 to 8 percent slopes	101	284D—Kiev-Roundor gravelly loams, 2 to 15 percent slopes	106
222B—Trudau loam, 0 to 4 percent slopes	200	285C—Winifred-Wayden-Cabba complex, 2 to 15 percent slopes	218
223D—Rothiemay-Crago complex, 4 to 15 percent slopes	165	286F—Neldore-Bascovy-Rock outcrop complex, 25 to 60 percent slopes	142
224B—Varney-Rothiemay gravelly clay loams, 0 to 4 percent slopes	207		

291F—Starley-Rock outcrop-Rubble land complex, 25 to 70 percent slopes	187	394E—Adel-Burnette-Sebud complex, 4 to 35 percent slopes	34
294E—Adel-Burnette-Bynum complex, 4 to 35 percent slopes	34	400—Havre-Fairway loams, 0 to 4 percent slopes, rarely flooded	94
296E—Babb-Tibson-Adel complex, 4 to 35 percent slopes	41	403—Haploborolls-Argiborolls complex, 0 to 4 percent slopes, rarely flooded	90
308A—Ridgelawn-Nesda-Korchea complex, 0 to 2 percent slopes, occasionally flooded	159	406—Harlake clay loam, 0 to 4 percent slopes, rarely flooded	92
322B—Kremlin clay loam, 0 to 4 percent slopes	114	427C—Beanlake-Saypo-Winspect complex, 0 to 8 percent slopes	46
322C—Kremlin clay loam, 4 to 8 percent slopes	114	434B—Chinook-Kremlin complex, 0 to 4 percent slopes	63
327C—Beanlake-Winspect cobbly loams, 2 to 15 percent slopes	45	439B—Ethridge clay loam, 0 to 4 percent slopes	77
327E—Winspect-Beanlake cobbly loams, 15 to 35 percent slopes	219	458B—Floweree silty clay loam, 0 to 4 percent slopes	84
330B—Niart gravelly loam, 0 to 4 percent slopes	147	468A—Saypo-Tetonview complex, saline, 0 to 2 percent slopes, rarely flooded	175
334C—Chinook-Joplin complex, 2 to 8 percent slopes	62	474F—Cabba-Roundor-Windham complex, 25 to 60 percent slopes	55
356A—Truchot-Tetonview-Saypo complex, 0 to 2 percent slopes, rarely flooded	198	475F—Kiev-Roundor-Windham complex, 15 to 45 percent slopes	107
364D—Scobey-Hillon clay loams, 2 to 15 percent slopes	179	476D—Delpoint-Kremlin-Cabbart complex, 4 to 15 percent slopes	70
367F—Migonot-Yawdim-Crago complex, 15 to 60 percent slopes	139	477C—Marmarth-Evanston-Delpoint complex, 2 to 15 percent slopes	131
368A—Saypo clay loam, saline, 0 to 2 percent slopes, rarely flooded	175	486F—Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes	143
376F—Delpoint-Cabbart-Hillon complex, 25 to 60 percent slopes	69	493E—Garlet-Cheadle-Loberg stony loams, 8 to 45 percent slopes	86
377C—Marmarth-Delpoint-Cabbart complex, 2 to 8 percent slopes	130	495B—Hanson very cobbly loam, 0 to 4 percent slopes	90
381C—Twilight-Rentsac complex, 2 to 8 percent slopes	202	500—Riverwash	160
384C—Shambo-Amor loams, 2 to 8 percent slopes	183	522C—Kremlin-Delpoint clay loams, 2 to 8 percent slopes	115
384D—Shambo-Amor loams, 8 to 15 percent slopes	183	523B—Rothiemay gravelly clay loam, 0 to 4 percent slopes	166
390F—Cheadle-Doby-Rock outcrop complex, 15 to 60 percent slopes	60	523C—Rothiemay gravelly clay loam, 4 to 8 percent slopes	166
		527E—Beanlake-Cabba-Castner complex, 8 to 35 percent slopes	46

534D—Chinook-Twilight fine sandy loams, 2 to 15 percent slopes	63	650C—Nunemaker-Ethridge silty clay loams, 4 to 8 percent slopes	153
539B—Ethridge-Nunemaker silty clay loams, 0 to 4 percent slopes	77	676C—Delpoint-Rothiemay clay loams, 2 to 8 percent slopes	71
540B—Marvan silty clay, wet, 0 to 4 percent slopes	134	676D—Delpoint-Rothiemay clay loams, 8 to 15 percent slopes	72
541C—Kobase-Ethridge clay loams, 4 to 8 percent slopes	110	693F—Whitore-Garlet-Starley stony loams, 15 to 60 percent slopes	212
550C—Nunemaker-Marias complex, 4 to 8 percent slopes	152	696E—Whitore-Teton-Tibson complex, 8 to 35 percent slopes	213
570D—Mego not-Kobase-Yawdim complex, 8 to 15 percent slopes	140	700—Urban land	203
574E—Cabba-Wayden-Castner complex, 4 to 35 percent slopes	55	722C—Marvan, wet-Trudau complex, 0 to 8 percent slopes	134
576F—Delpoint-Cabbart-Crago complex, 15 to 60 percent slopes	71	723B—Rothiemay-Niart gravelly clay loams, 0 to 4 percent slopes	168
589F—Mego not-Yawdim-Rock outcrop complex, 25 to 60 percent slopes	141	727C—Beanlake-Manhattan-Winspect complex, 2 to 15 percent slopes	47
590E—Babb-Fifer-Cheadle complex, 8 to 45 percent slopes	42	776C—Delpoint-Cabbart-Rootel loams, 2 to 15 percent slopes	72
596E—Whitore-Babb-Tibson complex, 8 to 45 percent slopes	211	784C—Kiev-Winifred-Vanda complex, 0 to 15 percent slopes	107
620C—Judith-Windham cobbly loams, 0 to 8 percent slopes	102	800—Pits, gravel	154
623C—Rothiemay-Delpoint gravelly clay loams, 2 to 8 percent slopes	166	823A—Saypo clay loam, sodic, 0 to 2 percent slopes, rarely flooded	176
623D—Rothiemay-Delpoint gravelly clay loams, 8 to 15 percent slopes	167	876C—Delpoint-Kremlin-Vanda complex, 2 to 15 percent slopes	73
630B—Rothiemay, calcareous-Niart gravelly clay loams, 0 to 4 percent slopes	167	904F—Cheadle-Adel-Doby complex, 15 to 60 percent slopes	60
630C—Rothiemay-Niart gravelly clay loams, 4 to 8 percent slopes	168	923B—Saypo-Niart clay loams, 0 to 4 percent slopes	176
		M-W—Miscellaneous water	141
		W—Water	208

Summary of Tables

Temperature and precipitation	7
Freeze dates in spring and fall	10
Growing season	12

For tables with the most current data, please visit the
Soil Data Mart at <http://soildatamart.nrcs.usda.gov/>.

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 on 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 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 local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Dave White
State Conservationist
Natural Resources Conservation Service

Soil Survey of Choteau-Conrad Area; Parts of Teton and Pondera Counties, Montana

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United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
the Montana Agricultural Experiment Station

CHOTEAU-CONRAD AREA; PARTS OF TETON AND PONDERA COUNTIES is located in north-central Montana (fig. 1) along the eastern front of the northern Rocky Mountains. The survey area covers about 1,234,200 acres in Teton County and 782,000 acres in Pondera County, totaling 2,016,200 acres, or 3,150 square miles.

The survey area is bounded by the northern Rocky Mountains to the west; Toole County, Birch Creek, and the Marias River to the north; Cascade County and the Sun River to the south; and Chouteau County to the east. Most of the land is privately owned but does include about 149,000 acres in Teton County and 58,000 acres in Pondera County of state and federal lands. The survey area's main drainages are the Marias, Sun, and Teton Rivers and their tributaries.

The survey area includes all of the land within Teton and Pondera Counties except for the Lewis and Clark National Forest and the Blackfeet Indian Reservation. The Blackfeet Indian Reservation in northern Pondera County was included in the 1980 publication, "Soil Survey of Glacier County Area and Part of Pondera County, Montana."

This soil survey updates the surveys "Soils of Teton County," published in 1937, and "Soils of Pondera County," published in 1934. It provides additional information and has larger maps, showing the soils in greater detail.

General Nature of the Survey Area

This section describes some of the environmental and cultural features that affect the use and management of soils in the survey area. These

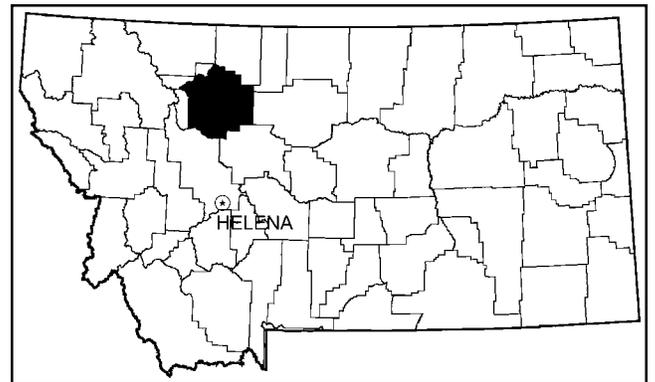


Figure 1.—Location of Choteau-Conrad Area; Parts of Teton and Pondera Counties, Montana

features are history; industry, transportation, and recreation; regional geology; natural resources; physiography and drainage; and climate.

History

In 1806, the Lewis and Clark Expedition traveled through the northwestern part of the survey area. During this time, the Blackfeet Indians were in possession of the area east of the Rocky Mountain Front. In 1867, Fort Shaw was established along the Sun River to protect the immigration of settlers. Soon afterward, cattle and other livestock were driven into the area.

In 1885, the present boundary of the Blackfeet Indian Reservation was established. In 1887, unreserved public lands were opened for settlement. However, not until after 1909, when the Homestead Act went into effect, did the area receive the greatest

influx of settlers. The present boundaries of Teton and Pondera Counties were established in 1919. Oil and gas fields were discovered in 1927. These counties have since developed into one of the most important oil-producing regions in Montana.

The Teton Soil Conservation District was established in 1947, and the Pondera Soil Conservation District was established in 1945. Soil surveys produced between 1947 and 1976 were primarily for conservation planning and were done on a farm-to-farm basis. In June 1976, the Choteau-Conrad Soil Survey Area; Parts of Teton and Pondera Counties was established.

Industry, Transportation, and Recreation

The economy of the area is based primarily on livestock and small-grain production. Large irrigation projects, such as Greenfield, Burton, and Sunnyslope Benches, and Birch Creek Area, greatly add to the overall grain and hay production. Petroleum is obtained from several oil fields; the largest is the Pondera Oil Field near Pendroy. Natural gas is obtained mainly from the Blackleaf Canyon area and the Pondera Oil Field. Timber production is mainly limited to posts, poles, and firewood. Gravelly material for roads is plentiful in the western part of the survey area but is not adequate in the eastern part.

A network of roads and railroads serves the survey area. Major paved roads are U.S. Highways 89 and 287; U.S. Interstate 15; and State Highways 221, 219, 216, and 408. The Burlington Northern Santa Fe Railroad has a main line and branch lines in the area. The main line goes through the communities of Power, Dutton, Brady, and Conrad, and branch lines extend to Fairfield and Choteau. Several community airports are located in the larger communities.

Many recreational activities exist in this survey area. Boating, cross-country skiing, fishing, golfing, hiking, hunting, mountain climbing, and snowmobiling are popular activities. Ponds, reservoirs, and streams provide exceptional boating, fishing, swimming, and water-skiing opportunities. Big game, such as bighorn sheep, black bear, elk, grizzly bear, mountain goat, mountain lion, mule deer, pronghorn antelope, and white-tailed deer, reside here. Upland game birds, including Hungarian partridge, ring-necked pheasant, and sharp-tailed grouse, along with waterfowl, such as duck, geese, and swan, inhabit the area.

Regional Geology

The survey area is underlain by a thick sequence of Cambrian- to Cretaceous-aged sedimentary rocks that range in age from 600-million to 65-million years. These rocks dip gently to the west and consist of both marine and terrestrial sediments. These sediments were deposited on ocean bottoms or coastal plains near the shorelines of ancient inland seas. These shorelines migrated back and forth across what is now central Montana.

The Rocky Mountains were formed during a time of compression and uplift in the early- to mid-Tertiary Period. The extensive folding and faulting, which accompanied the orogeny, uplifted older sediments and placed them in juxtaposition with the relatively flat-lying Cretaceous-aged sediments of the Great Plains. These older sediments lie in a series of closely spaced imbricated thrust blocks that dip steeply to the west.

Overlying the Cretaceous rocks are poorly consolidated, Tertiary-aged lake and streambed sediments; some of which stand out now as elevated terraces. Continental glaciation during the Quaternary Period alternately eroded and deposited large volumes of material on the plains. Thick deposits of glacial drift blanket the northeastern one-third of the survey area. Quaternary-aged alpine glaciers in the Rocky Mountains have deposited lobes of alpine glacial till at the base of the mountains in the western portion of the survey area. Paleozoic rocks are exposed in the Sawtooth Range. These Paleozoic rocks include Cambrian-, Devonian-, and Mississippian-aged sediments and consist primarily of carbonates, including limestone and dolomite, with subordinate amounts of sandstone, siltstone, and shale. These rocks are highly faulted and unconformably overlain by marine and nonmarine shale and sandstone of the Jurassic and lower-Cretaceous Periods.

Because of the complex geology and limited surface exposures, it is not always possible to directly correlate individual soil series with a particular formation. Starley and Whitore soils are typically formed from the Mississippian-aged Madison Limestone. Cheadle, Doby, and Fifer soils are derived from the sandstone and shale of the lower-Cretaceous Kootenai Formation.

The Cretaceous sediments in the Great Plains increase in age from west to east and are described

from oldest to youngest. The oldest exposed unit is the Colorado Group; it has been subdivided in this area to include the lower-Cretaceous Blackleaf Formation and the upper-Cretaceous Marias River Shale. Both consist of marine siltstone and shale with occasional sandstone beds. Salts in the Colorado Group and in portions of the Two Medicine Formation are leached by high ground water and are precipitated on the surface at saline seeps. Typical soils formed from this formation include the Abor, Bascovy, Mego not, Neldore, Tanna, and Yawdim series.

Directly overlying the Colorado Group is the Montana Group. This group consists of the Telegraph Creek Formation, the Virgelle Sandstone, and the Two Medicine Formation. The Telegraph Creek Formation is a sandy shale unit. It outcrops in a thin band west of the Colorado Group, acting as a transitional unit between the shales of the Colorado Group and the overlying Virgelle Sandstone. Typical soils formed from this formation include the Cabbart, Delpoint, and Yamacall series.

The Virgelle Sandstone is a permeable, cross-bedded sandstone that is used extensively as an aquifer. Its upper portion contains titaniferous magnetite and forms a prominent rimrock trending northwest to southeast in the southern portion of the survey area. Typical soils formed from this formation include the Rentsac, Rootel, and Twilight series.

The Two Medicine Formation, conformably overlying the Virgelle Sandstone, is a shaly unit containing sandstone and coal beds. Coal is locally abundant near the base of the formation. During deposition, the ancient shoreline was migrating back and forth across central Montana. The shale and sandstone deposited in a marine environment have a high sodium content, but it is not spread consistently throughout the formation. Typical soils formed from this formation include the Amor, Cabba, Wayden, and Winifred series.

The Two Medicine Formation contains a significant fossil location at Egg Mountain, where a complete nest of Hypsilophodontid eggs was found. Hypsilophodontids were 5-foot long, swift-running dinosaurs that lived in colonies and tended their nests. Lesser amounts of Troodon bones and eggs were also found at the Egg Mountain site. Troodons were a small, swift carnivorous dinosaur.

Small exposures of the Horsethief Sandstone and the Bearpaw Shale, a dark-gray marine shale, outcrop in the western edge of the plains, adjacent to the uplifted thrust belt. The Horsethief Sandstone is a cross-bedded sandstone that also contains deposits

of titaniferous magnetite. Neldore soils are closely associated with the Bearpaw Shale. However, there is no particular series associated with the small outcrops of the Horsethief Sandstone.

Overlying the lithified units are unconsolidated Tertiary- and Quaternary-aged sediments, including lake sediments consisting of fine-grained deposits that formed behind temporary ice dams. Typical soils associated with lakebed deposits include the Absher, Creed, Kobase, Marias, Marvan, and Nobe series.

Quaternary streambed deposits of coarse gravel are left as remnant terraces. These remnant terraces are up to 800 feet above the present valley floor. Soils typically associated with gravel terraces are the Crago, Fairfield, Judith, Niart, Rothiemay, Varney, and Windham series.

The continental glacial till in the northeastern portion of the survey area is closely associated with the Hillon, Kevin, Nunemaker, and Scobey series. Within the till are reworked glaciofluvial deposits closely associated with the Ethridge, Kobase, Kremlin, and Marias series. Soils typically associated with the glacial till in the western portion of the survey area include the Babb, Kiev, Tibson, and Winspect series.

Present drainages are filled with unconsolidated Quaternary-aged alluvium that is closely associated with the Binna, Havre, Korchea, Nesda, Ridgelawn, Rivra, Ryell, and Scravo series.

Natural Resources

Teton and Pondera Counties have produced significant quantities of oil and gas since deposits were discovered in the Sweetgrass Arch in the latter part of the 1920s (Perry, 1960). The Sweetgrass Arch is a gentle, north-plunging anticline 150-miles long and 60-miles wide that formed during the mid-Tertiary orogeny. The southwestern tip of the Northern District of the Montana Board of Oil and Gas Conservation extends into the survey area and consists of more than twenty separate oil and gas fields.

Outcrops of moderate to good quality, bituminous coal are widely distributed throughout the survey area, but the total volume is small. Small quantities have been excavated in the past, and some property owners mine small volumes for personal use. However, the deposits have not proven to be economically valuable, at least for present market conditions. The region was originally believed to contain significant economically recoverable coal deposits because of its similarity to other major coal-producing areas of Montana. However, in this area,

the beds are thinner and contain significant clay partings that limit the use of mechanized mining and separation.

There are no major mineral mining districts within the survey area, as there are in Lewis and Clark County to the southwest. However, small volumes of titanium, iron, and zircon have been produced from the titaniferous magnetite bed in the upper Virgelle Sandstone of Section 18, Township 25 North, Range 5 West.

Much of the ground water that has been developed within the survey area has been produced from unconsolidated Tertiary and Quaternary alluvial deposits (Noble and others, 1982). These sources consist of gravel terraces, old lakebeds, and alluvial fans and can produce significant quantities of good quality water. Recharge is a function of precipitation infiltration. In some areas, recharge is heavily dependent on canal seepage loss during the irrigation season. Alluvium typically yields more water to wells than other types of aquifers. However, aquifers that are formed in alluvium are susceptible to contamination and overuse. Pesticides have been found in some wells in Teton County, although the concentrations were generally below the health-advisory levels proposed by the Environmental Protection Agency for drinking water.

The bedrock ground water regime can generally be divided along a north-south line near the center of the survey area at the outcrop of the Virgelle Sandstone. The rocks to the west of this outcrop lie stratigraphically above the Virgelle Sandstone; therefore wells can be drilled through the overlying formations to intersect it. The Virgelle Sandstone is the primary aquifer in the northwestern Great Plains and contains water of good to moderate quality. Dissolved solids are generally in the range of 1,000mg/L. Wells yielding up to 250 gpm have been developed in the Virgelle Sandstone, although they generally average less than 50 gpm. The Colorado Group lies to the east of the surface exposure of the Virgelle Sandstone. This marine shale is over 2,500-feet thick and contains small volumes of highly mineralized water. Some water has been developed from sandy units within the Colorado Group, but, in general, the water is not suitable for domestic or stock use.

Physiography and Drainage

Teton and Pondera Counties overlie parts of two physiographic provinces, the Rocky Mountain Province and the Great Plains Province, which are separated by a 1- to 2-mile wide transitional zone of

foothills. The Sawtooth Range is the easternmost range in the Rocky Mountain Province and lies at the western margin of the survey area. It is composed of a mountainous, northwestern-trending belt approximately 3-miles wide, with narrow, linear valleys and high peaks. The survey area begins at the transitional foothills and does not include the high peaks of the Sawtooth Range.

The plains and rolling hills to the east of the Sawtooth Range are included within the Great Plains Province and can be further divided into glaciated and unglaciated regions of the Missouri Plateau. The boundary between the two regions is irregular and trends northwest to southeast in the eastern third of the survey area. The glaciated area is to the northeast.

Surface elevations range from 8,875 feet at Mount Wright to 3,200 feet at the eastern border. The Sawtooth Range contains numerous peaks ranging from 7,500 to 8,500 feet. The Sawtooth Range extends from the Continental Divide at the border of Pondera and Flathead Counties to the foothills 3 miles to the east. The transitional foothills have an average elevation of 5,000 feet. The plains slope gently to the east to a minimum elevation of 3,200 feet.

The survey area is bounded on the north by the Marias River, bounded on the south by the Sun River, and bisected by the Teton River. All three rivers flow to the east where they eventually join the Missouri River. They all have tributaries within Teton and Pondera Counties.

Numerous short tributaries in the Sawtooth Range flow south into the Sun River. Below the Sawtooth Range, there are few drainages entering the river. Water is diverted into a system of canals, including the USRS, Floweree, and Greenfield. The two major dams on the Sun River are Gibson Dam, west of the survey area in the Sawtooth Range, and Diversion Dam, which diverts water into Pishkun Reservoir. These are the only dams on the three major rivers in the survey area. However, many small dams and diversion structures have been constructed on the tributaries of the major rivers.

The Teton River and its tributaries drain the central portion of the survey area. The Teton River drainage includes Willow and Deep Creeks, flowing from the south, and Blackleaf and Muddy Creeks, flowing from the north. Water is diverted from the Teton River to feed the Bynum, Eureka, and Harvey Reservoirs. The Teton River drainage contains two swamps, Blackleaf and Pine Butte, immediately adjacent to the foothills. Muddy Creek drains Blackleaf Swamp, north of the Teton River. McDonald Creek and the North Fork of

Willow Creek drain Pine Butte Swamp, south of the Teton River.

The Marias River drains the northern half of the survey area, including most of Pondera County. Its major tributaries include Badger and Two Medicine Creeks at the western end, Birch and Dupuyer Creeks in the central portion, and the Dry Fork of the Marias River at the northeastern end. Pondera Coulee and Spring Creek flow east toward the Marias River in the eastern portion of the area. Near the western edge of the survey area, Swift Dam was constructed on Birch Creek. Water is diverted from Birch and Dupuyer Creeks to form Lake Francis.

Climate

Summers in the survey area are pleasant, with cool nights; moderately warm, sunny days; and little hot or humid weather. Most summer rainfall occurs as showers or thunderstorms, but steady rains may occur during late spring or early summer. Temperatures rarely reach a high of 100 degrees F. An average year will have only 15 days with maximums of 90 degrees F or higher. Weather stations in the area show freezing temperatures do not occur in July or August, rarely in June, and only a few days in May or September. During April and October, frost often occurs along the mountain fronts and in valleys.

Winters are not as cold as expected for continental locations at this latitude, mainly because of Chinook winds for which the survey area is noted. Normally, subzero weather only occurs several times during winter; the coldest weather seldom lasts more than a few days at a time. Cold temperatures cease when Chinook winds arrive from the southwest. These winds can produce sharp temperature rises of 40 degrees F or more in a 24-hour period. Because of recurring Chinook winds throughout the winter season, snow seldom accumulates to any great depth. The ground is generally bare, or nearly bare, of snow during most of the winter, except in the mountain fronts and higher foothills. Invasions of cold air from the polar regions occur a few times each winter. From mid-December to March, sharp temperature falls are observed, from above freezing to below zero, within a 24-hour period.

On the following pages are climate tables for the period 1961 to 1990 for the survey area. The "Temperature and Precipitation" table gives data for the survey area as recorded at Blackleaf, Choteau Airport, Conrad, Fairfield, and Valier. The "Freeze Dates in Spring and Fall" table shows probable dates of the first freeze in fall and the last freeze in spring.

The "Growing Season" table provides data on probable length of the growing season.

Growing-degree days, as shown in the "Temperature and Precipitation" table, 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 growing-degree accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

In areas having wide variations in elevation and irregular topographic features, differences in the amount of precipitation are considerable. Generally, precipitation falls as snow during late fall, winter, and early spring. Rain can occur in any month. Late-spring, summer, and early-fall precipitation is usually rain, but hail occasionally occurs during summer thunderstorms. The wettest areas are along the mountains.

Although the survey area's mean annual precipitation would normally classify the area as semiarid, it is important to note that about 70 percent of the annual total precipitation normally falls during the April to September growing season. The combination of ideal temperatures during the peak of the growing season, long hours of summer sunshine, and nearly 10 inches of precipitation during the 6 critical months, makes the climate favorable for dryland farming. Heavy fog seldom occurs. Average wind speed is relatively high, but winds over 70 mph seldom occur. Visibility is normally excellent.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. This 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 survey area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, soil scientists develop a concept, or model, of how the soils were formed. During mapping, this model enables 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, 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 data from these analyses and tests as well as field-observed characteristics and 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 for crop yields under high levels of management are modeled and validated with farm records and field or plot information 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, 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.

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 result from 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.

Temperature and Precipitation

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

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have—		Average Number of Growing Degree Days*	Average	2 years in 10 Will Have—		Average Number of Days With 0.10 or More	Average Total Snowfall
				Maximum Temperature More Than	Minimum Temperature Less Than			Less Than	More Than		
BLACKLEAF:											
January----	33.2	8.6	20.9	61	-31	16	0.54	0.20	0.82	2	9.6
February---	38.1	13.5	25.8	65	-26	19	0.53	0.16	0.82	1	8.3
March-----	42.2	18.4	30.3	66	-19	25	0.73	0.31	1.08	2	8.4
April-----	52.9	27.5	40.2	78	2	108	1.21	0.34	1.99	3	7.5
May-----	62.0	36.0	49.0	83	18	280	2.46	1.21	3.54	5	1.5
June-----	71.1	43.6	57.4	90	25	505	2.41	0.99	3.61	5	0.1
July-----	79.1	47.1	63.1	94	34	694	1.35	0.46	2.09	3	0.0
August-----	78.5	45.8	62.1	95	31	677	1.71	0.51	2.69	4	0.0
September--	67.8	37.6	52.7	90	19	381	1.24	0.33	1.96	3	1.3
October----	58.7	29.7	44.2	81	2	189	0.55	0.16	0.86	1	2.5
November---	43.3	19.1	31.2	70	-17	37	0.44	0.15	0.71	1	6.8
December---	34.3	10.3	22.3	61	-31	13	0.57	0.19	0.88	2	9.6
Yearly:											
Average----	55.1	28.1	41.6	—	—	—	—	—	—	—	—
Extreme-----	102.0	-42.0	—	97	-36	—	—	—	—	—	—
Total-----	—	—	—	—	—	2,944	13.73	9.32	16.78	32	55.6
Average number of days per year with at least 1 inch of snow on the ground--34											
CHOTEAU AIRPORT:											
January----	33.3	11.8	22.6	61	-28	21	0.29	0.08	0.47	0	7.3
February---	39.6	17.1	28.3	65	-19	30	0.22	0.07	0.36	0	5.4
March-----	45.4	22.3	33.8	69	-12	54	0.38	0.13	0.59	1	6.9
April-----	56.0	30.9	43.5	80	8	172	0.80	0.27	1.28	2	5.8
May-----	65.7	39.9	52.8	86	25	401	1.99	0.84	2.96	4	1.0
June-----	74.5	47.9	61.2	93	34	634	2.18	0.95	3.24	4	0.0
July-----	82.4	52.1	67.2	96	41	842	1.31	0.47	2.01	3	0.0
August-----	81.3	50.8	66.0	97	37	807	1.34	0.52	2.11	3	0.0
September--	70.3	42.5	56.4	91	25	503	1.02	0.23	1.65	2	1.4
October----	60.9	35.2	48.0	83	10	287	0.42	0.11	0.73	1	2.3
November---	44.2	23.3	33.8	70	-12	63	0.33	0.07	0.59	0	6.2
December---	35.1	14.9	25.0	61	-26	21	0.36	0.13	0.55	1	7.2
Yearly:											
Average----	57.4	32.4	44.9	—	—	—	—	—	—	—	—
Extreme-----	103.0	-43.0	—	98	-32	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,833	10.65	7.67	13.31	21	43.2
Average number of days per year with at least 1 inch of snow on the ground--45											

See footnote at end of table.

Temperature and Precipitation--Continued

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have--		Average Number of Growing Degree Days*	Average	2 years in 10 Will Have--		Average Number of Days With 0.10 or More	Average Total Snowfall
				Maximum Temperature More Than	Minimum Temperature Less Than			Less Than	More Than		
CONRAD:											
January----	31.2	6.6	18.9	60	-30	10	0.51	0.17	0.78	1	8.1
February---	38.1	12.7	25.4	65	-23	13	0.32	0.10	0.50	1	4.2
March-----	45.0	18.9	31.9	70	-17	35	0.67	0.21	1.08	2	6.2
April-----	56.9	28.0	42.5	81	4	148	0.96	0.35	1.58	3	5.1
May-----	66.8	37.8	52.3	88	21	387	2.11	1.13	2.97	5	0.3
June-----	74.8	45.8	60.3	93	31	607	2.24	1.03	3.28	5	0.1
July-----	81.9	49.3	65.6	96	36	794	1.23	0.39	1.92	3	0.0
August-----	81.4	48.1	64.7	98	35	759	1.39	0.48	2.14	3	0.0
September--	70.6	38.9	54.7	92	22	450	1.07	0.29	1.76	2	0.5
October----	61.0	30.1	45.6	84	4	225	0.47	0.11	0.79	1	1.4
November---	43.8	17.7	30.8	70	-16	36	0.45	0.17	0.75	1	5.0
December---	33.4	9.1	21.3	61	-33	9	0.49	0.16	0.77	2	6.9
Yearly:											
Average----	57.1	28.6	42.8	—	—	—	—	—	—	—	—
Extreme----	105.0	-46.0	—	99	-36	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,472	11.91	8.11	15.17	29	37.8
Average number of days per year with at least 1 inch of snow on the ground--9											
FAIRFIELD:											
January----	32.3	11.6	22.0	59	-27	16	0.45	0.15	0.72	1	8.6
February---	39.6	16.8	28.2	64	-20	25	0.28	0.09	0.43	0	5.8
March-----	46.0	21.8	33.9	69	-13	52	0.66	0.31	0.95	2	9.6
April-----	56.5	30.3	43.4	80	8	170	1.05	0.29	1.66	3	6.9
May-----	65.8	39.3	52.5	86	24	394	2.38	1.17	3.44	5	1.3
June-----	73.9	47.0	60.5	92	33	613	2.23	0.98	3.30	4	0.2
July-----	81.3	51.0	66.1	94	40	809	1.39	0.49	2.21	3	0.0
August-----	80.9	50.2	65.6	96	37	792	1.53	0.55	2.43	3	0.0
September--	70.8	41.9	56.4	91	25	496	1.22	0.38	1.91	3	1.9
October----	61.1	34.8	47.9	83	10	285	0.53	0.20	0.95	1	1.9
November---	44.3	23.1	33.7	68	-11	62	0.36	0.14	0.59	1	6.7
December---	34.3	14.1	24.2	59	-28	17	0.41	0.18	0.60	1	8.5
Yearly:											
Average----	57.2	31.8	44.5	—	—	—	—	—	—	—	—
Extreme----	103.0	-44.0	—	97	-32	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,733	12.48	9.38	15.35	27	51.5
Average number of days per year with at least 1 inch of snow on the ground--54											

See footnote at end of table.

Temperature and Precipitation--Continued

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have--		Average Number of Growing Degree Days*	Average	2 years in 10 Will Have--		Average Number of Days With 0.10 or More	Average Total Snowfall
				Maximum Temperature More Than	Minimum Temperature Less Than			Less Than	More Than		
VALIER:											
January----	30.8	9.2	20.0	58	-28	13	0.38	0.14	0.58	1	6.5
February---	37.2	14.3	25.8	63	-23	16	0.28	0.11	0.41	0	4.1
March-----	43.3	20.0	31.7	66	-16	33	0.53	0.16	0.82	1	4.8
April-----	54.9	29.2	42.0	79	6	142	0.89	0.33	1.46	2	4.7
May-----	64.8	38.7	51.7	85	22	370	2.18	1.07	3.15	4	0.5
June-----	73.3	46.6	59.9	91	33	598	2.48	1.09	3.67	5	0.0
July-----	80.6	50.7	65.6	95	39	793	1.42	0.39	2.24	3	0.0
August-----	80.0	49.7	64.9	95	37	771	1.60	0.52	2.49	3	0.0
September--	69.3	41.0	55.1	90	24	460	1.20	0.30	1.91	3	0.5
October----	59.7	33.5	46.6	81	8	251	0.49	0.20	0.80	1	0.9
November---	42.5	21.2	31.9	68	-13	44	0.36	0.13	0.56	1	4.3
December---	32.7	12.1	22.4	59	-28	12	0.36	0.14	0.54	1	5.6
Yearly:											
Average----	55.8	30.5	43.1	—	—	—	—	—	—	—	—
Extreme----	103.0	-42.0	—	97	-33	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,504	12.17	8.90	15.21	25	31.7
Average number of days per year with at least 1 inch of snow on the ground--49											

* 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 1961-1990 at Blackleaf, Choteau Airport, Conrad, Fairfield, and Valier)

Probability	Temperature		
	24 Degrees F or Lower	28 Degrees F or Lower	32 Degrees F or Lower
BLACKLEAF:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 15	June 8	June 28
2 years in 10 later than-----	May 10	June 1	June 21
5 years in 10 later than-----	April 30	May 19	June 6
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 10	September 2	August 21
2 years in 10 earlier than-----	September 16	September 7	August 26
5 years in 10 earlier than-----	September 27	September 15	September 4
CHOTEAU AIRPORT			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 6	May 15	June 1
2 years in 10 later than-----	May 1	May 10	May 27
5 years in 10 later than-----	April 21	May 2	May 18
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 25	September 13	September 5
2 years in 10 earlier than-----	October 1	September 19	September 10
5 years in 10 earlier than-----	October 12	October 1	September 19

Freeze Dates in Spring and Fall--Continued

Probability	Temperature		
	24 Degrees F or Lower	28 Degrees F or Lower	32 Degrees F or Lower
CONRAD:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 11	May 24	June 13
2 years in 10 later than-----	May 6	May 20	June 7
5 years in 10 later than-----	April 28	May 13	May 28
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 17	September 6	August 27
2 years in 10 earlier than-----	September 22	September 11	September 1
5 years in 10 earlier than-----	October 2	September 21	September 11
FAIRFIELD:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 6	May 16	June 2
2 years in 10 later than-----	May 1	May 12	May 29
5 years in 10 later than-----	April 21	May 3	May 20
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 24	September 13	September 2
2 years in 10 earlier than-----	October 1	September 20	September 8
5 years in 10 earlier than-----	October 13	October 2	September 19
VALIER:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 7	May 14	June 2
2 years in 10 later than-----	May 2	May 11	May 29
5 years in 10 later than-----	April 23	May 5	May 20
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 21	September 12	September 2
2 years in 10 earlier than-----	September 27	September 17	September 7
5 years in 10 earlier than-----	October 9	September 28	September 17

Growing Season

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

Probability	Daily Minimum Temperature		
	Higher Than 24 Degrees F	Higher Than 28 Degrees F	Higher Than 32 Degrees F
	<i>Days</i>	<i>Days</i>	<i>Days</i>
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

Growing Season--Continued

Probability	Daily Minimum Temperature		
	Higher Than 24 Degrees F	Higher Than 28 Degrees F	Higher Than 32 Degrees F
	<i>Days</i>	<i>Days</i>	<i>Days</i>
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 tables, "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," at the end of this section show the classification and extent of the soils in this survey area.

Formation of the Soils

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

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

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

Climate

Temperature and precipitation mainly determine climate, an active force in the formation of soils, although wind has some influence. Soils form in rocks that have been broken into suitable materials by erosion and alternate freezing and thawing. Chemical reactions, such as solution and hydration, further break down this weathered material.

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 that have warm

temperatures and low precipitation generally contain less organic matter and are light colored.

In this survey area, the annual precipitation ranges from about 10 to 24 inches.

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, and changes in porosity and structure.

Organic matter is the main source of the dark color of the surface layer. However, some soils, such as those in the Winifred series, get their dark color from dark minerals as well as from organic matter. Roots, rodents, and insects penetrate the soil and alter its structure. Microorganisms, chemicals in the soil, and insects change leaves, roots, and entire plants that remain in the surface layer to humus. Among the earliest inhabitants of rock material, fungi and algae contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common burrowing animals in the area are badger, ground squirrel, mice, and rabbit.

Vegetation in the survey area ranges from short grasses, mid grasses, and shrubs in most areas to Douglas-fir, lodgepole pine, and quaking aspen in the foothills and mountainous areas.

Topography

Topography, or relief, is determined by glaciation and mountain formation and by the age and resistance of geologic formations to erosion by wind and water. Topography influences soil development through its effect on drainage and runoff. On eroded uplands in the survey area, runoff water has carved deep valleys into the bedrock formations. The rugged relief contrasts sharply with the nearly level relief of the terraces and flood plains of the river valleys. On uplands, the number and distinctness of soil horizons generally decrease as the slope increases. Exceptions to this are the soils of the Burnette and

Loberg series that formed on steep mountainsides. Soils on steep slopes that have rapid runoff have many characteristics similar to those of soils formed in arid climates. Level soils that receive runoff water from overlying areas have many of the characteristics of soils that formed in humid climates. Examples of this pattern are the shallow Cabbart soils that have steep slopes and the deep Tetonview soils in subirrigated depressions. Cabbart soils have thin, light-colored A horizons, and Tetonview soils have thick, dark-colored A horizons.

The topography of the survey area closely affects the local microclimate. The amount of precipitation and air temperatures can have wide variations within short distances.

In the mountains, generally, depth to bedrock, amount of rock fragments, and number and distinctness of soil horizons are affected by steepness and shape of slope. Soils on steep convex slopes generally have a greater amount of rock fragments, are shallower to bedrock, and have fewer and less distinct soil horizons. In the valleys, the number and distinctness of soil horizons generally decrease as the slope increases.

Parent Material

About 45 percent of the soils in the survey area formed in glacial till or in glacial outwash material. Some of the soils formed in alluvium derived from mixed sources, and other soils formed in material that weathered from limestone, mudstone, sandstone, shale, or siltstone. Soils, such as the Twilight series, that formed in soft sandstone are generally sandy. Soils, such as the Rentsac series, that formed over hard rock are generally loamy and have a high content of rock fragments. Soils, such as the Cabbart and the Delpoint series, that formed in soft shale or siltstone are generally loamy. Soils, such as the Bascovy and the Neldore series, that formed in clay shale are generally clayey. Soils that formed in alluvium range from sandy, such as the Ryell series, to loamy, such as the Havre series, to extremely gravelly, such as the Rivra series.

Time

Change taking place in soils over a long period is called soil genesis. As a result of these changes, distinct horizons, or layers, develop in the soils. 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 kind and arrangement of

these horizons are called soil morphology. These layers are described in terms of chemistry, color, consistence, permeability, structure, texture, and thickness.

Soils are classified according to their approximate age, from young to mature. Age, or maturity, of a soil is generally indicated by the thickness and distinctness of subsurface horizons, content of organic matter and clay, depth to which soluble material is leached, and form and distribution of calcium carbonate and gypsum in the soil.

Havre loam, a soil of the Entisol order, is a young soil on a flood plain adjacent to a flowing stream. This soil contains little organic matter with which to form an A horizon and no clay accumulation. Little translocation of carbonates has occurred to form Bk horizons.

Evanston soil formed in parent material similar to, but much older than, that of the Havre soil. Evanston soil formed in alluvium on uplands and is a mature soil of the Mollisol order. It contains enough organic matter to have a dark A horizon. Also, it has a distinct clay accumulation in a Bt horizon, and nearly all of the carbonates have been leached from the solum.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1975 and 1987). 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 table, "Classification of the Soils," shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol, from *mollis*, meaning soft.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning northern, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature

regimes; type of saturation; 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 Calciborolls (*Calci*, meaning lime, plus *boroll*, the suborder of the Mollisols that are cool).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup 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 taxonomic class. 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 Calciborolls.

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, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed Typic Calciborolls.

SERIES. The series consists of soils within a family that have horizons similar in arrangement in the profile, color, consistence, mineral and chemical composition, reaction, structure, and texture. An example is the Kiev series. The soils in the Kiev series are fine-loamy, mixed Typic Calciborolls.

Soil Series and Detailed Soil Map Units

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

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1975). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units delineated on the detailed soil maps in 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.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class, there are precisely defined limits for the properties of the soils. On the landscape, however, the soils 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, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are

called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. 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. The contrasting components are mentioned in the map unit descriptions. 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 of 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 landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, 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, all of 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, slope, stoniness, salinity, 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, Kobase silty clay loam, 0 to 4 percent slopes, is a phase of the Kobase 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.

This survey includes *complexes*. They consist 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. Kobase-Marias complex, 0 to 4 percent slopes, is an example.

This survey includes *miscellaneous areas*. They have little or no soil material and support little or no vegetation. Pits, gravel, is an example.

The "Acreage and Proportionate Extent of the Soils" table 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. Many of the terms used in describing the soils or miscellaneous areas are defined in the "Glossary."

Abor Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Hills and sedimentary plains

Parent material: Residuum from semiconsolidated shale

Slope range: 2 to 35 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
Leptic Udic Haplusterts

Typical Pedon

Abor silty clay, in an area of Linnet-Abor silty clays, 2 to 8 percent slopes, in an area of nonirrigated cropland, 2,400 feet north and 850 feet east of the southwest corner of sec. 2, T. 23 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong

fine and medium granular structure; hard, friable, very sticky, moderately plastic; common fine roots; common fine pores; slightly effervescent in spots; slightly alkaline; clear smooth boundary.

Bss—5 to 14 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, very sticky, moderately plastic; common fine roots; common very fine and fine tubular pores; few faint shiny grooved slickensides that intersect at a 30 to 60 degree angle; strongly effervescent; slightly alkaline; clear smooth boundary.

Bssk—14 to 26 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; extremely hard, firm, very sticky, moderately plastic; common very fine roots; few fine tubular pores; common faint shiny grooved slickensides that intersect at a 30 to 60 degree angle; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—26 to 30 inches; mixed grayish brown (2.5Y 5/2) and olive gray (5Y 4/2) clay, dark grayish brown (2.5Y 4/2) and olive gray (5Y 4/2) moist; few fine yellowish brown (10YR 5/4) rust mottles; massive; extremely hard, firm, very sticky, moderately plastic; few very fine roots; few very fine tubular pores; 50 percent hard, weathered shale fragments; few fine soft masses of lime; common fine soft threads of gypsum crystals; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cr1—30 to 38 inches; olive gray (5Y 5/2) semiconsolidated platy shale, olive gray (5Y 5/2) moist; few fine soft masses of gypsum crystals between shale fragments; slightly effervescent between shale fragments; neutral; gradual wavy boundary.

Cr2—38 to 60 inches; olive (5Y 5/3) semiconsolidated shale; slightly acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F; summer temperatures of 60 to 72 degrees F

Depth to the Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

Other features: These soils have cracks that 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. Some pedons have a Bssky horizon.

Ap horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4 (The 1 chroma are inherent from the parent material.)
 Texture: Silty clay or silty clay loam
 Clay content: 35 to 55 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

Bss horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: Silty clay, silty clay loam, or clay
 Clay content: 35 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Slickensides: Few to common
 Reaction: pH 7.4 to 9.0

Bssk horizon

Hue: 2.5YR, 10YR, 2.5Y, or 5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 1 to 4
 Texture: Silty clay, silty clay loam, clay loam, or clay
 Clay content: 35 to 60 percent
 Slickensides: Few to common
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

Bky horizon

Hue: 2.5YR, 10YR, 2.5Y, or 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: Silty clay, silty clay loam, or clay
 Clay content: 35 to 60 percent
 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

170C—Abor-Yawdim silty clay loams, 4 to 15 percent slopes

Setting

Landform:

- Yawdim—Hills
- Abor—Hills

Position on landform:

- Abor—Foothslopes and toeslopes
- Yawdim—Backslopes and shoulders

Slope:

- Abor—4 to 15 percent
- Yawdim—4 to 15 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Abor and similar soils: 50 percent

Yawdim and similar soils: 35 percent

Minor Components

Kobase and similar soils: 0 to 4 percent

Tanna and similar soils: 0 to 3 percent

Bascovy and similar soils: 0 to 2 percent

Linnet and similar soils: 0 to 2 percent

Marvan and similar soils: 0 to 2 percent

Neldore and similar soils: 0 to 2 percent

Major Component Description

Abor

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 4.7 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded shale and siltstone 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.

170E—Abor-Yawdim silty clay loams, 15 to 35 percent slopes

Setting

Landform:

- Abor—Hills
- Yawdim—Hills

Position on landform:

- Abor—Backslopes and footslopes
- Yawdim—Backslopes and shoulders

Slope:

- Abor—15 to 35 percent
- Yawdim—15 to 35 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Abor and similar soils: 45 percent

Yawdim and similar soils: 40 percent

Minor Components

Tanna and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 4 percent

Neldore and similar soils: 0 to 4 percent

Linnet and similar soils: 0 to 2 percent

Major Component Description

Abor

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 4.7 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded shale and siltstone 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.

Absher Series

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Absher clay loam, in an area of Gerdrum-Absher clay loams, 0 to 2 percent slopes, in an area of rangeland, 1,500 feet north and 2,300 feet east of the southwest corner of sec. 5, T. 23 N., R. 2 W.

E—0 to 2 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to moderate fine granular; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; common vesicular pores; many unstained silt and sand grains; slightly alkaline; abrupt smooth boundary.

Btn1—2 to 4 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium columnar structure parting to moderate medium subangular blocky; extremely hard, very firm, moderately sticky, moderately plastic; common very fine and fine roots; few very fine tubular pores; light grayish brown (10YR 6/2) coats of unstained sand and silt grains on tops of columns; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Btn2—4 to 9 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate fine blocky; extremely hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine tubular pores; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Btknyz—9 to 14 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist;

strong medium prismatic structure parting to moderate fine blocky; extremely hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine tubular pores; few faint clay films on faces of peds; few fine soft masses of lime; common fine soft seams and masses of gypsum and salt crystals; moderately alkaline; clear smooth boundary.

Bknyz1—14 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine pores; common fine soft masses of lime; many fine soft seams and masses of gypsum and salt crystals; strongly alkaline; gradual wavy boundary.

Bknyz2—36 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; common fine soft masses of lime; common fine soft threads of gypsum and salt crystals; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F; summer temperatures of 60 to 68 degrees F

Depth to the Btknyz horizon: 6 to 20 inches; mainly 8 to 15 inches.

Phases: Wet

E horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 6 or 7 dry; 3 to 5 moist
Chroma: 1 to 3

Texture: Clay loam mixed to 7 inches
(uncultivated areas have a thin A horizon that is a loam or silt loam)

Clay content: 27 to 40 percent
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Electrical conductivity: 4 to 8 mmhos/cm
Reaction: pH 6.6 to 8.4

Btn horizons

Hue: 2.5Y, 10YR, or 7.5YR
Value: 4 to 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Silty clay, clay, or clay loam
Clay content: 35 to 60 percent
Structure: Moderate, strong columnar, or prismatic
Consistence: Very hard or extremely hard when dry

Content of 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 9.0

Btknyz horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 20 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 16 to 30 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 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 20 percent pebbles

Calcium carbonate equivalent: 4 to 15 percent

Electrical conductivity: 16 to 30 mmhos/cm

Sodium adsorption ratio: 23 to 70

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

214A—Absher clay loam, wet, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 2 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Absher, wet and similar soils: 90 percent

Minor Components

Lardell and similar soils: 0 to 5 percent

Nobe and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: 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 4.4 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.

Acel Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Glaciated till plain
Parent material: Glaciofluvial deposits and alluvium
Slope range: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Mollic Eutroboralfs

Typical Pedon

Acel silty clay loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 1,300 feet south and 2,600 feet east of the northwest corner of sec. 4, T. 29 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive when dry; very hard, firm, moderately sticky, moderately plastic; common fine roots; common fine pores; few unstained sand grains; neutral; clear smooth boundary.

E—5 to 8 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common fine roots; common fine pores; common

unstained silt and sand drains; neutral; clear smooth boundary.

Bt1—8 to 11 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong fine and medium prismatic structure parting to strong fine subangular blocky; hard, friable, very sticky, moderately plastic; common fine roots; common very fine pores; common distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

Bt2—11 to 24 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; hard, firm, very sticky, moderately plastic; common fine roots; common very fine pores; common distinct clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bk1—24 to 35 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—35 to 50 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—50 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; very hard, friable, moderately sticky, moderately plastic; common fine and medium soft masses of lime; common fine threads of gypsum crystals; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Bk horizon: 15 to 25 inches

Ap horizon

Hue: 2.5Y or 10YR

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

E horizon

Hue: 2.5Y or 10YR

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 2.5Y or 10YR
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Silty clay or clay
Clay content: 40 to 55 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bk and Bky horizons

Hue: 2.5Y or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay loam, silty clay loam, or silty clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 15 percent—0 to
5 percent cobbles; 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

31B—Acel silty clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Acel and similar soils: 85 percent

Minor Components

Scobey and similar soils: 0 to 7 percent
Ethridge and similar soils: 0 to 5 percent
Kobase and similar soils: 0 to 2 percent
Nishon and similar soils: 0 to 1 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 9.5 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.

Adel Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountain slopes
Parent material: Alluvium
Slope range: 0 to 60 percent
Mean annual precipitation: 18 to 24 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 60 to 90 days

Taxonomic Class: Fine-loamy, mixed Pachic Cryoborolls

Typical Pedon

Adel stony loam, in an area of Adel-Burnette-Bynum complex, 4 to 35 percent slopes, in an area of rangeland, 500 feet south and 60 feet east of the northwest corner of sec. 16, T. 25 N., R. 8 W.

- A1—0 to 8 inches; very dark grayish brown (10YR 3/2) stony loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many fine pores; 10 percent pebbles and 5 percent stones; neutral; gradual smooth boundary.
- A2—8 to 20 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; common fine and medium tubular pores; neutral; gradual smooth boundary.
- A3—20 to 32 inches; dark grayish brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many fine and medium irregular tubular pores; neutral; gradual wavy boundary.

Bw—32 to 50 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common fine irregular tubular pores; neutral; gradual wavy boundary.

C—50 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 37 to 46 degrees F; summer temperatures of 52 to 59 degrees F

Thickness of the mollic epipedon: 16 to 60 inches

A1 horizon

Hue: 2.5Y or 10YR

Value: 2 to 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent stones and cobbles; 0 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

A2 horizon

Hue: 2.5Y or 10YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 to 3

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent stones and cobbles; 0 to 30 percent pebbles

Reaction: pH 6.1 to 7.8

A3 horizon

Hue: 2.5Y or 10YR

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 1 to 3

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent stones and cobbles; 0 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

Bw horizon

Hue: 2.5Y or 10YR

Value: 4 or 5 dry; 2 to 4 moist

Chroma: 1 to 3

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent stones and cobbles; 0 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

C horizon

Hue: 2.5Y or 10YR

Value: 4 to 6 dry; 3 to 5 moist

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent stones and cobbles; 0 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

197E—Adel-Doby-Hanson complex, 8 to 35 percent slopes

Setting

Landform:

- Adel—Hills
- Doby—Hills
- Hanson—Hills

Position on landform:

- Adel—Backslopes and footslopes
- Doby—Backslopes
- Hanson—Shoulders and summits

Slope:

- Adel—8 to 35 percent
- Doby—8 to 35 percent
- Hanson—15 to 35 percent

Elevation: 4,600 to 5,600 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Adel and similar soils: 30 percent

Doby and similar soils: 30 percent

Hanson and similar soils: 25 percent

Minor Components

Raynesford and similar soils: 0 to 6 percent

Bynum and similar soils: 0 to 3 percent

Shedhorn and similar soils: 0 to 3 percent

Sebud and similar soils: 0 to 2 percent

Teton and similar soils: 0 to 1 percent

Major Component Description

Adel

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 9.4 inches

Doby

Surface layer texture: Clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.4 inches

Hanson

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
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.

198C—Adel-Gallatin-Shedhorn complex, 0 to 8 percent slopes**Setting***Landform:*

- Adel—Mountains
- Gallatin—Mountains
- Shedhorn—Mountains

Position on landform:

- Adel—Foothills and toeslopes
- Gallatin—Toeslopes
- Shedhorn—Foothills and toeslopes

Slope:

- Adel—0 to 8 percent
- Gallatin—0 to 8 percent
- Shedhorn—0 to 8 percent

Elevation: 4,600 to 5,600 feet

Mean annual precipitation: 19 to 22 inches
Frost-free period: 60 to 90 days

Composition**Major Components**

Adel and similar soils: 35 percent
 Gallatin and similar soils: 25 percent
 Shedhorn and similar soils: 25 percent

Minor Components

Sebud and similar soils: 0 to 7 percent
 Burnette and similar soils: 0 to 6 percent
 Gallatin and similar soils: 0 to 2 percent

Major Component Description**Adel**

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: None
Available water capacity: Mainly 9.4 inches

Gallatin

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 8.0 inches

Shedhorn

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: None
Water table: Apparent
Available water capacity: Mainly 7.5 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.

294E—Adel-Burnette-Bynum complex, 4 to 35 percent slopes

Setting

Landform:

- Adel—Mountains
- Burnette—Mountains
- Bynum—Mountains

Position on landform:

- Adel—Backslopes and footslopes
- Burnette—Backslopes and footslopes
- Bynum—Shoulders and summits

Slope:

- Adel—4 to 35 percent
- Burnette—4 to 25 percent
- Bynum—4 to 35 percent

Elevation: 4,600 to 6,000 feet

Mean annual precipitation: 18 to 21 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Adel and similar soils: 35 percent

Burnette and similar soils: 30 percent

Bynum and similar soils: 20 percent

Minor Components

Sebud and similar soils: 0 to 6 percent

Teton and similar soils: 0 to 4 percent

Tibson and similar soils: 0 to 4 percent

Gallatin and similar soils: 0 to 1 percent

Major Component Description

Adel

Surface layer texture: 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 9.3 inches

Burnette

Surface layer texture: Stony 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 9.5 inches

Bynum

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

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

Management

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

394E—Adel-Burnette-Sebud complex, 4 to 35 percent slopes

Setting

Landform:

- Adel—Mountains
- Burnette—Mountains
- Sebud—Mountains

Position on landform:

- Adel—Backslopes and footslopes
- Burnette—Backslopes and footslopes
- Sebud—Backslopes and shoulders

Slope:

- Adel—4 to 35 percent
- Burnette—4 to 35 percent
- Sebud—4 to 35 percent

Elevation: 4,600 to 5,600 feet

Mean annual precipitation: 19 to 24 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Adel and similar soils: 30 percent

Burnette and similar soils: 30 percent

Sebud and similar soils: 25 percent

Minor Components

Tibson and similar soils: 0 to 6 percent

Bynum and similar soils: 0 to 4 percent

Teton and similar soils: 0 to 4 percent

Gallatin and similar soils: 0 to 1 percent

Major Component Description

Adel

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: None
Available water capacity: Mainly 9.4 inches

Burnette

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: Forest land
Flooding: None
Available water capacity: Mainly 9.7 inches

Sebud

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 3.9 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.

Amor Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and sedimentary plains
Parent material: Sedimentary beds
Slope range: 2 to 35 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Haploborolls

Typical Pedon

Amor loam, in an area of Amor-Cabba loams, 2 to 15 percent slopes, in an area of native hayland, 2,000 feet south and 100 feet west of the northeast corner of sec. 19, T. 27 N., R. 8 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist;

moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; neutral; clear smooth boundary.

Bw—6 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; neutral; clear smooth boundary.

Bk1—14 to 17 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine tubular pores; few fine threads of segregated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—17 to 25 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, slightly plastic; few very fine and fine roots; common fine tubular pores; few fine threads of segregated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—25 to 32 inches; light brownish gray (2.5Y 6/2) loam with 40 percent soft fine shale chips, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; hard, friable, nonsticky, nonplastic; few fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—32 inches; calcareous semiconsolidated loamy sedimentary beds.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 7 to 14 inches

A horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 6.6 to 7.3

Bw horizon

Hue: 2.5Y or 10YR

Value: 4 to 7 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 30 percent

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 2.5Y or 10YR
 Value: 5 to 8 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam, silt loam, fine sandy loam, or clay loam
 Clay content: 18 to 30 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

BC horizon

Value: 6 or 7 dry; 4 to 6 moist
 Clay content: 20 to 27 percent
 Reaction: pH 7.4 to 8.4

174D—Amor-Cabba loams, 2 to 15 percent slopes

Setting

Landform:

- Amor—Hills
- Cabba—Hills

Position on landform:

- Amor—Footslopes and toeslopes
- Cabba—Shoulders

Slope:

- Amor—2 to 15 percent
- Cabba—2 to 15 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

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

Minor Components

Roundor and similar soils: 0 to 6 percent
 Shambo and similar soils: 0 to 6 percent
 Winifred and similar soils: 0 to 2 percent
 Linwell and similar soils: 0 to 1 percent

Major Component Description

Amor

Surface layer texture: 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 5.4 inches

Cabba

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

Arrod Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Mean annual precipitation: 12 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Loamy-skeletal, carbonatic, shallow Petrocalcic Calciborolls

Typical Pedon

Arrod gravelly loam, in an area of Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes, in an area of rangeland, 150 feet north and 2,700 feet east of the southwest corner of sec. 22, T. 22 N., R. 2 W. (Teton County, Montana)

A—0 to 7 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; 15 percent pebbles with lime coats on undersides and 5 percent cobbles; strongly effervescent; mildly alkaline; clear irregular boundary.

Bk—7 to 15 inches; pale brown (10YR 6/3) very gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine irregular pores; 35 percent pebbles with thick lime crusts on undersides and

- 10 percent cobbles; violently effervescent; moderately alkaline; abrupt wavy boundary.
- 2Bkm—15 to 25 inches; light gray (10YR 7/2) calcium carbonate cemented gravel and cobbles; extremely hard; violently effervescent; abrupt wavy boundary.
- 3Bk—25 to 60 inches; very pale brown (10YR 7/3) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky, nonplastic; 60 percent pebbles with thick lime crusts on undersides and 10 percent cobbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to the petrocalcic horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 35 percent—0 to 20 percent stones and cobbles; 0 to 15 percent pebbles
 Reaction: pH 7.4 to 7.8

Bk horizon

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 4 to 7 moist
 Chroma: 2 to 4
 Texture: Loam or clay loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 35 to 90 percent—0 to 15 percent stones and cobbles; 35 to 75 percent pebbles
 Calcium carbonate equivalent: 30 to 60 percent
 Reaction: pH 7.4 to 8.4

2Bkm horizon

Hard massive layer of calcium carbonate cemented rock fragments 4- to 12-inches thick
 Reaction: pH 7.4 to 8.4

3Bk horizon

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 5 to 7 moist
 Chroma: 2 to 4
 Texture: Sand, loamy sand, or sandy loam
 Clay content: 0 to 10 percent
 Content of rock fragments: 60 to 90 percent—0 to 20 percent stones and cobbles; 60 to 75 percent pebbles
 Calcium carbonate equivalent: 25 to 50 percent
 Reaction: pH 7.4 to 8.4

Assinniboine Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 115 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Assinniboine fine sandy loam, 0 to 8 percent slopes, in an area of nonirrigated cropland, 2,000 feet north and 100 feet west of the southeast corner of sec. 36, T. 28 N., R. 1 E.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many medium vesicular pores; neutral; abrupt smooth boundary.

Bt—6 to 14 inches; dark yellowish brown (10YR 4/4) sandy clay loam, dark brown (10YR 3/3) moist; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common fine roots; many very fine and fine tubular pores; few distinct clay films in bridges between sand grains; slightly alkaline; gradual wavy boundary.

Bk1—14 to 21 inches; pale brown (10YR 6/3) fine sandy loam, grayish brown (10YR 5/2) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many fine and medium tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—21 to 42 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots in upper part grading to few fine roots in lower part; many fine tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—42 to 60 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist;

massive; hard, firm, slightly sticky, moderately plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches; may include all or part of the Bt horizons.

Depth to the Bk horizon: 10 to 25 inches

Other features: Some pedons have a Btk horizon.

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Content of rock fragments: 0 to 25 percent pebbles

Clay content: 5 to 15 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Sandy clay loam or fine sandy loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk and C horizons

Hue: 2.5Y or 10YR

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Sandy loam, fine sandy loam, or sandy clay loam

Clay content: 0 to 20 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

132C—Assinniboine fine sandy loam, 0 to 8 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 8 percent

Elevation: 3,000 to 3,600 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 115 to 125 days

Composition

Major Components

Assinniboine and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 9 percent

Joplin and similar soils: 0 to 3 percent

Kevin and similar soils: 0 to 3 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 7.3 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.

Attewan Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate in the upper 20 to 40 inches; rapid below this depth

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Attewan loam, in an area of Attewan-Wabek complex, 0 to 8 percent slopes, in an area of nonirrigated cropland, 500 feet south and 1,320 feet east of the northwest corner of sec. 35, T. 29 N., R. 2 W. (Pondera County, Montana)

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

Bt—5 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium

subangular blocky; hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine tubular pores; few distinct clay films; dark brown (10YR 4/3) coats on faces of ped; neutral; clear wavy boundary.

Bk1—11 to 14 inches; light grayish brown (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; many very fine and fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—14 to 21 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk3—21 to 28 inches; light gray (2.5Y 7/2) very gravelly sandy loam, grayish brown (2.5Y 5/2) moist; single grain; slightly hard, very friable, slightly sticky, nonplastic; few very fine roots; 50 percent pebbles with lime coats on surfaces and crusts on undersides; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—28 to 60 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; 60 percent pebbles with lime crusts on undersides; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 7 to 12 inches; may include all or part of the argillic horizon.

Depth to the Bk horizon: 10 to 21 inches

Depth to the 2C horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Loam or fine sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 0 to 50 percent—0 to 20 percent greater than 3-inch stones and cobbles; 0 to 30 percent less than 3-inch pebbles

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent

Content of rock fragments: 0 to 25 percent—0 to 5 percent greater than 3-inch stones and cobbles; 0 to 20 percent less than 3-inch pebbles

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4 or 6

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

Clay content: 15 to 30 percent

Content of 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

2Bk3 and 2C horizons

Hue: 2.5Y or 10YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Sandy loam, loamy sand, sand, loamy coarse sand, or coarse sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles; 35 to 60 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

116B—Attewan fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Attewan and similar soils: 85 percent

Minor Components

Evanston and similar soils: 0 to 6 percent
 Wabek and similar soils: 0 to 5 percent
 Assiniboine and similar soils: 0 to 2 percent
 Chinook and similar soils: 0 to 2 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 5.3 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.

**216C—Attewan-Wabek complex,
0 to 8 percent slopes****Setting***Landform:*

- Attewan—Stream terraces
- Wabek—Stream terraces

Position on landform:

- Attewan—Footslopes and toeslopes
- Wabek—Shoulders and summits

Slope:

- Attewan—0 to 8 percent
- Wabek—0 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Attewan and similar soils: 50 percent
 Wabek and similar soils: 35 percent

Minor Components

Twilight and similar soils: 0 to 7 percent
 Assiniboine and similar soils: 0 to 2 percent
 Chinook and similar soils: 0 to 2 percent
 Evanston and similar soils: 0 to 2 percent
 Yetull and similar soils: 0 to 2 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 5.0 inches

Wabek

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

Babb Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountain slopes
Parent material: Alpine till
Slope range: 4 to 45 percent
Mean annual precipitation: 18 to 22 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 60 to 90 days

Taxonomic Class: Fine-loamy, mixed Typic
 Cryoborolls

Typical Pedon

Babb cobbly loam, in an area of Babb-Tibson-Adel complex, 4 to 35 percent slopes, in an area of rangeland, 1,050 feet north and 1,740 feet west of the southeast corner of sec. 24, T. 27 N., R. 9 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very

friable, slightly sticky, slightly plastic; many fine and common medium roots; 15 percent cobbles, 10 percent pebbles, and 5 percent stones; neutral; clear smooth boundary.

Bw1—6 to 12 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and common medium roots; 20 percent pebbles, 10 percent cobbles, and 5 percent stones; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bw2—12 to 22 inches; light brownish gray (10YR 6/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many fine and common medium roots; 15 percent pebbles and 5 percent cobbles; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—22 to 40 inches; light gray (10YR 7/2) gravelly clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; 15 percent pebbles and 5 percent cobbles; common medium soft masses of lime; violently effervescent; moderately alkaline; diffuse wavy boundary.

Bk2—40 to 60 inches; light gray (10YR 7/2) gravelly clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; 20 percent pebbles and 10 percent cobbles; common medium soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 42 degrees F

Thickness of the mollic epipedon: 10 to 16 inches; may include the Bw1 horizon.

Depth to the Bk horizon: 16 to 30 inches

A horizon

Hue: 10YR

Value: 2 to 4 dry; 1 to 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—10 to 20 percent stones and cobbles; 5 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 15 to 35 percent—5 to 10 percent cobbles; 10 to 25 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 15 to 35 percent—5 to 10 percent cobbles; 10 to 25 percent pebbles

Calcium carbonate equivalent: 20 to 40 percent

Reaction: pH 7.9 to 8.4

296E—Babb-Tibson-Adel complex, 4 to 35 percent slopes

Setting

Landform:

- Babb—Mountains
- Tibson—Mountains
- Adel—Mountains

Position on landform:

- Babb—Backslopes and footslopes
- Tibson—Shoulders and summits
- Adel—Footslopes

Slope:

- Babb—4 to 35 percent
- Tibson—4 to 35 percent
- Adel—4 to 35 percent

Elevation: 4,600 to 6,000 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Babb and similar soils: 35 percent

Tibson and similar soils: 30 percent

Adel and similar soils: 20 percent

Minor Components

Burnette and similar soils: 0 to 6 percent

Cheadle and similar soils: 0 to 3 percent

Gallatin and similar soils: 0 to 2 percent

Sebud and similar soils: 0 to 2 percent

Teton and similar soils: 0 to 2 percent

Major Component Description

Babb

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.7 inches

Tibson

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

Adel

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 9.4 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.

590E—Babb-Fifer-Cheadle complex, 8 to 45 percent slopes

Setting

Landform:

- Babb—Mountains
- Fifer—Mountains
- Cheadle—Mountains

Position on landform:

- Babb—Backslopes and footslopes
- Fifer—Shoulders and summits
- Cheadle—Shoulders and summits

Slope:

- Babb—8 to 45 percent
- Fifer—8 to 45 percent
- Cheadle—8 to 45 percent

Elevation: 4,600 to 5,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Babb and similar soils: 30 percent
 Fifer and similar soils: 30 percent
 Cheadle and similar soils: 25 percent

Minor Components

Adel and similar soils: 0 to 5 percent
 Teton and similar soils: 0 to 5 percent
 Sebud and similar soils: 0 to 3 percent
 Starley and similar soils: 0 to 2 percent

Major Component Description

Babb

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 9.0 inches

Fifer

Surface layer texture: Clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.2 inches

Cheadle

Surface layer texture: Stony 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 1.6 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.

Bascovy Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Hills and sedimentary plains

Parent material: Residuum from semiconsolidated shale

Slope range: 2 to 45 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
Leptic Udic Haplusterts

Typical Pedon

Bascovy silty clay, in an area of Bascovy-Neldore complex, 2 to 8 percent slopes, in an area of rangeland, 1,700 feet north and 1,900 feet west of the southeast corner of sec. 34, T. 23 N., R. 1 W.

A—0 to 5 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; with very dark grayish brown (10YR 3/2) coats on faces of peds; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, moderately sticky, moderately plastic; common fine roots; few fine pores; slightly alkaline; clear smooth boundary.

Bw—5 to 11 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common fine roots; few fine pores; slightly alkaline; gradual smooth boundary.

Bssy—11 to 18 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; massive; very hard, very firm, very sticky, moderately plastic; common very fine roots; few fine pores; common vertical cracks and pressure faces; few fine threadlike seams of gypsum; 10 percent soft shale fragments; slightly alkaline; gradual wavy boundary.

C—18 to 25 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; massive; very hard, firm, very sticky, moderately plastic; common very fine roots in cracks and between plates of soft shale; 30 percent soft shale and 10 percent hard shale

fragments; slightly alkaline; gradual wavy boundary.

Cr—25 to 60 inches; gray (10YR 5/1) and grayish brown (2.5Y 5/2) semiconsolidated shale; strongly acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Cr horizon: 20 to 40 inches

Other features: The chroma of 1 is lithochromic.

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 1 to 3

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 1 to 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 6.1 to 8.4

Bssy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Gypsum: 1 to 5 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.1 to 8.4

C 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

Electrical conductivity: 0 to 8 mmhos/cm

Reaction: pH 5.1 to 8.4

169C—Bascovy-Neldore complex, 2 to 8 percent slopes

Setting

Landform:

- Bascovy—Sedimentary plains
- Neldore—Sedimentary plains

Position on landform:

- Bascovy—Foothills and toeslopes
- Neldore—Backslopes and shoulders

Slope:

- Bascovy—2 to 8 percent
- Neldore—2 to 8 percent

Elevation: 3,200 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Bascovy and similar soils: 50 percent

Neldore and similar soils: 35 percent

Minor Components

Tanna and similar soils: 0 to 5 percent

Pylon and similar soils: 0 to 4 percent

Abor and similar soils: 0 to 3 percent

Marvan and similar soils: 0 to 3 percent

Major Component Description**Bascovy***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*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 3.7 inches**Neldore***Surface layer texture:* 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 2.6 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.

Beanlake Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Moraines and hills*Parent material:* Alpine till*Slope range:* 0 to 35 percent*Mean annual precipitation:* 15 to 19 inches*Annual air temperature:* 40 to 44 degrees F*Frost-free period:* 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Calciborolls

Typical Pedon

Beanlake cobbly loam, in an area of Beanlake-Winspect cobbly loams, 2 to 15 percent slopes, in an area of rangeland, 700 feet north and 1,900 feet east of the southwest corner of sec. 16, T. 22 N., R. 7 W.

A—0 to 6 inches; dark brown (10YR 4/3) cobbly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure parting to moderate medium granular; slightly hard, very friable, slightly sticky, slightly plastic; many fine and few medium roots; common fine irregular pores; 10 percent cobbles, 5 percent pebbles, and 2 percent stones; moderately effervescent; slightly alkaline; clear smooth boundary.

Bk—6 to 9 inches; brown (10YR 5/3) cobbly loam, dark brown (10YR 4/3) moist; moderate fine prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine irregular pores; 15 percent cobbles, 5 percent pebbles, and 2 percent stones; lime coats on undersides of rock fragments; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky1—9 to 15 inches; light brownish gray (10YR 6/2) loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; common fine and many very fine roots; common very fine and fine pores; 10 percent pebbles and few cobbles; lime coats on undersides of rock fragments; common medium soft masses of lime and gypsum;

violently effervescent; moderately alkaline; clear wavy boundary.

Bky2—15 to 28 inches; light brownish gray (10YR 6/2) cobbly loam, grayish brown (10YR 5/2) moist; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common very fine roots; few very fine and fine pores; 10 percent cobbles and 10 percent pebbles; many fine soft masses of lime and gypsum; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky3—28 to 60 inches; light brownish gray (10YR 6/2) cobbly loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure in the upper part grading to massive in the lower part; hard, firm, slightly sticky, slightly plastic; few very fine roots; few very fine pores; 10 percent cobbles and 10 percent pebbles; few fine soft masses of lime and gypsum; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 8 inches

A horizon

Hue: 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 18 to 25 percent

Content of rock fragments: 10 to 30 percent—0 to 15 percent stones and cobbles; 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR

Value: 5 to 8 dry; 3 to 6 moist

Chroma: 2 or 3

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 15 to 25 percent

Content of rock fragments: 10 to 35 percent—0 to 20 percent stones and cobbles; 5 to 15 percent pebbles

Reaction: pH 7.9 to 8.4

Bky1 horizon

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 18 to 25 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 15 to 25 percent

Gypsum content: 1 to 3 percent

Content of rock fragments: 10 to 35 percent—0 to 20 percent stones and cobbles; 5 to 15 percent pebbles

Reaction: pH 7.9 to 9.0

Bky2 and Bky3 horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 25 percent

Electrical conductivity: 0 to 4 mmhos/cm

Gypsum content: 1 to 3 percent

Calcium carbonate equivalent: 8 to 15 percent

Content of rock fragments: 15 to 40 percent—0 to 5 percent stones; 10 to 20 percent cobbles; 5 to 15 percent pebbles

Moist bulk density: More than 1.6 g/cm³

Reaction: pH 7.9 to 9.0

327C—Beanlake-Winspect cobbly loams, 2 to 15 percent slopes

Setting

Landform:

- Beanlake—Moraines
- Winspect—Moraines

Position on landform:

- Beanlake—Footslopes
- Winspect—Shoulders

Slope:

- Beanlake—2 to 15 percent
- Winspect—2 to 15 percent

Elevation: 4,200 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Beanlake and similar soils: 45 percent

Winspect and similar soils: 40 percent

Minor Components

Manhattan and similar soils: 0 to 5 percent

Shambo and similar soils: 0 to 5 percent

Saypo and similar soils: 0 to 3 percent

Birchfield and similar soils: 0 to 1 percent

Tetonview and similar soils: 0 to 1 percent

Major Component Description

Beanlake

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Winspect

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

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

Management

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

427C—Beanlake-Saypo-Winspect complex, 0 to 8 percent slopes

Setting

Landform:

- Beanlake—Moraines
- Saypo—Closed depressions
- Winspect—Moraines

Position on landform:

- Beanlake—Foothills and toeslopes
- Winspect—Shoulders

Slope:

- Beanlake—0 to 8 percent
- Saypo—0 to 4 percent
- Winspect—4 to 8 percent

Elevation: 4,000 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Beanlake and similar soils: 35 percent

Saypo and similar soils: 30 percent

Winspect and similar soils: 20 percent

Minor Components

Kiev and similar soils: 0 to 8 percent

Manhattan and similar soils: 0 to 5 percent

Birchfield and similar soils: 0 to 1 percent

Tetonview and similar soils: 0 to 1 percent

Major Component Description

Beanlake

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Saypo

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 7.8 inches

Winspect

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

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

Management

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

527E—Beanlake-Cabba-Castner complex, 8 to 35 percent slopes

Setting

Landform:

- Beanlake—Hills
- Cabba—Hills
- Castner—Hills

Position on landform:

- Beanlake—Backslopes and foothills
- Cabba—Shoulders and summits
- Castner—Shoulders and summits

Slope:

- Beanlake—8 to 35 percent
- Cabba—8 to 35 percent
- Castner—8 to 35 percent

Elevation: 4,000 to 4,800 feet
Mean annual precipitation: 16 to 19 inches
Frost-free period: 90 to 100 days

Composition

Major Components

Beanlake and similar soils: 30 percent
 Cabba and similar soils: 30 percent
 Castner and similar soils: 25 percent

Minor Components

Winspect and similar soils: 0 to 10 percent
 Shambo and similar soils: 0 to 5 percent

Major Component Description

Beanlake

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 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 1.2 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.

727C—Beanlake-Manhattan-Winspect complex, 2 to 15 percent slopes

Setting

Landform:

- Beanlake—Hills
- Manhattan—Hills
- Winspect—Hills

Position on landform:

- Beanlake—Footslopes
- Manhattan—Backslopes and footslopes
- Winspect—Shoulders

Slope:

- Beanlake—2 to 15 percent
- Manhattan—2 to 15 percent
- Winspect—2 to 15 percent

Elevation: 4,000 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Beanlake and similar soils: 30 percent
 Manhattan and similar soils: 30 percent
 Winspect and similar soils: 25 percent

Minor Components

Fairfield and similar soils: 0 to 8 percent
 Saypo and similar soils: 0 to 5 percent
 Birchfield and similar soils: 0 to 1 percent
 Tetonview and similar soils: 0 to 1 percent

Major Component Description

Beanlake

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Manhattan

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.6 inches

Winspect

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.0 inches

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

Management

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

Binna Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate to 22 inches; moderately rapid below this depth

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Binna loam, in an area of Binna-Scravo complex, 0 to 4 percent slopes, in an area of nonirrigated cropland, 600 feet north and 2,600 feet east of the southwest corner of sec. 35, T. 30 N., R. 7 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; many fine roots; many fine irregular pores; 5 percent pebbles; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—6 to 11 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, very

friable, slightly sticky, nonplastic; many very fine and fine roots; many fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—11 to 18 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many fine pores; 5 percent pebbles with lime coats on undersides; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—18 to 22 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky, slightly plastic; few fine roots; common very fine and fine pores; 10 percent pebbles with lime coats on undersides; common fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2C1—22 to 26 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky, nonplastic; few fine roots; 65 percent pebbles; strongly effervescent; moderately alkaline; clear wavy boundary.

2C2—26 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; nonsticky, nonplastic; 65 percent pebbles and 10 percent cobbles; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the sandy-skeletal horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 30 percent—0 to 10 percent cobbles; 0 to 20 percent pebbles
 Calcium carbonate equivalent: 15 to 30 percent
 Reaction: pH 7.9 to 9.0

Bk3 horizon

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 5 or 6 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 30 percent—0 to 10 percent cobbles; 0 to 20 percent pebbles
 Calcium carbonate equivalent: 10 to 30 percent
 Reaction: pH 7.9 to 9.0

2C horizons

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
 Content of 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 7.4 to 9.0

118B—Binna-Scravo complex, 0 to 4 percent slopes

Setting**Landform:**

- Binna—Relict stream terraces
- Scravo—Relict stream terraces

Slope:

- Binna—0 to 4 percent
- Scravo—0 to 4 percent

Elevation: 3,500 to 3,900 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Binna and similar soils: 50 percent
 Scravo and similar soils: 35 percent

Minor Components

Niart and similar soils: 0 to 8 percent
 Crago and similar soils: 0 to 7 percent

Major Component Description**Binna**

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 4.5 inches

Scravo

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

Birchfield Series

Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Moderately slow
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, frigid Typic Calciaquolls

Typical Pedon

Birchfield mucky peat, in an area of Winginaw-Birchfield mucky peats, 0 to 2 percent slopes, in an area of rangeland, 2,300 feet south and 2,300 feet west of the northeast corner of sec. 28, T. 25 N., R. 7 W.

(Colors are for moist soil unless otherwise noted.)

Oi—14 to 6 inches; very dark brown (10YR 2/2) unrubbed and very dark brown (10YR 2/2) rubbed and pressed fibric material that textures to mucky peat; 80 percent fiber—50 percent rubbed; massive; nonsticky, nonplastic; 40 percent lycopodium mosses and 50 percent herbaceous and woody species; 10 percent

mineral soil; slightly alkaline; gradual wavy boundary.

Oe—6 inches to 0; black (10YR 2/1) unrubbed and black (10YR 2/1) rubbed and pressed hemic material that textures to peaty muck; 40 percent fiber—30 percent rubbed; 25 percent mineral soil; weak very fine granular structure; nonsticky, nonplastic; slightly alkaline; clear smooth boundary.

Akg—0 to 6 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; common medium distinct yellowish brown (10YR 5/4) redox concentrations; weak fine granular structure; slightly hard, friable, moderately sticky, slightly plastic; common fine roots; few fine threadlike seams of lime; slightly effervescent; slightly alkaline; clear wavy boundary.

Bkg1—6 to 11 inches; very dark grayish brown (10YR 3/2) gravelly clay loam, grayish brown (10YR 5/2) dry; common medium distinct yellowish brown (10YR 5/4 and 10YR 5/6) redox concentrations; massive; hard, friable, moderately sticky, moderately plastic; few very fine roots; common fine threadlike seams of lime; 15 percent pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bkg2—11 to 23 inches; dark grayish brown (10YR 4/2) very gravelly clay loam, light brownish gray (10YR 6/2) dry; few fine distinct yellowish brown (10YR 5/4 and 10YR 5/6) redox concentrations; massive; very hard, firm, moderately sticky, moderately plastic; 40 percent pebbles and 5 percent cobbles; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bkg3—23 to 60 inches; grayish brown (10YR 5/2) extremely gravelly loam, light gray (10YR 7/2) dry; few fine distinct yellowish brown (10YR 5/4) redox concentrations; massive; very hard, firm, moderately sticky, slightly plastic; 65 percent pebbles and 10 percent cobbles; common medium soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Histic epipedon thickness: 8 to 16 inches

Thickness of the mollic epipedon: 7 to 12 inches

(Colors are mollic when mixed to 7 inches if the Akg horizon is less than 7 inches.)

Depth to the seasonal high water table: 0 to 6 inches

Oi horizon

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 75 to 90 percent unrubbed; 45 to 70 percent rubbed

Mineral content: 5 to 20 percent

Reaction: pH 7.4 to 7.8

Oe horizon

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 35 to 60 percent unrubbed; 25 to 35 percent rubbed

Mineral content: 15 to 35 percent

Reaction: pH 7.4 to 7.8

Akg horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 3 or 4 dry

Chroma: 1 or 2

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 0 to 20 percent pebbles

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.9 to 8.4

Bkg1 horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 4 or 5 dry

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 5 to 35 percent pebbles

Calcium carbonate equivalent: 25 to 30 percent

Reaction: pH 7.9 to 8.4

Bkg2 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 5 to 7 dry

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Calcium carbonate equivalent: 25 to 35 percent

Reaction: pH 7.9 to 8.4

Bkg3 horizon

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

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 1 or 2

Clay content: 10 to 20 percent

Content of rock fragments: 60 to 70 percent—5 to 15 percent cobbles; 55 to 65 percent pebbles

Calcium carbonate equivalent: 20 to 35 percent
Reaction: pH 7.9 to 8.4

Burnette Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Mountain slopes

Parent material: Alluvium

Slope range: 4 to 35 percent

Mean annual precipitation: 18 to 24 inches

Annual air temperature: 39 to 42 degrees F

Frost-free period: 60 to 90 days

Taxonomic Class: Fine, montmorillonitic Argic
Pachic Cryoborolls

Typical Pedon

Burnette stony clay loam, in an area of Adel-Burnette-Bynum complex, 4 to 35 percent slopes, in an area of rangeland, 700 feet north and 1,000 feet west of the southeast corner of sec. 14, T. 27 N., R. 9 W.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) stony clay loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; many fine roots; 10 percent pebbles and 5 percent stones; neutral; clear smooth boundary.

A2—7 to 14 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; slightly hard, firm, moderately sticky, moderately plastic; many fine roots; neutral; clear smooth boundary.

Bt1—14 to 21 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—21 to 30 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; common very fine roots; common distinct clay films on faces of peds; slightly alkaline; gradual wavy boundary.

Bk—30 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure;

slightly hard, firm, moderately sticky, moderately plastic; common fine soft masses of lime; strongly effervescent; moderately alkaline; few very fine roots.

Range in Characteristics

Soil temperature: 38 to 46 degrees F

Thickness of the mollic epipedon: 16 to 35 inches

Depth to the Bk horizon: 20 to 40 inches

A horizons

Value: 2 to 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 27 to 40 percent

Content of rock fragments: 0 to 30 percent—0 to 15 percent stones and cobbles; 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 1 to 3

Texture: Clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

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

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bynum Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Hills and mountain slopes

Parent material: Semiconsolidated sedimentary beds and interbedded sandstone and shale

Slope range: 4 to 35 percent

Mean annual precipitation: 18 to 21 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 60 to 90 days

Taxonomic Class: Fine-loamy, mixed Typic
Cryoborolls

Typical Pedon

Bynum loam, in an area of Bynum-Adel-Doby complex, 4 to 35 percent slopes, in an area of rangeland, 1,900 feet north and 200 feet east of the southwest corner of sec. 7, T. 27 N., R. 8 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine irregular pores; neutral; clear smooth boundary.

Bw—6 to 15 inches; dark grayish brown (10YR 4/2) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; neutral; gradual smooth boundary.

Bk—15 to 28 inches; pale brown (10YR 6/3) loam, dark brown or brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; few fine threads of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—28 to 34 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure; hard, friable, nonsticky, nonplastic; few very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—34 to 60 inches; light brownish gray (10YR 6/2) semiconsolidated sedimentary beds; strongly effervescent; moderately alkaline; very hard when dry but crushes under pressure when wet.

Range in Characteristics

Soil temperature: 38 to 40 degrees F

Thickness of the mollic epipedon: 10 to 16 inches

Depth to the Bk horizon: 11 to 25 inches

Depth to the Cr horizon: 20 to 40 inches

A horizon

Value: 3 to 5 dry; 1 to 3 moist

Chroma: 1 or 2

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 dry; 3 to 5 moist

Chroma: 1 or 2

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 8 dry; 4 to 6 moist

Chroma: 1 to 3

Texture: Loam, silty clay loam, or clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

C horizon

Texture: Loam, silty clay loam, or clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.9 to 9.0

194E—Bynum-Adel-Doby complex, 4 to 35 percent slopes

Setting

Landform:

- Bynum—Hills
- Adel—Hills
- Doby—Hills

Position on landform:

- Bynum—Backslopes and footslopes
- Adel—Backslopes and footslopes
- Doby—Shoulders and summits

Slope:

- Bynum—4 to 35 percent
- Adel—4 to 35 percent
- Doby—4 to 35 percent

Elevation: 4,600 to 5,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Bynum and similar soils: 35 percent

Adel and similar soils: 25 percent

Doby and similar soils: 25 percent

Minor Components

Burnette and similar soils: 0 to 5 percent

Fifer and similar soils: 0 to 3 percent

Teton and similar soils: 0 to 3 percent

Cheadle and similar soils: 0 to 2 percent

Gallatin and similar soils: 0 to 2 percent

Major Component Description

Bynum

Surface layer texture: 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 5.2 inches

Adel

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 9.4 inches

Doby

Surface layer texture: 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 2.4 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.

Cabba Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and escarpments
Parent material: Material derived from semiconsolidated sedimentary beds
Slope range: 2 to 60 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Cabba loam, in an area of Cabba-Roundor-Windham complex, 25 to 60 percent slopes, in an area of

rangeland, 1,300 feet north and 400 feet west of the southeast corner of sec. 8, T. 25 N., R. 7 W.

- A—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; strongly effervescent; slightly alkaline; clear smooth boundary.
- Bk1—3 to 8 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; slightly alkaline; clear smooth boundary.
- Bk2—8 to 15 inches; light olive gray (5Y 6/2) loam with 20 percent small fragments of weakly consolidated siltstone, olive gray (5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine roots; common very fine and fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.
- Cr—15 to 60 inches; light olive gray (5Y 6/2) semiconsolidated siltstone, olive gray (5Y 6/2) moist; roots in cracks in upper few inches; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 3 to 6 dry; 3 or 4 moist
 Chroma: 1 to 4
 Clay content: 10 to 27 percent
 Content of rock fragments: 0 to 60 percent—0 to 40 percent boulders, stones, and cobbles; 0 to 30 percent pebbles or channers
 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 to 8 dry; 4 to 7 moist
 Chroma: 1 to 4 or 6
 Texture: Loam, silt loam, clay loam, or silty clay loam
 Clay content: 20 to 35 percent
 Structure: Massive thin platy, subangular blocky, or prismatic

Content of 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

Effervescence: Slightly to violently

Reaction: pH 7.4 to 9.0

Cr horizon

This horizon consists of interbedded layers of silt, sand, and clay or a mixture of the three. They crush to loam, silt loam, very fine sandy loam, clay loam, or silty clay loam. Some layers are harder than others, but all are considered rippable, or soft, and are readily dug with power tools.

Reaction: pH 7.4 to 8.4

174E—Cabba-Amor loams, 15 to 35 percent slopes

Setting

Landform:

- Cabba—Hills
- Amor—Hills

Position on landform:

- Cabba—Shoulders and summits
- Amor—Backslopes and shoulders

Slope:

- Cabba—15 to 35 percent
- Amor—15 to 35 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Cabba and similar soils: 55 percent

Amor and similar soils: 30 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Roundor and similar soils: 0 to 5 percent

Castner and similar soils: 0 to 3 percent

Windham and similar soils: 0 to 2 percent

Major Component Description

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

Amor

Surface layer texture: 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 5.4 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.

271F—Cabba-Castner-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:

- Cabba—Escarpments
- Castner—Escarpments
- Rock outcrop—Escarpments

Slope:

- Cabba—25 to 60 percent
- Castner—25 to 60 percent
- Rock outcrop—25 to 60 percent

Elevation: 4,200 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Cabba and similar soils: 35 percent

Castner and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Wayden and similar soils: 0 to 7 percent

Amor and similar soils: 0 to 5 percent

Roundor and similar soils: 0 to 3 percent

Major Component Description

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 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 1.2 inches

Rock outcrop

Definition: Weakly to strongly indurated sandstone

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.

474F—Cabba-Roundor-Windham complex, 25 to 60 percent slopes

Setting

Landform:

- Cabba—Hills
- Roundor—Hills
- Windham—Hills

Position on landform:

- Cabba—Backslopes
- Roundor—Backslopes and footslopes
- Windham—Risers

Slope:

- Cabba—25 to 60 percent
- Roundor—25 to 60 percent
- Windham—25 to 60 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Cabba and similar soils: 40 percent
 Roundor and similar soils: 30 percent
 Windham and similar soils: 15 percent

Minor Components

Amor and similar soils: 0 to 6 percent
 Kiev and similar soils: 0 to 6 percent
 Judith and similar soils: 0 to 3 percent

Major Component Description

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

Roundor

Surface layer texture: 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 5.3 inches

Windham

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

574E—Cabba-Wayden-Castner complex, 4 to 35 percent slopes

Setting

Landform:

- Cabba—Hills
- Wayden—Hills
- Castner—Hills

Slope:

- Cabba—4 to 35 percent
- Wayden—4 to 35 percent
- Castner—4 to 35 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Cabba and similar soils: 35 percent

Wayden and similar soils: 30 percent

Castner and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 9 percent

Amor and similar soils: 0 to 3 percent

Winifred and similar soils: 0 to 3 percent

Major Component Description

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 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 1.9 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 1.2 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.

Cabbart Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Sedimentary plains and hills

Parent material: Semiconsolidated sedimentary beds

Slope range: 2 to 70 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Cabbart loam, in an area of Cabbart-Delpoint-Rock outcrop complex, 25 to 70 percent slopes, in an area of rangeland, 50 feet south and 750 feet east of the northwest corner of sec. 33, T. 30 N., R. 3 W.

A—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; many fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—3 to 11 inches; pale brown (10YR 6/3) loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure; hard, friable, slightly sticky, nonplastic; many very fine and fine roots; many fine pores; few fine threads of soft lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr1—11 to 14 inches; mixed grayish brown (2.5Y 5/2) and pale brown (10YR 6/3) weathered platy siltstone and slightly indurated sandstone with 20 percent soil between plates, grayish brown (2.5Y 5/2) moist; common very fine and fine roots between cracks and plates; few fine soft masses of lime on undersides of plates; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr2—14 to 26 inches; mixed grayish brown (2.5Y 5/2) and pale brown (10YR 6/3) thin platy siltstone and slightly indurated sandstone; few very fine and fine roots between plates and cracks in the

upper few inches; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cr3—26 to 60 inches; mixed grayish brown (2.5Y 5/2) and pale brown (10YR 6/3) thin to medium soft siltstone with thin strata of slightly indurated sandstone; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 60 percent hard fragments—0 to 20 percent cobbles; 0 to 50 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 35 percent

Structure: Massive, prismatic, or blocky

Content of rock fragments: 0 to 45 percent—0 to 15 percent hard pebbles; 0 to 45 percent soft pebbles

Electrical conductivity: 0 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 5

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.4 to 9.0

173E—Cabbart-Delpoint loams, 15 to 35 percent slopes

Setting

Landform:

- Cabbart—Hills
- Delpoint—Hills

Position on landform:

- Cabbart—Shoulders and summits
- Delpoint—Backslopes and footslopes

Slope:

- Cabbart—15 to 35 percent
- Delpoint—15 to 35 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Cabbart and similar soils: 50 percent

Delpoint and similar soils: 35 percent

Minor Components

Yamacall and similar soils: 0 to 6 percent

Kremlin and similar soils: 0 to 5 percent

Hillon and similar soils: 0 to 4 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

Delpoint

Surface layer texture: 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 5.8 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.

273F—Cabbart-Delpoint-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform:

- Cabbart—Hills
- Delpoint—Hills
- Rock outcrop—Hills

Position on landform:

- Cabbart—Shoulders and summits
- Delpoint—Backslopes and footslopes
- Rock outcrop—Summits

Slope:

- Cabbart—25 to 70 percent
- Delpoint—25 to 45 percent
- Rock outcrop—25 to 70 percent

Elevation: 3,200 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Cabbart and similar soils: 45 percent

Delpoint and similar soils: 25 percent

Rock outcrop: 15 percent

Minor Components

Yamacall and similar soils: 0 to 7 percent

Yawdim and similar soils: 0 to 6 percent

Kremlin and similar soils: 0 to 2 percent

Major Component Description**Cabbart***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated sedimentary beds*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 sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.1 inches**Rock outcrop***Definition:* Weakly to strongly indurated sandstone

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*Landform:* Hills and escarpments*Parent material:* Residuum from hard sandstone*Slope range:* 4 to 60 percent*Mean annual precipitation:* 15 to 19 inches*Annual air temperature:* 40 to 44 degrees F*Frost-free period:* 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Haploborolls

Typical Pedon

Castner channery loam, in an area of Cabbat-Wayden-Castner complex, 4 to 35 percent slopes, in an area of rangeland, 500 feet south and 1,900 feet west of the northeast corner of sec. 11, T. 24 N., R. 8 W.

A1—0 to 4 inches; dark brown (10YR 4/3) channery loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; many fine and medium roots; 30 percent channers; few thin lime coats on undersides of larger rock fragments; slightly alkaline; clear wavy boundary.

A2—4 to 8 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, nonplastic; many fine and few medium roots; 55 percent channers; lime crusts on undersides of rock fragments; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—8 to 14 inches; brown (10YR 5/3) extremely flaggy loam, dark brown (10YR 4/3) moist; weak thin platy; slightly hard, very friable, slightly sticky, nonplastic; common fine and few medium roots between plates; 50 percent channers and 25 percent flagstones; lime crusts on undersides of rock fragments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

R—14 inches; hard sandstone.

Range in Characteristics*Soil temperature:* 41 to 47 degrees F*Thickness of the mollic epipedon:* 7 to 15 inches*Depth to bedrock:* 10 to 20 inches*Depth to the Bk horizon:* 7 to 15 inches*Other features:* Some pedons have a thin Bw horizon.

A1 horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR
 Value: 3 to 5 dry; 2 or 3 moist
 Chroma: 1 to 3
 Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand
 Content of rock fragments: 5 to 45 percent—0 to 15 percent stones and cobbles; 5 to 30 percent pebbles and channers
 Reaction: pH 6.6 to 7.8

A2 horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR
 Value: 3 to 5 dry; 2 or 3 moist
 Chroma: 1 to 3
 Texture: Loam or sandy loam
 Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand
 Content of rock fragments: 35 to 70 percent—5 to 20 percent stones and cobbles; 30 to 55 percent pebbles and channers
 Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 2.5Y, 10YR, 7.5YR, or 5YR
 Value: 4 to 6 dry; 3 to 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
 Content of rock fragments: 35 to 80 percent—10 to 25 percent stones and flagstones; 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

Cheadle Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Hills and mountain slopes

Parent material: Residuum from hard sandstone

Slope range: 4 to 60 percent

Mean annual precipitation: 18 to 24 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 55 to 90 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Cryoborolls

Typical Pedon

Cheadle stony loam, in an area of Teton-Tibson-Cheadle complex, 4 to 35 percent slopes, in an area of rangeland, 2,000 feet south and 1,000 feet west of the northeast corner of sec. 30, T. 25 N., R. 8 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure parting to moderate medium granular; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; 20 percent channers and 3 percent stones on the surface; slightly alkaline; clear smooth boundary.

A2—5 to 10 inches; dark grayish brown (10YR 4/2) very channery loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky, moderately plastic; common fine roots; 40 percent channers; slightly alkaline; gradual smooth boundary.

C—10 to 18 inches; grayish brown (10YR 5/2) very channery loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky, moderately plastic; few very fine and fine roots; 50 percent channers; slightly effervescent; moderately alkaline; abrupt smooth boundary.

R—18 inches; fractured hard sandstone interbedded with semiconsolidated sandy shale.

Range in Characteristics

Soil temperature: 37 to 47 degrees F; mean summer temperature of less than 59 degrees F.

Thickness of the mollic epipedon: 7 to 16 inches

Depth to bedrock: 10 to 20 inches

A1 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 10 to 27 percent

Content of rock fragments: 0 to 60 percent—0 to 50 percent stones, cobbles, and channers; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

A2 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 to 3

Texture: Loam, fine sandy loam, or sandy loam

Clay content: 10 to 27 percent

Content of rock fragments: 35 to 75 percent—0 to 65 percent stones, cobbles, and channers; 10 to 30 percent pebbles
 Effervescence: Slightly or strongly
 Reaction: pH 7.4 to 9.0

C horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Loam, fine sandy loam, or sandy loam
 Clay content: 10 to 27 percent
 Content of rock fragments: 35 to 75 percent—0 to 65 percent stones, cobbles, and channers; 20 to 30 percent pebbles
 Calcium carbonate equivalent: 3 to 5 percent
 Reaction: pH 7.4 to 9.0

390F—Cheadle-Doby-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform:

- Cheadle—Mountains
- Doby—Mountains
- Rock outcrop—Mountains

Position on landform:

- Cheadle—Shoulders and summits
- Doby—Backslopes and shoulders
- Rock outcrop—Summits of mountains

Slope:

- Cheadle—15 to 60 percent
- Doby—15 to 60 percent
- Rock outcrop—15 to 60 percent

Elevation: 4,600 to 5,800 feet

Mean annual precipitation: 19 to 22 inches

Frost-free period: 55 to 80 days

Composition

Major Components

Cheadle and similar soils: 35 percent

Doby and similar soils: 25 percent

Rock outcrop: 25 percent

Minor Components

Fifer and similar soils: 0 to 6 percent

Teton and similar soils: 0 to 4 percent

Shedhorn and similar soils: 0 to 3 percent

Adel and similar soils: 0 to 2 percent

Major Component Description

Cheadle

Surface layer texture: Stony 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 1.6 inches

Doby

Surface layer texture: Clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.4 inches

Rock outcrop

Definition: Sandstone or 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.

904F—Cheadle-Adel-Doby complex, 15 to 60 percent slopes

Setting

Landform:

- Cheadle—Hills
- Adel—Hills
- Doby—Hills

Position on landform:

- Cheadle—Backslopes and shoulders
- Adel—Backslopes and footslopes
- Doby—Backslopes and shoulders

Slope:

- Cheadle—15 to 60 percent
- Adel—15 to 60 percent
- Doby—15 to 35 percent

Elevation: 4,600 to 6,000 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Cheadle and similar soils: 35 percent

Adel and similar soils: 30 percent

Doby and similar soils: 20 percent

Minor Components

Fifer and similar soils: 0 to 4 percent
 Teton and similar soils: 0 to 4 percent
 Bynum and similar soils: 0 to 3 percent
 Shedhorn and similar soils: 0 to 3 percent
 Gallatin and similar soils: 0 to 1 percent

Major Component Description**Cheadle**

Surface layer texture: Stony 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 1.6 inches

Adel

Surface layer texture: 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 9.3 inches

Doby

Surface layer texture: 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 2.4 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.

Chinook Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Glaciated till plains, hills, alluvial fans, and stream terraces
Parent material: Alluvium or eolian material
Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Chinook fine sandy loam, 0 to 8 percent slopes, in an area of nonirrigated cropland, 1,500 feet north and 100 feet east of the southwest corner of sec. 26, T. 28 N., R. 2 E.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; slightly alkaline; abrupt smooth boundary.

Bw—6 to 12 inches; dark yellowish brown (10YR 4/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; weak coarse prismatic structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; common very fine and fine pores; neutral; gradual smooth boundary.

Bk1—12 to 36 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; soft, very friable, nonsticky, nonplastic; many very fine roots in the lower part; few very fine tubular pores; few fine soft threadlike masses of lime; strongly effervescent; moderately alkaline; diffuse wavy boundary.

Bk2—36 to 42 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine tubular pores; few fine soft threadlike masses of lime; strongly effervescent; moderately alkaline; diffuse wavy boundary.

BC—42 to 60 inches; pale brown (10YR 6/3) loamy fine sand and fine sandy loam, brown (10YR 5/3) moist; massive; loose, nonsticky, nonplastic; few very fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to the 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

Content of rock fragments: 0 to 35 percent pebbles
Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 5 to 18 percent; more than 50 percent medium, fine, and coarser sand
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 5 to 15 percent; more than 50 percent medium, fine, and coarser sand
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 3 to 12 percent
Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 5 to 15 percent; more than 50 percent medium, fine, and coarser sand
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent—few and common masses and threads of lime
Reaction: pH 7.4 to 9.0

BC horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Fine sandy loam, sandy loam, loamy fine sand, or loamy sand
Clay content: 5 to 15 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 9.0

34C—Chinook fine sandy loam, 0 to 8 percent slopes

Setting

Landform: Till plains
Slope: 0 to 8 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Chinook and similar soils: 90 percent

Minor Components

Assinniboine and similar soils: 0 to 5 percent
Joplin and similar soils: 0 to 4 percent
Telstad and similar soils: 0 to 1 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 or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.2 inches

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

Management

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

334C—Chinook-Joplin complex, 2 to 8 percent slopes

Setting

Landform:

- Chinook—Till plains
- Joplin—Till plains

Position on landform:

- Chinook—Footslopes and toeslopes
- Joplin—Shoulders and summits

Slope:

- Chinook—2 to 8 percent
- Joplin—2 to 8 percent

Elevation: 3,200 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Chinook and similar soils: 50 percent

Joplin and similar soils: 35 percent

Minor Components

Telstad and similar soils: 0 to 8 percent

Assinniboine and similar soils: 0 to 4 percent

Kremlin and similar soils: 0 to 3 percent

Major Component Description**Chinook***Surface layer texture:* Fine sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or eolian material*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 7.2 inches**Joplin***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 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.

**434B—Chinook-Kremlin complex,
0 to 4 percent slopes****Setting***Landform:*

- Chinook—Alluvial fans and stream terraces
- Kremlin—Alluvial fans and stream terraces

Position on landform:

- Chinook—Shoulders
- Kremlin—Foothslopes and toeslopes

Slope:

- Chinook—0 to 4 percent
- Kremlin—0 to 4 percent

Elevation: 3,200 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Chinook and similar soils: 45 percent

Kremlin and similar soils: 45 percent

Minor Components

Yamacall and similar soils: 0 to 7 percent

Rothiemay and similar soils: 0 to 3 percent

Major Component Description**Chinook***Surface layer texture:* Fine sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or eolian material*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 7.2 inches**Kremlin***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.

**534D—Chinook-Twilight fine sandy
loams, 2 to 15 percent slopes****Setting***Landform:*

- Chinook—Hills
- Twilight—Hills

Position on landform:

- Chinook—Backslopes and footslopes
- Twilight—Backslopes and shoulders

Slope:

- Chinook—2 to 15 percent
- Twilight—2 to 15 percent

Elevation: 3,200 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Chinook and similar soils: 50 percent

Twilight and similar soils: 40 percent

Minor Components

Assinniboine and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 3 percent

Kremlin and similar soils: 0 to 2 percent

Major Component Description**Chinook***Surface layer texture:* Fine sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or eolian material*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 7.2 inches**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:* 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.

Crago Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate to 22 inches; moderately rapid below this depth*Landform:* Relict stream terraces and hills*Parent material:* Alluvium*Slope range:* 0 to 60 percent*Mean annual precipitation:* 11 to 14 inches*Annual air temperature:* 41 to 45 degrees F*Frost-free period:* 105 to 125 days

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

Typical Pedon

Crago gravelly loam, in an area of Niart-Crago gravelly loams, 0 to 4 percent slopes, in an area of irrigated cropland, 2,040 feet north and 400 feet west of the southeast corner of sec. 26, T. 22 N., R. 1 W.

Ap—0 to 6 inches; brown (2.5Y 5/3) gravelly loam, dark brown (2.5Y 4/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many fine vesicular pores; 15 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—6 to 10 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine irregular pores; 20 percent pebbles with lime coats; few fine and medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—10 to 22 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; common fine pores; 55 percent pebbles with lime coats on upper sides and lime crusts on undersides; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—22 to 60 inches; light gray (10YR 7/2) extremely gravelly sandy loam, pale brown (10YR 6/3) moist; single grain; loose, very friable, nonsticky, nonplastic; 60 percent pebbles and 20 percent cobbles; lime crusts on undersides of larger pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 40 to 47 degrees F

Other features: When mixed to 7 inches, the surface horizon does not meet the requirements for a mollic epipedon.

Ap horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 4 to 6 dry; 3 to 5 moist
 Chroma: 2 or 3
 Clay content: 15 to 27 percent
 Content of rock fragments: 0 to 75 percent—0 to 30 percent stones and cobbles; 0 to 45 percent pebbles
 Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 5 to 8 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam, clay loam, or sandy clay loam
 Clay content: 20 to 35 percent
 Content of 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 percent for the whole soil including coarse rock fragments less than $\frac{3}{4}$ inch in size
 Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons

Hue: 2.5Y or 10YR
 Value: 6 to 8 dry; 4 to 7 moist
 Chroma: 2 to 4
 Texture: Sandy loam, loam, sandy clay loam, or clay loam
 Clay content: 18 to 30 percent
 Content of rock fragments: 35 to 85 percent—0 to 30 percent stones and cobbles; 35 to 60 percent pebbles
 Calcium carbonate equivalent: 15 to 30 percent in the fine earth fraction; 40 to 70 percent for the whole soil including coarse rock fragments less than $\frac{3}{4}$ inch in size
 Reaction: pH 7.4 to 8.4

**15B—Crago gravelly loam,
0 to 4 percent slopes****Setting**

Landform: Relict stream terraces
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Crago and similar soils: 90 percent

Minor Components

Arrod and similar soils: 0 to 4 percent
 Niart and similar soils: 0 to 3 percent
 Rothiemay and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.2 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.

**15C—Crago gravelly loam,
4 to 8 percent slopes****Setting**

Landform: Relict stream terraces
Slope: 4 to 8 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Crago and similar soils: 90 percent

Minor Components

Arrod and similar soils: 0 to 4 percent
 Niart and similar soils: 0 to 3 percent
 Rothiemay and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.2 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.

Creed Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Creed loam, in an area of Creed-Gerdrum complex, 0 to 4 percent slopes, in an area of rangeland, 2,000 feet south and 1,800 feet east of the northwest corner of sec. 16, T. 23 N., R. 1 W.

E—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 5/2) moist; weak medium platy structure parting to moderate fine granular; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; many fine vesicular pores; common unstained silt and sand grains; slightly alkaline; abrupt wavy boundary.

B_{tn1}—5 to 10 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium columnar structure parting to moderate medium subangular blocky; very hard, firm, moderately sticky, very plastic; common very fine and fine roots; common very fine pores; common distinct clay films on faces of peds; light gray (10YR 6/1) skeletons on tops of columns; many unstained sand and silt grains on ped faces; slightly alkaline; gradual wavy boundary.

B_{tn2}—10 to 20 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate medium angular blocky; very hard, firm, moderately sticky, very plastic; common very fine and fine roots; few very fine and fine pores; common distinct clay films on faces of peds and as bridges between sand grains; slightly alkaline; clear wavy boundary.

B_{kn}—20 to 26 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist;

moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, moderately sticky, very plastic; few fine roots; few very fine and fine pores; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

B_{kny}—26 to 53 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; moderately sticky, moderately plastic; few very fine roots; common medium threadlike seams of gypsum and lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

B_{nyz}—53 to 60 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few fine threads of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to gypsum and other salts: 22 to 30 inches

E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 7 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 8.4

B_{tn} horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

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

Clay contents: 35 to 55 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm; sandy substratum phase 0 to 2 mmhos/cm

Sodium adsorption ratio: 8 to 13

Reaction: pH 6.6 to 9.0

B_{kn} and B_{kny} horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Content of rock fragments: 0 to 15 percent pebbles

Clay content: 25 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

Bnyz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Loam, clay loam, or sandy clay loam that is thinly stratified or stratified with thin layers of coarser material or silty clay loam
 Clay content: 25 to 35 percent
 Content of 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
 Reaction: pH 7.9 to 9.0

131B—Creed-Gerdrum complex, 0 to 4 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 4 percent
- Gerdrum—0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Creed and similar soils: 60 percent

Gerdrum and similar soils: 25 percent

Minor Components

Absher and similar soils: 0 to 8 percent

Ethridge and similar soils: 0 to 5 percent

Lardell and similar soils: 0 to 2 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

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.6 inches

Gerdrum

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

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

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.

137B—Creed-Absher complex, 0 to 4 percent slopes

Setting

Landform:

- Creed—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:

- Creed—Microhighs
- Absher—Microlows

Slope:

- Creed—0 to 4 percent
- Absher—0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Creed and similar soils: 60 percent

Absher and similar soils: 25 percent

Minor Components

Gerdrum and similar soils: 0 to 7 percent

Marvan and similar soils: 0 to 6 percent

Lardell and similar soils: 0 to 2 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
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.4 inches

Absher

Surface layer texture: 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
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.8 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.

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated sedimentary beds
Slope range: 2 to 45 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Delpoint loam, in an area of Cabbart-Delpoint-Rock outcrop complex, 25 to 70 percent slopes, in an area of rangeland, 2,600 feet south and 800 feet west of the northeast corner of sec. 29, T. 30 N., R. 3 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine

granular structure; slightly hard, very friable, slightly sticky, nonplastic; many fine pores; strongly effervescent; slightly alkaline; clear smooth boundary.

Bw—5 to 15 inches; pale brown (10YR 6/3) loam, dark, grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky, nonplastic; common very fine and fine roots; many very fine and fine pores; few fine threads of soft lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—15 to 25 inches; pale brown (10YR 6/3) loam, dark grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; hard, very friable, slightly sticky, nonplastic; common very fine and fine roots; many very fine and fine pores; common fine threads of soft lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr1—25 to 34 inches; mixed light brownish gray (2.5Y 6/2) and pale brown (10YR 6/3) shale; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cr2—34 to 60 inches; mixed grayish brown (2.5Y 5/2) and pale brown (10YR 6/3) siltstone interbedded with thin strata of slightly indurated sandstone; few roots between plates in upper few inches; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Soil phases: Calcareous (more than 5 percent lime)

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3 to 5 moist
 Chroma: 2 to 4
 Texture: Loam or clay loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 0 to 20 percent pebbles
 Effervescence: None to strongly
 Reaction: pH 6.6 to 8.4
 Other features: When mixed to 7 inches, the surface will not meet the requirements for a mollic epipedon.

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Loam, clay loam, or silty clay loam
 Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: None to violently

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent.

There is not more than a 5-percent difference in calcium carbonate equivalent or by volume of secondary carbonates in the underlying horizon of material to meet the requirements of a calcic horizon.

Effervescence: Strongly or violently

Reaction: pH 7.4 to 9.0

**176C—Delpoint-Cabbart loams,
2 to 15 percent slopes**

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills

Position on landform:

- Delpoint—Backslopes and footslopes
- Cabbart—Shoulders and summits

Slope:

- Delpoint—2 to 15 percent
- Cabbart—2 to 15 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 50 percent

Cabbart and similar soils: 35 percent

Minor Components

Yamacall and similar soils: 0 to 9 percent

Kremlin and similar soils: 0 to 6 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 sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.8 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

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.

**376F—Delpoint-Cabbart-Hillon complex,
25 to 60 percent slopes**

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills
- Hillon—Hills

Position on landform:

- Delpoint—Backslopes
- Cabbart—Backslopes and shoulders
- Hillon—Backslopes and shoulders

Slope:

- Delpoint—25 to 45 percent
- Cabbart—25 to 60 percent
- Hillon—25 to 60 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 40 percent

Cabbart and similar soils: 25 percent

Hillon and similar soils: 25 percent

Minor Components

Kevin and similar soils: 0 to 4 percent

Yamacall and similar soils: 0 to 4 percent

Kremlin and similar soils: 0 to 2 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 sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.8 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

Hillon

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 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.

476D—Delpoint-Kremlin-Cabbart complex, 4 to 15 percent slopes**Setting**

Landform:

- Delpoint—Hills
- Kremlin—Hills
- Cabbart—Hills

Position on landform:

- Delpoint—Backslopes and footslopes
- Kremlin—Footslopes and toeslopes
- Cabbart—Shoulders and summits

Slope:

- Delpoint—4 to 15 percent
- Kremlin—4 to 15 percent
- Cabbart—4 to 15 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Delpoint and similar soils: 35 percent

Kremlin and similar soils: 30 percent

Cabbart and similar soils: 20 percent

Minor Components

Yamacall and similar soils: 0 to 10 percent

Rothiemay 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 sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.8 inches

Kremlin

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

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

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.

576F—Delpoint-Cabbart-Crago complex, 15 to 60 percent slopes

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills
- Crago—Relict stream terraces

Position on landform:

- Delpoint—Backslopes and footslopes
- Cabbart—Backslopes and shoulders
- Crago—Shoulders

Slope:

- Delpoint—15 to 35 percent
- Cabbart—35 to 60 percent
- Crago—35 to 60 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 40 percent

Cabbart and similar soils: 25 percent

Crago and similar soils: 20 percent

Minor Components

Yamacall and similar soils: 0 to 8 percent

Rothiemay and similar soils: 0 to 5 percent

Kremlin and similar soils: 0 to 2 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 sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.8 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 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.

676C—Delpoint-Rothiemay clay loams, 2 to 8 percent slopes

Setting

Landform:

- Delpoint—Sedimentary plains
- Rothiemay—Sedimentary plains

Position on landform:

- Delpoint—Backslopes and shoulders
- Rothiemay—Footslopes

Slope:

- Delpoint—2 to 8 percent
- Rothiemay—2 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 50 percent

Rothiemay and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent

Rootel and similar soils: 0 to 3 percent

Varney and similar soils: 0 to 2 percent

Major Component Description

Delpoint

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 5.1 inches

Rothiemay

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 9.3 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.

676D—Delpoint-Rothiemay clay loams, 8 to 15 percent slopes

Setting

Landform:

- Delpoint—Hills
- Rothiemay—Hills

Position on landform:

- Delpoint—Shoulders and summits
- Rothiemay—Backslopes and footslopes

Slope:

- Delpoint—8 to 15 percent
- Rothiemay—8 to 15 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 45 percent

Rothiemay and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 6 percent

Crago and similar soils: 0 to 6 percent

Kremlin and similar soils: 0 to 3 percent

Major Component Description

Delpoint

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 5.1 inches

Rothiemay

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 9.3 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.

776C—Delpoint-Cabbart-Rootel loams, 2 to 15 percent slopes

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills
- Rootel—Hills

Position on landform:

- Delpoint—Footslopes
- Cabbart—Shoulders and summits
- Rootel—Footslopes

Slope:

- Delpoint—2 to 15 percent
- Cabbart—2 to 15 percent
- Rootel—2 to 15 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 35 percent

Cabbart and similar soils: 25 percent

Rootel and similar soils: 25 percent

Minor Components

Kremlin and similar soils: 0 to 5 percent

Marmarth and similar soils: 0 to 5 percent

Yamacall 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 sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.8 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

Rootel

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 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.

876C—Delpoint-Kremlin-Vanda complex, 2 to 15 percent slopes

Setting

Landform:

- Delpoint—Hills
- Kremlin—Hills
- Vanda—Hills

Position on landform:

- Delpoint—Backslopes and shoulders
- Kremlin—Footslopes
- Vanda—Footslopes

Slope:

- Delpoint—2 to 15 percent
- Kremlin—2 to 15 percent
- Vanda—2 to 15 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 35 percent

Kremlin and similar soils: 30 percent

Vanda and similar soils: 20 percent

Minor Components

Yamacall and similar soils: 0 to 7 percent

Marvan and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 2 percent

McKenzie and similar soils: 0 to 1 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 sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Kremlin

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

Vanda

Surface layer texture: 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.

46—Denied access

Composition

Major Components

Denied access: 100 percent

Major Component Description

Definition: Areas where mapping access was denied by the landowner

Doby Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Hills and mountain slopes
Parent material: Residuum from semiconsolidated shale
Slope range: 4 to 60 percent
Mean annual precipitation: 18 to 22 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 55 to 90 days

Taxonomic Class: Clayey, montmorillonitic, shallow Typic Cryoborolls

Typical Pedon

Doby clay loam, in an area of Bynum-Adel-Doby complex, 4 to 35 percent slopes, in an area of rangeland, 1,180 feet north and 320 feet east of the southwest corner of sec. 17, T. 26 N., R. 8 W.

A1—0 to 4 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; hard, firm, moderately sticky, moderately plastic; many fine roots; slight effervescent; slightly alkaline; clear smooth boundary.

A2—4 to 11 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to strong medium granular; hard, very firm, moderately sticky, moderately plastic; many fine roots; neutral; clear smooth boundary.

C—11 to 18 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; hard, very firm, moderately sticky, moderately plastic; few fine roots; slightly alkaline; 10 to 15 percent soft shale fragments; clear irregular boundary.

Cr—18 to 60 inches; grayish brown (10YR 5/2) semiconsolidated shale; very hard when dry and crushes under moderate pressure when wet.

Range in Characteristics

Soil temperature: 39 to 45 degrees F

Thickness of the mollic epipedon: 9 to 16 inches

Depth to the Cr horizon: 10 to 20 inches

A1 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 35 to 40 percent

Reaction: pH 6.6 to 7.8

A2 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, clay, or silty clay

Clay content: 35 to 55 percent

Reaction: pH 6.6 to 7.8

C horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 3

Texture: Clay loam, clay, or silty clay

Clay content: 35 to 55 percent

Reaction: pH 7.4 to 8.4

Dougcliff Series

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Permeability: Rapid

Landform: Stream terraces

Parent material: Peat

Slope range: 0 to 1 percent

Mean annual precipitation: 17 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 100 days

Taxonomic Class: Euic Typic Borofibrists

Typical Pedon

Dougcliff mucky peat, in an area of Winginaw-Dougcliff mucky peats, 0 to 2 percent slopes, in an area of marshland, 800 feet south and 2,500 feet west of the northeast corner of sec. 13, T. 24 N., R. 8 W.

(Colors are for moist soil unless otherwise noted.)

Oi1—0 to 3 inches; black (10YR 2/1) and black (10YR 2/1) rubbed and pressed fibric material; 80 percent fiber and raw herbaceous plant material—70 percent rubbed; massive; nonsticky, nonplastic; 75 percent lycopodium mosses and 25 percent herbaceous species; neutral (pH 7.2 in water); clear wavy boundary.

Oi2—3 to 14 inches; dark reddish brown (5YR 3/2) and dark brown (7.5YR 3/2) rubbed and pressed fibric material; 90 percent fiber—80 percent rubbed; massive; nonsticky, nonplastic; 90 percent herbaceous species and 10 percent lycopodium mosses; neutral (pH 7.0 in water); clear wavy boundary.

Oi3—14 to 38 inches; dark reddish brown (5YR 2/2) and dark reddish brown (5YR 2/2) rubbed and pressed; 85 percent fiber—80 percent rubbed; massive; nonsticky, nonplastic; neutral (pH 7.2 in water); gradual wavy boundary.

Oi4—38 to 60 inches; dark reddish brown (5YR 3/2) and dark reddish brown (5YR 3/2) rubbed and pressed; 75 percent fiber, rubbed; massive; nonsticky, nonplastic; 95 percent herbaceous species; slightly alkaline (pH 7.4 in water).

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Depth of organic material: Greater than 51 inches

Depth to the seasonal high water table: 0 to 6 inches

Other features: Some pedons have mineral materials at depths of 51 to 60 inches. Some pedons have an Oe horizon.

Oi1 horizon

Hue: 10YR or 7.5YR

Chroma: 1 or 2

Fiber content: 80 to 90 percent unrubbed, 65 to 75 percent rubbed

Reaction: pH 6.1 to 7.8

Oi2 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 85 to 95 percent unrubbed, 75 to 85 percent rubbed

Reaction: pH 6.1 to 7.8

Oi3 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 2 or 3 moist

Fiber content: 80 to 70 percent unrubbed, 70 to 80 percent rubbed

Reaction: pH 6.6 to 7.8

Oi4 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 3 moist

Fiber content: 75 to 85 percent unrubbed, 60 to 75 percent rubbed

Reaction: pH 6.1 to 7.8

Ethridge Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Alluvial fans, stream terraces, and glaciated till plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Ethridge silty clay loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 1,400 feet north and 1,800 feet west of the southeast corner of sec. 26, T. 25 N., R. 2 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, moderately sticky, moderately

plastic; many fine roots; few pebbles; common fine irregular pores; neutral; clear smooth boundary.

Bt—6 to 13 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium angular and subangular blocky; very hard, firm, very sticky, very plastic; common very fine and fine roots; common very fine tubular pores; common distinct clay films; neutral; clear wavy boundary.

Bk1—13 to 19 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky, very plastic; common very fine roots; common very fine tubular pores; thin patchy clay films on vertical faces of peds; common fine and medium soft masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk2—19 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, very sticky, moderately plastic; few very fine roots; common fine tubular and irregular pores; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—30 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, very sticky, moderately plastic; few very fine roots; common very fine tubular and irregular pores; common fine and medium soft masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bky—48 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, very sticky, moderately plastic; common very fine irregular pores; common fine soft masses of gypsum; few fine soft masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 14 inches; may include all or part of the Bt horizon.

Depth to the Bk horizon: 10 to 20 inches

Other features: In some pedons, the Bky horizon may not be stratified or present.

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Content of 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 to 4

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

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 25 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

Bky horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Clay loam, silt loam, loam, or silty clay loam (these textures consist of strata of finer and coarser materials)

Clay content: 25 to 40 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 3 percent

Reaction: pH 7.4 to 9.0

39B—Ethridge silty clay loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 6 percent

Richey and similar soils: 0 to 5 percent

Marias and similar soils: 0 to 4 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 9.8 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.

439B—Ethridge clay loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 90 percent

Minor Components

Kobase and similar soils: 0 to 4 percent

Richey and similar soils: 0 to 4 percent

Marias and similar soils: 0 to 2 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.

539B—Ethridge-Nunemaker silty clay loams, 0 to 4 percent slopes

Setting

Landform:

- Ethridge—Till plains
- Nunemaker—Till plains

Position on landform:

- Ethridge—Foothills and toeslopes
- Nunemaker—Shoulders

Slope:

- Ethridge—0 to 4 percent
- Nunemaker—0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 45 percent

Nunemaker and similar soils: 40 percent

Minor Components

Richey and similar soils: 0 to 4 percent

Scobey and similar soils: 0 to 4 percent

Kevin and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 3 percent

Nishon and similar soils: 0 to 1 percent

Major Component Description

Ethridge

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 9.9 inches

Nunemaker

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 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.

Evanston Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Evanston loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 2,500 feet south and 900 feet west of the northeast corner of sec. 3, T. 30 N., R. 3 W.

Ap—0 to 5 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; many very fine irregular pores; neutral; abrupt smooth boundary.

Bt—5 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3, rubbed, with 10YR 3/3 coats on faces of peds) moist; moderate medium prismatic parting to moderate fine and medium angular and subangular blocky; hard, friable, moderately sticky, moderately plastic; many very fine and fine roots; many very fine and fine tubular and irregular pores; few distinct clay films; slightly alkaline; clear wavy boundary.

Bk1—11 to 14 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine and fine irregular and tubular pores; common fine soft

masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—14 to 26 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, slightly plastic; few very fine roots; many very fine and fine irregular pores; many fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—26 to 36 inches; light brownish gray (10YR 6/2) fine sandy loam with thin lenses of clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; 5 percent pebbles; common fine soft masses of lime; strongly effervescent; strongly alkaline; clear wavy boundary.

BC—36 to 60 inches; grayish brown (10YR 5/2) loam with thin lenses of fine sandy loam and silty clay loam, dark grayish brown (10YR 4/2) moist; stratified; hard, friable, moderately sticky, slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 44 to 46 degrees F

Thickness of the mollic epipedon: 7 to 15 inches

Depth to the Bk horizon: 10 to 20 inches

Ap horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 3 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Clay loam or loam

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

BC horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4
 Texture: Loam, clay loam, or sandy clay loam
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic
 Argiborolls

53B—Evanston loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Evanston and similar soils: 90 percent

Minor Components

Kremlin and similar soils: 0 to 4 percent
 Chinook and similar soils: 0 to 2 percent
 Telstad and similar soils: 0 to 2 percent
 Assiniboine and similar soils: 0 to 1 percent
 Floweree and similar soils: 0 to 1 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.

Fairfield Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Mean annual precipitation: 15 to 17 inches

Typical Pedon

Fairfield clay loam, in an area of Kiev-Fairfield complex, 0 to 4 percent slopes, in an area of nonirrigated cropland, 650 feet north and 2,300 feet west of the southeast corner of sec. 17, T. 27 N., R. 6 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; strong medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; few pebbles; neutral; clear smooth boundary.

Bt—6 to 10 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium angular blocky; hard, friable, moderately sticky, moderately plastic; common fine roots; common very fine and fine pores; few distinct clay films on vertical faces and patchy on horizontal faces; scattered pebbles; slightly alkaline; clear smooth boundary.

Bk1—10 to 17 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; common very fine and fine pores; common fine soft masses of lime; 5 percent lime-coated pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—17 to 22 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots; common very fine and fine pores; many soft masses of lime; 5 percent lime-coated pebbles; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk3—22 to 30 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; many soft masses of lime; 10 percent lime-coated pebbles; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk4—30 to 60 inches; light gray (10YR 7/2) loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable, slightly sticky, slightly plastic; many

soft masses of lime; 15 percent lime-coated pebbles; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Other features: Some pedons have a Btk horizon.

Ap horizon

Hue: 10YR or 7.5YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 32 percent

Content of rock fragments: 0 to 35 percent—0 to 15 percent stones and cobbles; 0 to 20 percent pebbles

Rock fragments, surface cover: 0.01 to 0.1 percent

Reaction: pH 6.6 to 8.4

Bt horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, loam, or silty clay loam

Clay content: 30 to 35 percent

Electrical conductivity: 0 to 2 mmhos/cm

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Clay loam, loam, or silty clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 2 percent cobbles; 0 to 15 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 15 to 35 percent

Reaction: pH 7.4 to 8.4

Bk2, Bk3, and Bk4 horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Clay loam, loam, or silty clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 15 percent cobbles; 0 to 20 percent pebbles

Calcium carbonate equivalent: 10 to 25 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

Fairway Series

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Mean annual precipitation: 12 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed Fluvaquentic Haploborolls

Typical Pedon

Fairway loam, in an area of Fairway-Meadowcreek loams, 0 to 2 percent slopes, rarely flooded, in an area of native hayland, 150 feet south and 1,700 feet east of the northwest corner of sec. 13, T. 26 N., R. 8 W.

A1—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, moderately sticky, slightly plastic; many fine roots; many fine irregular pores; weakly effervescent; slightly alkaline; clear smooth boundary.

A2—9 to 15 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; common very fine and fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg1—15 to 24 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; common fine faint yellowish brown (10YR 5/4) redox concentrations; weak fine subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Cg2—24 to 42 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; common fine distinct yellowish brown (10YR 5/4) redox concentrations; massive; very hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine pores;

strongly effervescent; moderately alkaline; clear wavy boundary.

Cg₃—42 to 48 inches; light brownish gray (10YR 6/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; common fine faint yellowish brown (10YR 5/4) redox concentrations and gray (10YR 5/1) redox depletions; massive; very hard, firm, moderately sticky, moderately plastic; few fine roots in upper part; strongly effervescent; moderately alkaline; clear wavy boundary.

2C—48 to 60 inches; light brownish gray (10YR 6/2) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; nonsticky, nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 10 to 15 inches

Depth to the 2C horizon: 40 inches or more

Depth to the seasonal high water table: 36 to 60 inches

A₁ horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 15 to 27 percent

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 2 to 5 percent

Reaction: pH 6.6 to 7.8

A₂ horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 to 3

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

Clay content: 18 to 20 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 6.6 to 7.8

Cg horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 moist; 6 dry

Chroma: 1 to 3

Texture: Loam, silt loam, and silty clay loam with some thin strata of sandy loam, loamy sand, and clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 7.8

2C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 3 or 4 moist; 6 dry

Chroma: 1 or 2

Texture: Sand, loamy sand, or sandy loam

Clay content: 0 to 10 percent

Content of rock fragments: 0 to 60 percent—0 to 5 percent cobbles; 0 to 55 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 0 to 15 percent

Reaction: pH 6.6 to 7.8

125A—Fairway-Meadowcreek loams, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Fairway—Flood plains
- Meadowcreek—Flood plains

Slope:

- Fairway—0 to 2 percent
- Meadowcreek—0 to 2 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 14 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Fairway and similar soils: 50 percent

Meadowcreek and similar soils: 35 percent

Minor Components

Straw and similar soils: 0 to 6 percent

Ridgelawn and similar soils: 0 to 4 percent

Korchea and similar soils: 0 to 3 percent

Tetonview and similar soils: 0 to 2 percent

Major Component Description

Fairway

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 10.5 inches

Meadowcreek*Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat poorly drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* Rare*Water table:* Apparent*Available water capacity:* Mainly 5.7 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.

Fifer Series*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Mountain slopes*Parent material:* Interbedded shale and siltstone*Slope range:* 8 to 45 percent*Mean annual precipitation:* 18 to 20 inches*Annual air temperature:* 38 to 42 degrees F*Frost-free period:* 60 to 90 days

Taxonomic Class: Loamy, mixed, shallow Typic Cryoborolls

Typical Pedon

Fifer clay loam, in an area of Babb-Fifer-Cheadle complex, 8 to 45 percent slopes, in an area of forest land, 2,000 feet south and 300 feet east of the northwest corner of sec. 17, T. 27 N., R. 8 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) clay loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine pores; 10 percent soft shale fragments and 5 percent hard shale fragments; neutral; gradual smooth boundary.

A2—5 to 8 inches; very dark grayish brown (10YR 3/2) clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; many very fine and fine roots; many fine and medium pores; 15 percent soft shale fragments and 10 percent hard shale fragments; neutral; gradual wavy boundary.

BC—8 to 13 inches; dark gray (N 4/) channery clay loam, very dark gray (N 3/) moist; moderate thin platy structure; hard, firm, moderately sticky, moderately plastic; many very fine roots between plates; 30 percent soft shale fragments and 20 percent hard shale fragments; slightly alkaline; gradual wavy boundary.

Cr—13 inches; gray (N 5/) interbedded shale and siltstone.

Range in Characteristics*Soil temperature:* 39 to 46 degrees F*Thickness of the mollic epipedon:* 7 to 10 inches*Depth to the Cr horizon:* 10 to 20 inches**A horizons**

Hue: 2.5Y or 10YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

BC horizon

Hue: 5Y, 2.5Y, 5GY, or N

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 1 or 2

Clay content: 18 to 35 percent

Content of rock fragments: 5 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Cr horizon

Hue: 5Y, 2.5Y, 5GY, or N

Reaction: pH 7.4 to 8.4

Floweree Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Glaciated till plains and alluvial fans*Parent material:* Alluvium and glaciofluvial deposits*Slope range:* 0 to 8 percent*Mean annual precipitation:* 11 to 14 inches*Annual air temperature:* 38 to 45 degrees F*Frost-free period:* 105 to 125 days

Taxonomic Class: Fine-silty, mixed Aridic Haploborolls

Typical Pedon

Floweree silt loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 2,000 feet north and 1,500 feet west of the southeast corner of sec. 22, T. 30 N., R. 3 W.

Ap—0 to 6 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, moderately sticky, slightly plastic; common fine and medium roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—6 to 12 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common fine roots; many very fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—12 to 20 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, slightly plastic; common very fine tubular roots and few fine; few fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 36 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak prismatic structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; few threadlike soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—36 to 60 inches; pale brown (10YR 6/3) stratified silt loam and silty clay loam, dark brown (10YR 4/3) moist; weak thin platy structure; hard, friable, slightly sticky, slightly plastic; few very fine tubular pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches; may include all or the upper part of the Bw horizon.

Depth to the Bk horizon: 11 to 25 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Effervescence: None to strongly

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Effervescence: None to strongly

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silty clay loam or loam consisting of thin strata of silt loam, very fine sandy loam, and/or clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 0 to 2 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 1 to 5

Reaction: pH 7.9 to 9.0

58B—Floweree silt loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Floweree and similar soils: 90 percent

Minor Components

Lonna and similar soils: 0 to 7 percent

Kremlin and similar soils: 0 to 3 percent

Major Component Description

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

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

Management

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

458B—Floweree silty clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains
Slope: 0 to 4 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Floweree and similar soils: 90 percent

Minor Components

Lonna and similar soils: 0 to 4 percent
 Ethridge and similar soils: 0 to 3 percent
 Richey and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.3 inches

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

Management

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

Gallatin Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Mountains
Parent material: Alluvium
Slope range: 0 to 8 percent
Mean annual precipitation: 19 to 22 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 60 to 90 days

Taxonomic Class: Fine-loamy, mixed Pachic
Cryoborolls

Typical Pedon

Gallatin loam, in an area of Adel-Gallatin-Shedhorn complex, 0 to 8 percent slopes, in an area of native hayland, 500 feet south and 2,400 feet west of the northeast corner of sec. 4, T. 24 N., R. 8 W.

A1—0 to 4 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, nonsticky, slightly plastic; many very fine and common roots; few fine vesicular pores; neutral; clear smooth boundary.

A2—4 to 14 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine vesicular pores; neutral; gradual wavy boundary.

A3—14 to 23 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common fine vesicular pores; slightly alkaline; gradual wavy boundary.

Bw—23 to 28 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/6) redox concentrations; moderate fine and coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; few fine vesicular pores; slightly alkaline; gradual wavy boundary.

Bk—28 to 36 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many medium distinct light olive brown (2.5Y 5/4) redox concentrations; massive; very hard, firm,

moderately sticky, moderately plastic; common medium soft masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkg—36 to 60 inches; light gray (5Y 6/1) and (5Y 7/1) gravelly clay loam, dark gray (5Y 5/1) and (5Y 6/1) moist; many medium prominent olive yellow (2.5Y 6/6) redox concentrations; massive; extremely hard, firm, moderately sticky, moderately plastic; common medium soft masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 16 to 30 inches

Depth to the seasonal high water table: 24 to 48 inches

A1 and A2 horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.0 to 7.6

A3 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 1 or 2

Texture: Sandy clay loam, loam, or clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.0 to 7.6

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Sandy clay loam, loam, or clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.2 to 7.8

Bk horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sandy clay loam or clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bkg horizon

Hue: 5Y, 2.5Y, or 10YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 or 2

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 20 percent pebbles

Reaction: pH 7.4 to 8.4

Garlet Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Mountain slopes

Parent material: Colluvium and alpine till

Slope range: 8 to 60 percent

Mean annual precipitation: 20 to 24 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 50 to 90 days

Taxonomic Class: Loamy-skeletal, mixed Typic Cryochrepts

Typical Pedon

Garlet stony loam, in an area of Garlet-Cheadle-Loberg stony loams, 8 to 45 percent slopes, in an area of forest land, 900 feet south and 900 feet west of the northeast corner of sec. 8, T. 23 N., R. 8 W.

O—1 inch to 0; undecomposed and slightly decomposed forest litter.

E1—0 to 3 inches; grayish brown (10YR 5/2) stony loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many fine and few coarse roots; many fine vesicular pores; 20 percent stones, cobbles, and pebbles; moderately acid; clear smooth boundary.

E2—3 to 12 inches; brown (10YR 5/3) stony loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine and few coarse roots; common fine vesicular pores; 20 percent stones, cobbles, and pebbles; slightly acid; clear wavy boundary.

E/Bw—12 to 28 inches; 60 percent brown (10YR 5/3) and 40 percent pale brown (10YR 6/3) very

cobbly loam, dark brown (10YR 4/3) and brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine and few coarse roots; common fine vesicular pores; 40 percent stones, cobbles, and pebbles; neutral; gradual wavy boundary.

C1—28 to 50 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few coarse roots; few fine vesicular pores; 30 percent stones and cobbles and 20 percent pebbles; neutral; gradual wavy boundary.

C2—50 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few coarse roots; 40 percent pebbles and 30 percent stones and cobbles; neutral.

Range in Characteristics

Soil temperature: 38 to 47 degrees F

E1 horizon

Hue: 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 10 to 25 percent

Content of rock fragments: 15 to 60 percent—0 to 30 percent stones and cobbles; 5 to 45 percent pebbles

Reaction: pH 5.6 to 6.5

E2 horizon

Hue: 10YR or 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 85 percent—10 to 40 percent stones and cobbles; 25 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

E/Bw horizon

Hue: E part—10YR or 7.5YR; B part—10YR or 7.5YR

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

Chroma: 2 to 4

Texture: Sandy clay loam, sandy loam, or loam

Clay content: 10 to 25 percent

Content of rock fragments: 40 to 80 percent—15 to 40 percent stones and cobbles; 25 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

C horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Loam, sandy loam, or sandy clay loam

Clay content: 5 to 25 percent

Content of rock fragments: 45 to 80 percent—15 to 30 percent stones and cobbles; 30 to 50 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 5.6 to 8.4

493E—Garlet-Cheadle-Loberg stony loams, 8 to 45 percent slopes

Setting

Landform:

- Garlet—Mountains
- Cheadle—Mountains
- Loberg—Mountains

Position on landform:

- Garlet—Backslopes and shoulders
- Cheadle—Shoulders and summits
- Loberg—Backslopes and footslopes

Slope:

- Garlet—25 to 45 percent
- Cheadle—8 to 45 percent
- Loberg—8 to 35 percent

Elevation: 5,000 to 6,300 feet

Mean annual precipitation: 20 to 24 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Garlet and similar soils: 35 percent

Cheadle and similar soils: 25 percent

Loberg and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent

Fifer and similar soils: 0 to 5 percent

Tibson and similar soils: 0 to 2 percent

Major Component Description

Garlet

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.3 inches

Cheadle

Surface layer texture: Stony 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 1.6 inches

Loberg

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 5.1 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.

Gerdrum Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Gerdrum clay loam, in an area of Gerdrum-Absher clay loams, 0 to 2 percent slopes, in an area of rangeland, 1,100 feet north and 700 feet west of the southeast corner of sec. 20, T. 23 N., R. 1 W.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common unstained silt and sand grains; slightly alkaline; abrupt smooth boundary.

Btn1—3 to 7 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parting to moderate fine and medium subangular blocky; extremely hard, very firm, moderately sticky, very plastic; common very fine and fine roots; few fine tubular pores; few coats of unstained sand and silt grains on tops of columns; common distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

Btn2—7 to 15 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; extremely hard, very firm, moderately sticky, very plastic; common fine roots; few very fine tubular pores; common distinct clay films on faces of peds; slightly alkaline; clear wavy boundary.

Btnk—15 to 25 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, moderately sticky, very plastic; few very fine roots; few very fine tubular pores; few faint clay films on faces of peds; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bknyz—25 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine tubular pores; common fine and medium soft masses of gypsum and other salts; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz—36 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, very sticky, very plastic; few very fine pores; common fine and medium soft seams of gypsum and other salts; weakly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Btnk horizon: 10 to 24 inches
Depth to gypsum: 10 to 28 inches

E horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4 to 6 moist
 Chroma: 2 or 3
 Clay content: 20 to 27 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Btn1 horizon

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Clay, silty clay, or silty clay loam
 Clay content: 35 to 55 percent
 Content of rock fragments: 0 to 10 percent pebbles
 Hardness: Extremely or very hard when dry
 Electrical conductivity: 1 to 8 mmhos/cm
 Sodium adsorption ratio: 10 to 20
 Reaction: pH 7.4 to 9.0

Btn2 horizon

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Clay, silty clay, or silty clay loam
 Clay content: 35 to 55 percent
 Content of rock fragments: 0 to 10 percent pebbles
 Hardness: Extremely or very hard when dry
 Electrical conductivity: 1 to 8 mmhos/cm
 Sodium adsorption ratio: 10 to 20
 Reaction: pH 7.4 to 9.0

Btnk horizon

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

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

**114A—Gerdrum-Absher clay loams,
0 to 2 percent slopes****Setting***Landform:*

- Gerdrum—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:

- Gerdrum—Microhighs
- Absher—Microlows

Slope:

- Gerdrum—0 to 2 percent
- Absher—0 to 2 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Gerdrum and similar soils: 50 percent

Absher and similar soils: 35 percent

Minor Components

Creed and similar soils: 0 to 8 percent

Marvan and similar soils: 0 to 5 percent

McKenzie and similar soils: 0 to 2 percent

Major Component Description**Gerdrum**

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

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.1 inches

Absher

Surface layer texture: 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

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

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.

Hanson Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces and hills

Parent material: Alluvium derived from limestone and argillite

Slope range: 0 to 35 percent

Mean annual precipitation: 18 to 20 inches

Annual air temperature: 38 to 41 degrees F

Frost-free period: 60 to 90 days

Taxonomic Class: Loamy skeletal, carbonatic Calcic Cryoborolls

Typical Pedon

Hanson very cobbly loam, in an area of Hanson-Raynesford complex, 0 to 4 percent slopes, in an area of rangeland, 2,600 feet south and 1,250 feet west of the northeast corner of sec. 11, T. 27 N., R. 9 W.

A—0 to 6 inches; grayish brown (10YR 4/2) very cobbly loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; 20 percent limestone pebbles, 15 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

Bk1—6 to 10 inches; grayish brown (10YR 5/2) very cobbly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; 20 percent limestone pebbles and 10 percent cobbles; common fine and medium soft masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—10 to 18 inches; light brownish gray (10YR 6/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; 35 percent limestone pebbles and 10 percent

cobbles; many fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—18 to 60 inches; light gray (10YR 7/2) extremely gravelly loam, brown (10YR 5/3) moist; massive structure; slightly hard, very friable, slightly sticky, nonplastic; few very fine roots; 60 percent limestone pebbles and 10 percent cobbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 37 to 44 degrees F

Thickness of the mollic epipedon: 8 to 16 inches

Depth to the calcic horizon: 8 to 16 inches

A horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 27 percent

Content of rock fragments: 5 to 50 percent—0 to 25 percent stones and cobbles; 5 to 45 percent pebbles or channers

Surface stones, cover: 0 to 0.1 percent

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 to 8 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Content of rock fragments: 35 to 80 percent—20 to 55 percent stones and cobbles; 15 to 25 percent pebbles or channers

Calcium carbonate equivalent: 30 to 40 percent in less than 2-mm particle-size fraction; more than 40 percent in the less than 20-mm particle-size fraction

Reaction: pH 7.4 to 8.4

2Bk2 and 2C horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Content of rock fragments: 35 to 90 percent—10 to 30 percent stones and cobbles; 25 to 60 percent pebbles or channers

Calcium carbonate equivalent: 15 to 30 percent in the less than 2-mm particle-size fraction; more than 40 percent in the less than 20-mm fraction

Reaction: pH 7.4 to 8.4

195B—Hanson-Raynesford complex, 0 to 4 percent slopes

Setting

Landform:

- Hanson—Stream terraces
- Raynesford—Stream terraces

Slope:

- Hanson—0 to 4 percent
- Raynesford—0 to 4 percent

Elevation: 4,600 to 5,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Hanson and similar soils: 50 percent

Raynesford and similar soils: 35 percent

Minor Components

Shedhorn and similar soils: 0 to 8 percent

Sebud and similar soils: 0 to 6 percent

Gallatin and similar soils: 0 to 1 percent

Major Component Description

Hanson

Surface layer texture: Very 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 4.7 inches

Raynesford

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 6.7 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.

495B—Hanson very cobbly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 4,600 to 5,600 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Hanson and similar soils: 85 percent

Minor Components

Raynesford and similar soils: 0 to 8 percent

Tibson and similar soils: 0 to 5 percent

Shedhorn and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Very cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

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.

403—Haploborolls-Argiborolls complex, 0 to 4 percent slopes, rarely flooded

Setting

Landform:

- Haploborolls—Alluvial fans

- Argiborolls—Alluvial fans

Slope:

- Haploborolls—0 to 4 percent

- Argiborolls—0 to 4 percent

Elevation: 3,300 to 4,600 feet

Mean annual precipitation: 12 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Haploborolls and similar soils: 45 percent

Argiborolls and similar soils: 40 percent

Minor Components

Lardell and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 2 percent

Kevin and similar soils: 0 to 2 percent

Kremlin and similar soils: 0 to 2 percent

Richey and similar soils: 0 to 2 percent

Scobey and similar soils: 0 to 2 percent

Major Component Description

Haploborolls

Dominant parent material: Alluvium

Flooding: Rare

Argiborolls

Dominant parent material: Glaciofluvial deposits

Flooding: Rare

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.

Harlake Series

Depth class: Very deep (more than 60 inches)

Permeability: Slow

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 95 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Harlake clay loam, 0 to 4 percent slopes, rarely flooded, in an area of nonirrigated cropland, 250 feet south and 2,500 feet west of the northeast corner of sec. 17, T. 23 N., R. 5 W.

A—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, friable, moderately sticky, moderately

plastic; many fine and few medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C—5 to 15 inches; light brownish gray (10YR 6/2) silty clay loam, brown (10YR 4/3) moist; moderate medium granular structure; hard, firm, moderately sticky, moderately plastic; many fine roots; common fine pores; violently effervescent; moderately alkaline; gradual wavy boundary.

Cz—15 to 60 inches; pale brown (10YR 6/3) silty clay loam consisting of thin strata of silt loam and clay, brown (10YR 5/3) moist; massive; hard, firm, moderately sticky, moderately plastic; many fine and few very fine roots; few fine pores; common fine masses of salts; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Other features: Some pedons have a thin dark-colored surface about 4-inches thick that has values of 4 or 5 dry; 3 moist, and chroma of 2 or 3.

A horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 30 to 40 percent

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 0 to 4

Calcium carbonate equivalent: 0 to 5 percent

Effervescence: Slightly or strongly

Reaction: pH 6.6 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 55 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 0 to 5

Calcium carbonate equivalent: 2 to 10 percent

Effervescence: Slightly or violently

Reaction: pH 7.4 to 9.0

Cz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam, loam, clay loam, or fine sandy loam consisting of stratified layers of silty clay loam, silt loam, and fine sandy loam

Clay content: 15 to 35 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 0 to 13
 Calcium carbonate equivalent: 2 to 10 percent
 Effervescence: Strongly or violently
 Reaction: pH 7.9 to 9.0

406—Harlake clay loam, 0 to 4 percent slopes, rarely flooded

Setting

Landform: Flood plains
Slope: 0 to 4 percent
Elevation: 3,300 to 4,600 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 95 to 125 days

Composition

Major Components

Harlake and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 6 percent
 Harlake, poorly drained: 0 to 5 percent
 Ryell and similar soils: 0 to 4 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: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Available water capacity: Mainly 6.3 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.

Havre Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 125 days

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

Typical Pedon

Havre loam, in an area of Havre-Ryell loams, 0 to 2 percent slopes, rarely flooded, in an area of nonirrigated cropland, 1,300 feet south and 600 feet west of the northeast corner of sec. 14, T. 24 N., R. 5 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—8 to 20 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine and medium pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—20 to 60 inches; light brownish gray (10YR 6/2) loam consisting of thin strata of clay loam, fine sandy loam, and silt loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine roots in upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 15 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 7.4 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 consisting 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
 Effervescence: Slightly or strongly

Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 5
 Reaction: pH 7.4 to 9.0

C2 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 consisting 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
 Effervescence: Slightly or strongly
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 5
 Reaction: pH 7.4 to 9.0

7A—Havre loam, 0 to 2 percent slopes, rarely flooded**Setting**

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Havre and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 5 percent
 Harlake and similar soils: 0 to 4 percent
 Rivra and similar soils: 0 to 3 percent
 Ryell and similar soils: 0 to 3 percent

Major Component Description

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

107A—Havre-Ryell loams, 0 to 2 percent slopes, rarely flooded**Setting***Landform:*

- Havre—Flood plains
- Ryell—Flood plains

Slope:

- Havre—0 to 2 percent
- Ryell—0 to 2 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Havre and similar soils: 55 percent
 Ryell and similar soils: 35 percent

Minor Components

Areas of riverwash: 0 to 5 percent
 Rivra and similar soils: 0 to 3 percent
 Fairway 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: Rare
Available water capacity: Mainly 9.8 inches

Ryell

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 5.3 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.

400—Havre-Fairway loams, 0 to 4 percent slopes, rarely flooded

Setting

Landform:

- Havre—Flood plains
- Fairway—Flood plains

Slope:

- Havre—0 to 4 percent
- Fairway—0 to 2 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Havre and similar soils: 45 percent

Fairway and similar soils: 40 percent

Minor Components

Meadowcreek and similar soils: 0 to 5 percent

Ryell and similar soils: 0 to 3 percent

Tetonview and similar soils: 0 to 3 percent

Rivra and similar soils: 0 to 2 percent

Birchfield 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: Rare

Available water capacity: Mainly 9.8 inches

Fairway

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 8.9 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.

Hillon Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Glaciated till plains and hills

Parent material: Glacial till

Slope range: 2 to 60 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Hillon clay loam, in an area of Delpoint-Cabbart-Hillon complex, 25 to 60 percent slopes, in an area of rangeland, 1,600 feet south and 500 feet west of the northeast corner of sec. 17, T. 29 N., R. 3 W.

A—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, moderately sticky, slightly plastic; common fine and medium roots; many fine irregular pores; 5 percent pebbles; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—5 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; common fine roots; many fine tubular pores; common soft masses of lime; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—32 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky, very plastic; few very fine roots; many very fine and fine tubular pores; common soft masses of lime; 5 percent pebbles; strongly effervescent; strongly alkaline; gradual smooth boundary.

Cy—45 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark brownish gray (2.5Y 4/2) moist; massive; hard, firm, very sticky, very plastic; few very fine roots; common very fine tubular pores; few fine seams and threadlike masses of

gypsum; few lignite chips; 10 percent pebbles; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Depth to accumulated carbonates: 3 to 9 inches

Moist bulk density of till: 1.55 to 1.75 g/cm³

Other features: When mixed to 7 inches, the surface layer will not meet the color requirements for a mollic epipedon.

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 25 percent—0 to 10 percent stones and cobbles; 0 to 15 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Effervescence: None to violently

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent with 25 to 35 percent fine and coarser sand

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: Strongly or violently

Moist bulk density: 1.55 to 1.75 g/cm³

Reaction: pH 7.9 to 9.0

Cy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent with 25 to 35 percent fine and coarser sand

Content of rock fragments: 0 to 15 percent pebbles

Moist bulk density: 1.55 to 1.75 g/cm³

Calcium carbonate equivalent: 2 to 15 percent

Effervescence: Strongly to violently

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.9 to 9.0

61F—Hillon clay loam, 15 to 60 percent slopes

Setting

Landform: Hills

Slope: 15 to 60 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 110 to 125 days

Composition

Major Components

Hillon and similar soils: 85 percent

Minor Components

Kevin and similar soils: 0 to 6 percent

Joplin and similar soils: 0 to 3 percent

Yawdim and similar soils: 0 to 3 percent

Abor and similar soils: 0 to 2 percent

Kobase and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 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.

161F—Hillon-Yawdim complex, 15 to 45 percent slopes

Setting

Landform:

- Hillon—Hills

- Yawdim—Hills

Position on landform:

- Hillon—Backslopes and footslopes

- Yawdim—Backslopes and shoulders

Slope:

- Hillon—15 to 45 percent
- Yawdim—15 to 45 percent

Elevation: 3,200 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Hillon and similar soils: 50 percent

Yawdim and similar soils: 35 percent

Minor Components

Kevin and similar soils: 0 to 5 percent

Abor and similar soils: 0 to 4 percent

Kobase and similar soils: 0 to 3 percent

Megenot and similar soils: 0 to 3 percent

Major Component Description**Hillon***Surface layer texture:* Clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.9 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.

**163D—Hillon-Kevin clay loams,
8 to 15 percent slopes****Setting***Landform:*

- Hillon—Hills
- Kevin—Hills

Position on landform:

- Hillon—Shoulders
- Kevin—Backslopes and footslopes

Slope:

- Hillon—8 to 15 percent
- Kevin—8 to 15 percent

Elevation: 3,200 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Hillon and similar soils: 45 percent

Kevin and similar soils: 40 percent

Minor Components

Scobey and similar soils: 0 to 9 percent

Yawdim and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 2 percent

Major Component Description**Hillon***Surface layer texture:* Clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.9 inches**Kevin***Surface layer texture:* Clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 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.

257E—Hillon-Lambeth complex, 15 to 35 percent slopes

Setting

Landform:

- Hillon—Hills
- Lambeth—Hills

Position on landform:

- Hillon—Backslopes and footslopes
- Lambeth—Shoulders and summits

Slope:

- Hillon—15 to 35 percent
- Lambeth—15 to 35 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Hillon and similar soils: 45 percent

Lambeth and similar soils: 45 percent

Minor Components

Kevin and similar soils: 0 to 5 percent

Lonna and similar soils: 0 to 5 percent

Major Component Description

Hillon

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Lambeth

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 11.4 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.

Joplin Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Glaciated till plains

Parent material: Glacial till

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Joplin loam, in an area of Telstad-Joplin loams, 4 to 8 percent slopes, in an area of nonirrigated cropland, 1,750 feet south and 150 feet east of the northwest corner of sec. 17, T. 26 N., R. 3 W.

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

Bt—6 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium angular and subangular blocky; hard, friable, moderately sticky, moderately plastic; common fine roots; common very fine and fine tubular pores; few distinct clay films; slightly alkaline; clear smooth boundary.

Btk—9 to 18 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine and fine pores; few faint clay films; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—18 to 33 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, moderately sticky, slightly plastic; few very fine roots; common very fine and fine irregular pores; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—33 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, moderately sticky, slightly plastic; few soft masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to secondary lime: 7 to 10 inches

Other features: Some pedons have a Bky horizon.

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 0 to 60 percent—0 to 40 percent cobbles; 5 to 20 percent pebbles

Effervescence: None to violently

Electrical conductivity: 0 to 4 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: Loam or clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 7.8

Btk and Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Content of rock fragments: 0 to 35 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 0 to 5 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

BC horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Content of rock fragments: 0 to 35 percent pebbles

Moist bulk density: 1.6 to 1.8 g/cm³

Gypsum: 0 to 5 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 8.4

Judith Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate to 24 inches; moderately rapid below this depth

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, carbonatic Typic Calciborolls

Typical Pedon

Judith loam, in an area of Judith-Windham complex, 0 to 4 percent slopes, in an area of rangeland, 700 feet north and 1,850 feet east of the southwest corner of sec. 28, T. 26 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—5 to 10 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable, slightly sticky, slightly plastic; many fine roots; many very fine and fine pores; 5 percent pebbles with lime coats on undersides; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—10 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium

prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky, moderately plastic; common very fine and fine roots; common fine distinct soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—14 to 24 inches; light gray (10YR 7/2) gravelly clay loam, pale brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky, moderately plastic; few very fine and fine roots; common very fine pores; 20 percent pebbles; lime coats on undersides of larger pebbles; many fine and medium soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk3—24 to 38 inches; pale brown (10YR 6/3) very gravelly loam, pale brown (10YR 5/3) moist; massive; hard, friable, slightly sticky, moderately plastic; few very fine and fine roots; 50 percent pebbles and 10 percent cobbles; lime coats on pebbles with lime crusts on undersides of larger pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk4—38 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy clay loam, pale brown (10YR 5/3) moist; massive; hard, friable, slightly sticky, slightly plastic; 60 percent pebbles and 10 percent cobbles; lime coats on pebbles with lime crusts on undersides of larger pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the calcic horizon: 9 to 12 inches

Depth to the 2Bk3 horizon: Mainly 23 to 32 inches but ranges from 23 to 38 inches

A horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles
Reaction: pH 7.9 to 8.4

Bk horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 35 percent (10 to 20 percent noncarbonate clay)

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles

Calcium carbonate content: 40 to 60 percent

Reaction: pH 7.9 to 8.4

2Bk horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent (10 to 20 percent noncarbonate clay)

Content of rock fragments: 35 to 80 percent—10 to 20 percent cobbles; 25 to 60 percent pebbles

Calcium carbonate content: 40 to 60 percent

Reaction: pH 7.9 to 9.0

20B—Judith loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Judith and similar soils: 85 percent

Minor Components

Windham and similar soils: 0 to 6 percent

Kiev and similar soils: 0 to 5 percent

Utica and similar soils: 0 to 3 percent

Arrod and similar soils: 0 to 1 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 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.

120B—Judith-Kiev loams, 0 to 4 percent slopes

Setting

Landform:

- Judith—Stream terraces
- Kiev—Stream terraces

Slope:

- Judith—0 to 4 percent
- Kiev—0 to 4 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Judith and similar soils: 45 percent

Kiev and similar soils: 45 percent

Minor Components

Windham and similar soils: 0 to 7 percent

Arrod and similar soils: 0 to 3 percent

Major Component Description

Judith

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 6.2 inches

Kiev

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 10.3 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.

120C—Judith-Kiev loams, 4 to 8 percent slopes

Setting

Landform:

- Judith—Stream terraces
- Kiev—Stream terraces

Slope:

- Judith—4 to 8 percent
- Kiev—4 to 8 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Judith and similar soils: 45 percent

Kiev and similar soils: 45 percent

Minor Components

Windham and similar soils: 0 to 5 percent

Roundor and similar soils: 0 to 3 percent

Arrod and similar soils: 0 to 2 percent

Major Component Description

Judith

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 6.2 inches

Kiev

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 10.3 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.

220B—Judith-Windham complex, 0 to 4 percent slopes

Setting

Landform:

- Judith—Stream terraces
- Windham—Stream terraces

Slope:

- Judith—0 to 4 percent
- Windham—0 to 4 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Judith and similar soils: 50 percent

Windham and similar soils: 40 percent

Minor Components

Utica and similar soils: 0 to 4 percent

Kiev and similar soils: 0 to 3 percent

Shawmut and similar soils: 0 to 3 percent

Major Component Description

Judith

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 6.0 inches

Windham

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 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.

220C—Judith-Windham complex, 4 to 8 percent slopes

Setting

Landform:

- Judith—Stream terraces
- Windham—Stream terraces

Slope:

- Judith—4 to 8 percent
- Windham—4 to 8 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Judith and similar soils: 50 percent

Windham and similar soils: 40 percent

Minor Components

Utica and similar soils: 0 to 4 percent

Kiev and similar soils: 0 to 3 percent

Shawmut and similar soils: 0 to 3 percent

Major Component Description

Judith

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 6.0 inches

Windham

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 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.

620C—Judith-Windham cobbly loams, 0 to 8 percent slopes

Setting

Landform:

- Judith—Stream terraces
- Windham—Stream terraces

Slope:

- Judith—0 to 8 percent
- Windham—0 to 8 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Judith and similar soils: 45 percent

Windham and similar soils: 40 percent

Minor Components

Shawmut and similar soils: 0 to 7 percent

Kiev and similar soils: 0 to 4 percent

Utica and similar soils: 0 to 4 percent

Major Component Description

Judith

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 5.8 inches

Windham

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 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.

Kevin Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Glaciated till plains and hills

Parent material: Glacial till

Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Kevin clay loam, in an area of Scobey-Kevin clay loams, 4 to 8 percent slopes, in an area of nonirrigated cropland, 1,500 feet north and 200 feet east of the southwest corner of sec. 9, T. 25 N., R. 2 W.

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

Bt—6 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many very fine and fine roots; many very fine and fine tubular pores; few pebbles; common distinct clay films on peds; neutral; clear wavy boundary.

Bk1—9 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many very fine and fine tubular pores; few fine soft masses of lime; few pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—14 to 34 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; very hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; few very fine tubular and irregular pores; many fine and medium soft masses of lime; few pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky—34 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, moderately sticky, moderately plastic; few fine soft masses of lime; common fine and medium threadlike masses of gypsum in cracks; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the Bk horizon: 7 to 10 inches

Moist bulk density of till: 1.6 to 1.8 g/cm³

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

Chroma: 2 or 3

Clay content: 27 to 32 percent

Content of rock fragments: 0 to 60 percent—0 to 10 percent cobbles; 0 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Moist bulk density: 1.55 to 1.75 g/cm³

Calcium carbonate equivalent: .5 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bky horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Moist bulk density: 1.55 to 1.75 g/cm³

Calcium carbonate equivalent: 2 to 10 percent

Gypsum: 1 to 4 percent

Reaction: pH 7.9 to 8.4

163C—Kevin-Hillon clay loams, 2 to 8 percent slopes

Setting

Landform:

- Kevin—Till plains
- Hillon—Till plains

Position on landform:

- Kevin—Foothills
- Hillon—Shoulders

Slope:

- Kevin—2 to 8 percent
- Hillon—2 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kevin and similar soils: 45 percent

Hillon and similar soils: 40 percent

Minor Components

Scobey and similar soils: 0 to 8 percent

Ethridge and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 2 percent

McKenzie and similar soils: 0 to 1 percent

Nishon soils: 0 to 1 percent

Major Component Description

Kevin

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.2 inches

Hillon

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 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.

Kiev Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces and hills

Parent material: Alluvium

Slope range: 0 to 35 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Calciborolls

Typical Pedon

Kiev loam, in an area of Kiev-Roundor loams, 2 to 15 percent slopes, in an area of rangeland, 2,600 feet south and 400 feet east of the northwest corner of sec. 19, T. 28 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure in the upper part grading to moderate medium granular in the lower part; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many vesicular pores; 5 percent pebbles; neutral; clear smooth boundary.

Bw—5 to 14 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine and fine pores; 5 percent pebbles; slightly effervescent; slightly alkaline; clear wavy boundary.

Bk1—14 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist;

weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine pores; few pebbles; strongly effervescent; common fine soft masses of lime; moderately alkaline; gradual wavy boundary.

Bk2—28 to 60 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; few very fine and fine roots; common very fine pores; violently effervescent; common medium soft masses of lime; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the calcic horizon: 7 to 18 inches

A horizon

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

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 20 percent stones and cobbles; 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Reaction: pH 7.4 to 7.8

Bw horizon

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

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or silt loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 25 percent—0 to 10 percent cobbles; 0 to 15 percent pebbles

Effervescence: Slightly to violently

Reaction: pH 7.4 to 8.4

Bk horizons

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

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 25 percent—0 to 10 percent cobbles; 0 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Effervescence: Strongly or violently

Reaction: pH 7.4 to 8.4

**117B—Kiev-Fairfield complex,
0 to 4 percent slopes****Setting***Landform:*

- Kiev—Stream terraces
- Fairfield—Stream terraces

Slope:

- Kiev—0 to 4 percent
- Fairfield—0 to 4 percent

Elevation: 3,800 to 4,600 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 90 to 110 days**Composition****Major Components**

Kiev and similar soils: 50 percent

Fairfield and similar soils: 40 percent

Minor Components

Judith and similar soils: 0 to 10 percent

Major Component Description**Kiev***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 10.3 inches**Fairfield***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 9.1 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.

**121B—Kiev-Judith gravelly loams,
0 to 4 percent slopes****Setting***Landform:*

- Kiev—Stream terraces
- Judith—Stream terraces

Slope:

- Kiev—0 to 4 percent
- Judith—0 to 4 percent

Elevation: 3,800 to 4,600 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 90 to 110 days**Composition****Major Components**

Kiev and similar soils: 50 percent

Judith and similar soils: 45 percent

Minor Components

Windham and similar soils: 0 to 3 percent

Arrod and similar soils: 0 to 1 percent

Fairfield and similar soils: 0 to 1 percent

Major Component Description**Kiev***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.0 inches**Judith***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.8 inches

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

Management

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

184D—Kiev-Roundor loams, 2 to 15 percent slopes

Setting

Landform:

- Kiev—Hills
- Roundor—Hills

Position on landform:

- Kiev—Foothills
- Roundor—Backslopes and foothills

Slope:

- Kiev—2 to 15 percent
- Roundor—2 to 15 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Kiev and similar soils: 50 percent

Roundor and similar soils: 35 percent

Minor Components

Amor and similar soils: 0 to 8 percent

Cabbart and similar soils: 0 to 5 percent

Judith and similar soils: 0 to 2 percent

Major Component Description

Kiev

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 10.3 inches

Roundor

Surface layer texture: 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 5.3 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.

284D—Kiev-Roundor gravelly loams, 2 to 15 percent slopes

Setting

Landform:

- Kiev—Hills
- Roundor—Hills

Position on landform:

- Kiev—Foothills
- Roundor—Backslopes and foothills

Slope:

- Kiev—2 to 15 percent
- Roundor—2 to 15 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Kiev and similar soils: 45 percent

Roundor and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 7 percent

Judith and similar soils: 0 to 4 percent

Windham and similar soils: 0 to 4 percent

Major Component Description

Kiev

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Roundor

Surface layer texture: Gravelly 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 5.1 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.

475F—Kiev-Roundor-Windham complex, 15 to 45 percent slopes

Setting

Landform:

- Kiev—Hills
- Roundor—Hills
- Windham—Hills

Position on landform:

- Kiev—Backslopes and footslopes
- Roundor—Backslopes
- Windham—Risers

Slope:

- Kiev—15 to 35 percent
- Roundor—15 to 45 percent
- Windham—25 to 45 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Kiev and similar soils: 40 percent

Roundor and similar soils: 30 percent

Windham and similar soils: 15 percent

Minor Components

Amor and similar soils: 0 to 7 percent

Cabbart and similar soils: 0 to 4 percent

Judith and similar soils: 0 to 4 percent

Major Component Description

Kiev

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 10.3 inches

Roundor

Surface layer texture: 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 5.3 inches

Windham

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 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.

784C—Kiev-Winifred-Vanda complex, 0 to 15 percent slopes

Setting

Landform:

- Kiev—Hills
- Winifred—Hills
- Vanda—Alluvial fans

Position on landform:

- Kiev—Footslopes
- Winifred—Backslopes and footslopes

Slope:

- Kiev—0 to 15 percent
- Winifred—0 to 15 percent
- Vanda—0 to 15 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 17 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Kiev and similar soils: 40 percent

Winifred and similar soils: 25 percent

Vanda and similar soils: 20 percent

Minor Components

Linwell and similar soils: 0 to 7 percent
 Amor and similar soils: 0 to 4 percent
 Roundor and similar soils: 0 to 3 percent
 McKenzie and similar soils: 0 to 1 percent

Major Component Description**Kiev**

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 10.2 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 3.9 inches

Vanda

Surface layer texture: 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.

Kobase Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans and glaciated till plains
Parent material: Alluvium
Slope range: 0 to 15 percent
Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Kobase silty clay loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 2,000 feet north and 500 feet west of the southeast corner of sec. 30, T. 25 N., R. 3 W.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; slightly hard, very friable, moderately sticky, moderately plastic; common fine and medium roots; 5 percent pebbles; many fine irregular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw1—6 to 14 inches; olive (5Y 5/3) silty clay, olive (5Y 4/3) moist; weak medium prismatic structure parting to moderate fine and medium angular blocky; very hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw2—14 to 24 inches; olive (5Y 5/3) clay, olive (5Y 4/3) moist; moderate medium prismatic structure parting to moderate medium angular and subangular blocky; very fine roots; common very fine and fine pores; few pressure faces; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—24 to 28 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; common very fine and fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bky—28 to 36 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few fine soft masses of lime; common fine and medium threads of gypsum crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

By—36 to 60 inches; mixed color of pale yellow (2.5Y 7/4) and light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; massive; very hard, firm, very

sticky, very plastic; 5 percent pebbles; common fine masses and seams of gypsum crystals; few soft chips of lignite; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Bk horizon: 12 to 17 inches

Depth to the Bky horizon: 20 to 40 inches

Soil phases: Moist

Other features: Some pedons have a C horizon. The 1 chromas are lithochromic in the B horizons. Some pedons have thin strata of silt loam or loam below depths of 40 inches and a BCy or Byz horizon.

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or clay loam

Clay content: 27 to 40 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

Bw horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Sodium adsorption ratio: 0 to 10

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 9.0

Bky horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Sodium adsorption ratio: 0 to 10

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

By horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Sodium adsorption ratio: 1 to 20

Electrical conductivity: 0 to 8 mmhos/cm

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

40B—Kobase silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kobase and similar soils: 90 percent

Minor Components

Ethridge and similar soils: 0 to 4 percent

Marias and similar soils: 0 to 4 percent

Abor and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

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, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kobase and similar soils: 90 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent

Marias and similar soils: 0 to 3 percent

Abor and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

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.

240B—Kobase-Marias complex, 0 to 4 percent slopes

Setting

Landform:

- Kobase—Till plains
- Marias—Till plains

Slope:

- Kobase—0 to 4 percent
- Marias—0 to 4 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kobase and similar soils: 55 percent

Marias and similar soils: 35 percent

Minor Components

Linnet and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 3 percent

Nishon soils: 0 to 2 percent

Richey and similar soils: 0 to 1 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

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 9.7 inches

Marias

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

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.

541C—Kobase-Ethridge clay loams, 4 to 8 percent slopes

Setting

Landform:

- Kobase—Alluvial fans
- Ethridge—Alluvial fans

Position on landform:

- Kobase—Backslopes and footslopes
- Ethridge—Footslopes

Slope:

- Kobase—4 to 8 percent
- Ethridge—4 to 8 percent

Elevation: 3,200 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Kobase and similar soils: 50 percent

Ethridge and similar soils: 35 percent

Minor Components

Linnet and similar soils: 0 to 6 percent

Marias and similar soils: 0 to 5 percent

Richey and similar soils: 0 to 4 percent

Major Component Description**Kobase***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*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 9.6 inches**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

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 (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Flood plains*Parent material:* Alluvium*Slope range:* 0 to 2 percent*Mean annual precipitation:* 15 to 19 inches*Annual air temperature:* 40 to 44 degrees F*Frost-free period:* 90 to 110 days

Taxonomic Class: Fine-loamy, mixed (calcareous) frigid Mollic Ustifluvents

Typical Pedon

Korchea loam, in an area of Korchea-Ridgelawn loams, 0 to 2 percent slopes, rarely flooded, in an area of irrigated grass-hay meadowland, 2,100 feet south and 2,000 feet west of the northeast corner of sec. 29, T. 23 N., R. 6 W.

- A—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky, nonplastic; many roots; many vesicular pores; slightly effervescent; moderately alkaline; clear smooth boundary.
- C1—8 to 16 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; stratified; weak fine and medium granular structure in individual strata; soft, very friable, slightly sticky, nonplastic; many fine roots; common vesicular pores; strongly effervescent; moderately alkaline; clear wavy boundary.
- C2—16 to 29 inches; grayish brown (10YR 5/2) loam with thin lenses of fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, slightly sticky, nonplastic; common very fine roots; common vesicular pores; strongly effervescent; slightly alkaline; clear wavy boundary.
- C3—29 to 48 inches; grayish brown (10YR 5/2) fine sandy loam with thin lenses of loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, slightly sticky, nonplastic; few very fine roots; common vesicular pores; strongly effervescent; slightly alkaline; clear wavy boundary.
- C4—48 to 60 inches; grayish brown (10YR 5/2) loam with few fine faint yellowish brown (10YR 5/4) mottles; massive; soft, very friable, slightly sticky, nonplastic; strongly effervescent; slightly alkaline.

Range in Characteristics*Soil temperature:* 42 to 47 degrees F

Other features: Some pedons have layers of coarser or finer textures at depths of 40 to 60 inches.

A horizon

Hue: 10YR or 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent
Reaction: pH 6.6 to 8.4

C horizons

Hue: 2.5Y or 10YR
Value: 4 to 7 dry; 3 to 6 moist
Chroma: 2 to 4
Texture: Loam, silt loam, fine sandy loam, sandy loam, or very fine sandy loam
Clay content: 18 to 27 percent
Reaction: pH 7.4 to 8.4

108A—Korchea-Ridgelawn loams, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Korchea—Flood plains
- Ridgelawn—Flood plains

Slope:

- Korchea—0 to 2 percent
- Ridgelawn—0 to 2 percent

Elevation: 3,800 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Korchea and similar soils: 50 percent
Ridgelawn and similar soils: 35 percent

Minor Components

Korchea and similar soils: 0 to 5 percent
Nesda and similar soils: 0 to 5 percent
Straw and similar soils: 0 to 5 percent

Major Component Description

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

Ridgelawn

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 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.

208A—Korchea-Straw loams, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Korchea—Flood plains
- Straw—Flood plains

Slope:

- Korchea—0 to 2 percent
- Straw—0 to 2 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Korchea and similar soils: 50 percent
Straw and similar soils: 35 percent

Minor Components

Tetonview and similar soils: 0 to 5 percent
Fairway and similar soils: 0 to 4 percent
Ridgelawn and similar soils: 0 to 4 percent
Nesda and similar soils: 0 to 2 percent

Major Component Description

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

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 10.6 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.

Kremlin Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Alluvial fans, stream terraces, hills, and sedimentary plains

Parent material: Alluvium

Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Kremlin loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 300 feet south and 500 feet east of the northwest corner of sec. 12, T. 29 N., R. 2 W.

Ap—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common fine roots; neutral; clear smooth boundary.

Bw—6 to 12 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, moderately sticky, slightly plastic; slightly effervescent; neutral; clear smooth boundary.

Bk1—12 to 18 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine and fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—18 to 26 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk3—26 to 42 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; few very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

BC—42 to 60 inches; pale brown (10YR 6/3) stratified loam and silt loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 15 inches; may include all or the upper part of the Bw horizon.

Depth to the Bk horizon: 10 to 24 inches

Soil phases: Calcareous

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: None to strongly

Calcium carbonate equivalent: 5 to 15 percent for the calcareous phase

Reaction: pH 6.1 to 8.4; calcareous phase is pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

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

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 5 to 15 percent for the calcareous phase

Reaction: pH 6.6 to 8.4; calcareous phase is pH 7.9 to 8.4

Bk horizons

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 or 3
 Texture: Loam, silt loam, clay loam, or sandy clay loam
 Clay content: 18 to 30 percent
 Content of 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; calcareous phase is pH 7.9 to 9.0

BC horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 6 to 8 dry; 4 to 6 moist
 Chroma: 2 to 4
 Clay content: 10 to 25 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 3 to 12 percent
 Effervescence: Strongly or violently
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 9.0; calcareous phase pH 7.9 to 9.0

22B—Kremlin loam, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Kremlin and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent
 Evanston and similar soils: 0 to 4 percent
 Chinook and similar soils: 0 to 3 percent
 Joplin and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.4 inches

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

Management

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

322B—Kremlin clay loam, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Kremlin and similar soils: 90 percent

Minor Components

Ethridge and similar soils: 0 to 4 percent
 Richey and similar soils: 0 to 3 percent
 Kobase and similar soils: 0 to 2 percent
 Rothiemay and similar soils: 0 to 1 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.

322C—Kremlin clay loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans
Slope: 4 to 8 percent
Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kremlin and similar soils: 90 percent

Minor Components

Richey and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 3 percent

Rothiemay and similar soils: 0 to 2 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.

522C—Kremlin-Delpoint clay loams, 2 to 8 percent slopes

Setting

Landform:

- Kremlin—Sedimentary plains
- Delpoint—Sedimentary plains

Position on landform:

- Kremlin—Footslopes
- Delpoint—Backslopes and shoulders

Slope:

- Kremlin—2 to 8 percent
- Delpoint—2 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kremlin and similar soils: 50 percent

Delpoint and similar soils: 35 percent

Minor Components

Evanston and similar soils: 0 to 3 percent

Megonot and similar soils: 0 to 3 percent

Richey and similar soils: 0 to 3 percent

Yamacall and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 2 percent

Cabbart and similar soils: 0 to 1 percent

Major Component Description

Kremlin

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

Delpoint

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 5.1 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.

Lambeth Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow

Landform: Hills

Parent material: Alluvium

Slope range: 15 to 70 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Lambeth silt loam, in an area of Hillon-Lambeth complex, 15 to 35 percent slopes, in an area of rangeland, 550 feet south and 900 feet west of the northeast corner of sec. 16, T. 30 N., R. 3 W.

A—0 to 4 inches; light brownish gray (10YR 6/2) silt loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, moderately sticky, slightly plastic; common fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—4 to 13 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium granular; slightly hard, very friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine and fine pores; few very fine threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—13 to 25 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium granular; hard, very friable, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine pores; few very fine threads of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—25 to 44 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; hard, very friable, moderately sticky, slightly plastic; few very fine and fine roots; few fine pores; violently effervescent; moderately alkaline; gradual wavy boundary.

Cy—44 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; hard, very friable, moderately sticky, slightly plastic; strongly effervescent; few very fine threads of gypsum; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 20 to 27 percent

Calcium carbonate equivalent: 5 to 10 percent

Effervescence: Slightly to violently

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam with thin bands of loam, fine sandy loam, or very fine sandy loam

Clay content: 20 to 35 percent

Gypsum: 1 to 5 percent

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: Strongly or violently

Reaction: pH 7.9 to 9.0

C and Cy horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam with thin bands of loam, fine sandy loam, or very fine sandy loam

Clay content: 20 to 35 percent

Gypsum: 1 to 5 percent

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: Strongly or violently

Reaction: pH 7.9 to 9.0

Lardell Series

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Permeability: Slow

Landform: Fan terraces and glaciated till plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed, frigid Aquollic Salorthids

Typical Pedon

Lardell silty clay loam, 0 to 4 percent slopes, in an area of rangeland, 300 feet north and 1,700 feet west of the southeast corner of sec. 21, T. 24 N., R. 3 W.

Az—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium granular structure; very hard, friable, moderately sticky, moderately plastic; few very fine roots; common fine masses of salts; slightly effervescent; very strongly alkaline; clear smooth boundary.

Bz1—6 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; extremely hard, firm, moderately sticky, very plastic; few very fine roots; common very fine tubular pores;

many fine masses of salts when dry; slightly effervescent; very strongly alkaline; clear wavy boundary.

Bz2—18 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, moderately sticky, moderately plastic; few very fine tubular pores; many fine masses of salt when dry; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the salic horizon: 4 to 8 inches

Depth to the seasonal high water table: 18 to 36 inches

Az horizon

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

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 1 or 2

Clay content: 27 to 40 percent

Electrical conductivity: Greater than 16 mmhos/cm

Sodium adsorption ratio: 8 to 50

Reaction: pH 7.9 to 10.0

Bz1 horizon

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

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 1 to 3

Texture: Silty clay loam, silt loam, loam, or clay loam

Clay content: 27 to 35 percent

Electrical conductivity: Greater than 16 to 50 mmhos/cm

Salt content: 2 to 3 percent

Sodium adsorption ratio: 13 to 80

Reaction: pH 8.5 to 10.0

Bz2 horizon

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

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 1 to 4

Texture: Silty clay loam, silt loam, loam, or clay loam

Clay content: 15 to 35 percent

Electrical conductivity: 16 to 50 mmhos/cm

Salt content: 1 to 2 percent

Sodium adsorption ratio: 13 to 30

Reaction: pH 8.5 to 10.0

3B—Lardell silty clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lardell and similar soils: 90 percent

Minor Components

McKenzie and similar soils: 0 to 3 percent

Absher and similar soils: 0 to 2 percent

Gerdrum and similar soils: 0 to 2 percent

Nishon and similar soils: 0 to 2 percent

Vanda and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

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.

Linnet Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Glaciated till plains and sedimentary plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Ustertic
Argiborolls

Typical Pedon

Linnet silty clay, in an area of Marias-Linnet silty clays, 0 to 4 percent slopes, in an area of nonirrigated cropland, 30 feet north and 300 feet west of the southeast corner of sec. 3, T. 29 N., R. 5 W.

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

Bt—5 to 13 inches; dark grayish brown (2.5Y 4/2) silty clay, dark grayish brown (2.5Y 4/2) moist; ped faces on vertical cracks very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to strong fine angular blocky; extremely hard, firm, moderately sticky, very plastic; common very fine and fine roots; common very fine tubular and few fine pores; common distinct clay films on faces of peds; ³/₄- to 1-inch wide cracks; neutral; clear smooth boundary.

Bk1—13 to 26 inches; olive gray (5Y 4/2) silty clay, olive gray (5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; extremely hard, firm, moderately sticky, very plastic; common very fine and fine roots; common very fine tubular pores; few fine soft masses of lime; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk2—26 to 48 inches; olive (5Y 5/3) silty clay, olive (5Y 4/3) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; extremely hard, firm, moderately sticky, very plastic; few very fine and fine roots; common very fine and fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

BCy—48 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, moderately sticky, very plastic; few fine soft masses and threads of

gypsum crystals; 5 percent pebbles; few fine weathered lignite chips; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Surface cracks: 1- to 2-inches wide

Depth to the Bk horizon: 11 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 40 to 45 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 45 to 60 percent

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

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.4 to 9.0

BCy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent pebbles

Gypsum: 2 to 5 percent

Sodium adsorption ratio: 2 to 13

Reaction: pH 7.9 to 9.0

147C—Linnet-Abor silty clays, 2 to 8 percent slopes

Setting

Landform:

- Linnet—Sedimentary plains
- Abor—Sedimentary plains

Position on landform:

- Linnet—Foothills
- Abor—Backslopes and shoulders

Slope:

- Linnet—2 to 8 percent
- Abor—2 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Linnet and similar soils: 50 percent

Abor and similar soils: 35 percent

Minor Components

Marias and similar soils: 0 to 8 percent

Lothair and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 3 percent

Major Component Description

Linnet

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 8.8 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 4.6 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.

Linwell Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Hills

Parent material: Alluvium

Slope range: 2 to 15 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Haploborolls

Typical Pedon

Linwell clay loam, in an area of Linwell-Winifred clay loams, 2 to 15 percent slopes, in an area of rangeland, 400 feet south and 2,100 feet east of the northwest corner of sec. 8, T. 26 N., R. 7 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, moderately sticky, moderately plastic; many fine roots; many fine irregular pores; slightly effervescent in spots; slightly alkaline; clear smooth boundary.

Bw—7 to 15 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many fine roots; common very fine and fine pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—15 to 23 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine pores; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—23 to 36 inches; light brownish gray (5Y 6/2) silty clay loam, grayish brown (5Y 5/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky, very plastic; few very fine and fine roots; common very fine pores; few fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—36 to 60 inches; light brownish gray (5Y 6/2) silty clay loam, grayish brown (5Y 5/2) moist; massive;

very hard, firm, very sticky, very plastic; few very fine pores; few fine threads of gypsum in upper few inches; effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Bk horizon: 12 to 24 inches

A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 1 or 2

Clay content: 30 to 40 percent

Content of rock fragments: 0 to 5 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

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 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

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

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

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Mottles: None to few

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

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 12 percent

Reaction: pH 7.9 to 8.4

179C—Linwell-Winifred clay loams, 2 to 15 percent slopes

Setting

Landform:

- Linwell—Hills
- Winifred—Hills

Position on landform:

- Linwell—Foothills
- Winifred—Backslopes and shoulders

Slope:

- Linwell—2 to 15 percent
- Winifred—2 to 15 percent

Elevation: 3,400 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Linwell and similar soils: 50 percent

Winifred and similar soils: 35 percent

Minor Components

Wayden and similar soils: 0 to 7 percent

Amor and similar soils: 0 to 4 percent

Cabba and similar soils: 0 to 4 percent

Major Component Description

Linwell

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 8.9 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 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.

Loberg Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Mountain slopes

Parent material: Colluvium

Slope range: 8 to 35 percent

Mean annual precipitation: 20 to 24 inches

Annual air temperature: 38 to 41 degrees F

Frost-free period: 50 to 90 days

Taxonomic Class: Clayey-skeletal, mixed Glosic Cryoboralfs

Typical Pedon

Loberg stony loam, in an area of Loberg-Whitore-Garlet stony loams, 8 to 35 percent slopes, in an area of forest land, 800 feet south and 1,700 feet west of the northeast corner of sec. 30, T. 25 N., R. 8 W.

O—1 inch to 0; undecomposed and slightly decomposed forest litter.

E—0 to 8 inches; light brownish gray (10YR 6/2) stony loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine vesicular pores; 20 percent stones; slightly acid; gradual wavy boundary.

E/Bt—8 to 24 inches; 70 percent light brownish gray (10YR 6/2) and 30 percent brown (10YR 5/3) very channery clay loam, dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; common very fine roots; common very fine and fine tubular pores; 35 percent sandstone fragments; neutral; diffuse irregular boundary.

Bt—24 to 60 inches; brown (10YR 5/3) very channery clay loam, dark brown (10YR 4/3) moist; tonguing of light brownish gray (10YR 6/2) loam in upper 8 inches; strong medium prismatic structure parting to strong medium subangular blocky;

hard, firm, moderately sticky, moderately plastic; few very fine roots; common fine tubular pores; many distinct clay films on faces of prisms, faces of peds, and lining tubular pores; 45 percent sandstone fragments and 5 percent stones; neutral.

Range in Characteristics

Soil temperature: 36 to 47 degrees F

Other features: Some pedons have a thin 1- to 4-inch thick A horizon.

E horizon

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

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Surface stones, cover: 0 to 3 percent

Content of rock fragments: 15 to 75 percent—0 to 70 percent stones and cobbles; 10 to 35 percent pebbles

Reaction: pH 5.1 to 6.5

E/Bt horizon

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

Value: E part—5 to 7 dry; 3 to 5 moist; Bt part—4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 35 to 50 percent

Content of rock fragments: 20 to 60 percent—15 to 45 percent stones and cobbles; 10 to 40 percent pebbles

Reaction: pH 5.1 to 6.5

Bt horizon

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

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Sandy clay, clay, or clay loam

Clay content: 35 to 45 percent

Content of rock fragments: 35 to 60 percent—0 to 45 percent stones and cobbles; 20 to 40 percent pebbles

Reaction: pH 6.1 to 7.8

193E—Loberg-Whitore-Garlet stony loams, 8 to 35 percent slopes

Setting

Landform:

- Loberg—Mountains
- Whitore—Mountains
- Garlet—Mountains

Position on landform:

- Loberg—Backslopes and footslopes
- Whitore—Shoulders and summits
- Garlet—Backslopes and shoulders

Slope:

- Loberg—8 to 35 percent
- Whitore—8 to 35 percent
- Garlet—8 to 35 percent

Elevation: 5,000 to 6,300 feet*Mean annual precipitation:* 20 to 24 inches*Frost-free period:* 50 to 80 days**Composition****Major Components**

Loberg and similar soils: 35 percent

Whitore and similar soils: 25 percent

Garlet and similar soils: 25 percent

Minor Components

Cheadle and similar soils: 0 to 9 percent

Tibson and similar soils: 0 to 6 percent

Major Component Description**Loberg***Surface layer texture:* Stony loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 5.1 inches**Whitore***Surface layer texture:* Stony loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.5 inches**Garlet***Surface layer texture:* Stony loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 5.3 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.

Lonna Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Alluvial fans*Parent material:* Glaciofluvial deposits*Slope range:* 2 to 8 percent*Mean annual precipitation:* 11 to 14 inches*Annual air temperature:* 41 to 45 degrees F*Frost-free period:* 105 to 125 days

Taxonomic Class: Fine-silty, mixed, frigid Aridic Ustochrepts

Typical Pedon

Lonna silt loam, in an area of Lonna-Floweree silt loams, 2 to 8 percent slopes, in an area of rangeland, 1,000 feet south and 650 feet west of the northeast corner of sec. 16, T. 30 N., R. 3 W.

A—0 to 3 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, moderately sticky, slightly plastic; many fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—3 to 11 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, moderately sticky, slightly plastic; many very fine and fine roots; many very fine and fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—11 to 25 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, very friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine and fine pores; common very fine threads of soft lime; strongly effervescent; strongly alkaline; clear wavy boundary.

Bk2—25 to 42 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; hard, very friable, moderately sticky, slightly plastic; few very fine and fine roots; common very fine and fine pores; common fine threads of soft lime;

strongly effervescent; strongly alkaline; gradual wavy boundary.

BCy—42 to 60 inches; pale brown (10YR 6/3) silt loam with thin lenses of silty clay loam, brown (10YR 5/3) moist; massive; hard, very friable, moderately sticky, slightly plastic; common fine threads of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Bk horizon: 10 to 12 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Effervescence: Slightly or strongly

Calcium carbonate equivalent: 5 to 10 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 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Effervescence: Slightly or strongly

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

BCy horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Very fine sandy loam, loam, silt loam, or silty clay loam (may be stratified)

Clay content: 10 to 35 percent

Electrical conductivity: 2 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 20

Effervescence: Strongly or violently

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

158C—Lonna-Floweree silt loams, 2 to 8 percent slopes

Setting

Landform:

- Lonna—Alluvial fans
- Floweree—Alluvial fans

Position on landform:

- Lonna—Shoulders
- Floweree—Foothslopes

Slope:

- Lonna—2 to 8 percent
- Floweree—2 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lonna and similar soils: 45 percent

Floweree and similar soils: 40 percent

Minor Components

Kremlin and similar soils: 0 to 8 percent

Yamacall and similar soils: 0 to 5 percent

Chinook and similar soils: 0 to 2 percent

Major Component Description

Lonna

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.1 inches

Floweree

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.4 inches

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

Management

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

Lothair Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans
Parent material: Lacustrine deposits
Slope range: 4 to 15 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, mixed (calcareous), frigid
 Aridic Ustorthents

Typical Pedon

Lothair silty clay loam, in an area of Lothair-Marias complex, 4 to 15 percent slopes, in an area of nonirrigated cropland, 100 feet north and 1,400 feet west of the southeast corner of sec. 18, T. 24 N., R. 3 W.

- Ap—0 to 6 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine granular structure; hard, friable, very sticky, moderately plastic; common fine roots; common vesicular pores; strongly effervescent; slightly alkaline; clear smooth boundary.
- By1—6 to 14 inches; pale brown (10YR 6/3) silty clay, dark brown (10YR 4/3) moist; few faint yellowish brown (10YR 6/6) relict mottles; weak coarse prismatic structure parting to moderate fine and medium granular; very hard, firm, very sticky, very plastic; common fine roots; common very fine and fine pores; few fine masses of gypsum; strongly effervescent; slightly alkaline; clear smooth boundary.
- By2—14 to 27 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin strata of silt loam, and silty clay, grayish brown (2.5Y 5/2) moist;

common distinct yellowish brown (10YR 5/8) and brownish yellow (10YR 6/6) relict mottles between plates; strong and fine and medium platy structure; extremely hard, firm, very sticky, very plastic; few fine roots; few very fine pores; common fine masses of gypsum between larger plates; strongly effervescent; moderately alkaline; clear smooth boundary.

- By3—27 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin strata of silt loam and silty clay, grayish brown (2.5Y 5/2) moist; common distinct yellowish brown (10YR 5/8) relict mottles between larger plates; strong thin and medium platy structure; extremely hard, firm, very sticky, very plastic; common fine masses of gypsum between larger plates; strongly effervescent; moderately alkaline; clear smooth boundary.
- BC—42 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin strata of silt loam and silty clay, grayish brown (2.5Y 5/2) moist; common distinct yellowish brown (10YR 5/8) relict mottles between larger plates; strong thin and medium platy structure; extremely hard, firm, very sticky, very plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Ap horizon

Hue: 5Y, 2.5Y, or 10YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 35 to 40 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Reaction: pH 7.4 to 8.4

By and BC horizons

Hue: 5Y, 2.5Y, or 10YR
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Stratified silty clay or silty clay loam
 Clay content: 35 to 45 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

249D—Lothair-Marias complex, 4 to 15 percent slopes

Setting

Landform:

- Lothair—Alluvial fans
- Marias—Alluvial fans

Slope:

- Lothair—4 to 15 percent
- Marias—4 to 15 percent

Elevation: 3,400 to 3,800 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Lothair and similar soils: 45 percent

Marias and similar soils: 40 percent

Minor Components

Linnet and similar soils: 0 to 6 percent

Lonna and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 4 percent

Major Component Description**Lothair***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.7 inches**Marias***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 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.

Manhattan Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Rapid*Landform:* Hills*Parent material:* Alluvium and eolian deposits*Slope range:* 2 to 15 percent*Mean annual precipitation:* 15 to 19 inches*Annual air temperature:* 40 to 44 degrees F*Frost-free period:* 90 to 110 days

Taxonomic Class: Coarse-loamy, mixed Typic Calciborolls

Typical Pedon

Manhattan fine sandy loam, in an area of Beanlake-Manhattan-Winspect complex, 2 to 15 percent slopes, in an area of rangeland, 2,450 feet north and 1,650 feet east of the southwest corner of sec. 10, T. 22 N., R. 7 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—6 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—15 to 45 inches; light brownish gray (2.5Y 6/2) sandy loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—45 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; massive; loose, very friable, nonsticky, nonplastic; few very fine roots; violently effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 40 to 47 degrees F*Thickness of the mollic epipedon:* 7 to 14 inches*Depth to the calcic horizon:* 10 to 20 inches*A horizon*

Hue: 10YR or 2.5Y

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Reaction: pH 7.4 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 5 to 10 percent

Content of rock fragments: 0 to 25 percent pebbles
 Calcium carbonate equivalent: 5 to 25 percent
 Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y
 Value: 5 to 8 dry; 4 to 6 moist
 Chroma: 2 or 3
 Clay content: 5 to 10 percent
 Content of rock fragments: 0 to 25 percent pebbles
 Calcium carbonate equivalent: 15 to 40 percent
 Reaction: pH 7.9 to 8.4

C horizon

Hue: 10YR or 2.5Y
 Value: 5 to 8 dry; 4 to 6 moist
 Chroma: 2 or 3
 Clay content: 0 to 5 percent
 Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles
 Calcium carbonate equivalent: 5 to 20 percent
 Reaction: pH 7.9 to 8.4

Marcott Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, mixed Aquic Haploborolls

Typical Pedon

Marcott silty clay loam, 0 to 2 percent slopes, in an area of nonirrigated cropland, 2,500 feet north and 500 feet west of the southeast corner of sec. 18, T. 28 N., R. 2 W.

Apz—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, friable, moderately sticky, moderately plastic; common fine roots; common fine masses of salt crystals; slightly effervescent; slightly alkaline; clear smooth boundary.

Bz—6 to 16 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to

moderate fine subangular blocky; very hard, firm, moderately sticky, moderately plastic; common fine roots; common fine pores; common fine masses of salt crystals; slightly effervescent; slightly alkaline; clear smooth boundary.

Bkz1—16 to 24 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/4) redox concentrations; weak medium prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; common fine roots; common very fine and fine pores; common fine masses of salt crystals; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkz2—24 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/6) redox concentrations; weak fine subangular blocky structure; extremely hard, firm, very sticky, moderately plastic; few fine roots; few very fine and fine pores; few fine masses of salt crystals; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cz—48 to 60 inches; light brownish gray (2.5Y 6/2) varved silty clay loam, grayish brown (2.5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/4) redox concentrations; extremely hard, firm, very sticky, moderately plastic; common fine nests and seams of salt crystals; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to the Bkz horizon: 12 to 24 inches
Depth to the seasonal high water table: 24 to 36 inches

Apz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 2 or 3 moist; 3 to 5 dry
 Chroma: 1 or 2
 Clay content: 30 to 40 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 4 to 8 mmhos/cm
 Sodium adsorption ratio: 0 to 20
 Reaction: pH 6.6 to 8.4

Bz horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 3 to 5 moist; 4 to 7 dry
 Chroma: 1 to 3

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

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 25

Calcium carbonate equivalent: 3 to 12 percent

Reaction: pH 7.4 to 8.4

Bkz horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 4 to 7 dry

Chroma: 1 to 3

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

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 30

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

Cz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 4 to 7 dry

Chroma: 1 to 3

Clay content: 25 to 50 percent

Content of rock fragments: 0 to 80 percent—0 to 10 percent cobbles; 0 to 70 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 20

Reaction: pH 7.4 to 9.0

241A—Marcott silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 2 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marcott and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 7 percent

Richey and similar soils: 0 to 6 percent

McKenzie and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly 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 8.8 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.

Marias Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Alluvial fans and glaciated till plains

Parent material: Lacustrine deposits and glaciolacustrine deposits

Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Chromic Udic Haplusterts

Typical Pedon

Marias silty clay, 0 to 4 percent slopes, in an area of nonirrigated cropland, 200 feet north and 1,000 feet west of the southeast corner of sec. 24, T. 25 N., T. 4 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; very hard, firm, moderately sticky, very plastic; common fine roots; common fine irregular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—5 to 11 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine subangular blocky structure; extremely hard, firm, moderately sticky, very plastic; common fine roots; few very fine tubular pores; common

cracks; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bss—11 to 30 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 5/2) moist; strong fine subangular blocky structure; extremely hard, firm, moderately sticky, very plastic; few fine roots; few very fine tubular pores; common cracks and common slickensides that intersect at 20 to 50 degree angles; strongly effervescent; slightly alkaline; clear smooth boundary.

Bssy—30 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; extremely hard, firm, moderately sticky, very plastic; few slickensides upper part; common fine threads of gypsum crystals; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the B horizon: 20 to 45 inches

Linear extensibility: .06 to .10 in the upper 30 inches of soil

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 1 to 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: 1 to 10 percent

Reaction: pH 7.9 to 8.4

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: 2 to 4 mmhos/cm

Sodium adsorption ratio: 1 to 4

Calcium carbonate equivalent: 1 to 10 percent

Reaction: pH 7.9 to 9.0

Bssy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 1 to 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Gypsum: 1 to 6 percent

Electrical conductivity: 2 to 4 mmhos/cm above a depth of 30 inches; 2 to 8 mmhos/cm below 30 inches

Sodium adsorption ratio: 1 to 4 above 30 inches; 4 to 13 below 30 inches

Calcium carbonate equivalent: 2 to 10 percent

Reaction: pH 7.9 to 9.0

44B—Marias silty clay, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marias and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 5 percent

Linnet and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 3 percent

Nishon and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

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.

**50B—Marias-Nunemaker complex,
0 to 4 percent slopes****Setting***Landform:*

- Marias—Till plains
- Nunemaker—Till plains

Position on landform:

- Marias—Toeslopes
- Nunemaker—Shoulders

Slope:

- Marias—0 to 4 percent
- Nunemaker—0 to 4 percent

Elevation: 3,300 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Marias and similar soils: 45 percent

Nunemaker and similar soils: 40 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 5 percent

Scobey and similar soils: 0 to 3 percent

McKenzie and similar soils: 0 to 2 percent

Major Component Description**Marias***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciolacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 8.5 inches**Nunemaker***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 8.3 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.

**150B—Marias-Linnet silty clays,
0 to 4 percent slopes****Setting***Landform:*

- Marias—Till plains
- Linnet—Till plains

Slope:

- Marias—0 to 4 percent
- Linnet—0 to 4 percent

Elevation: 3,300 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Marias and similar soils: 55 percent

Linnet and similar soils: 35 percent

Minor Components

Ethridge and similar soils: 0 to 6 percent

Lothair and similar soils: 0 to 2 percent

McKenzie and similar soils: 0 to 2 percent

Major Component Description**Marias***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciolacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 8.5 inches**Linnet***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 8.8 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.

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Hills and sedimentary plains

Parent material: Semiconsolidated sedimentary beds

Slope range: 2 to 15 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic
Argiborolls

Typical Pedon

Marmarth clay loam, in an area of Rootel-Marmarth loams, 2 to 8 percent slopes, in an area of rangeland, 1,100 feet south and 600 feet east of the northwest corner of sec. 19, T. 24 N., R. 5 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/2) moist; moderate medium granular structure; hard, friable, moderately sticky, slightly plastic; many fine roots; many fine vesicular pores; neutral; clear smooth boundary.

Bt—3 to 12 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, moderately sticky, moderately plastic; many very fine and fine roots; many very fine and fine tubular pores; few distinct very dark grayish brown (10YR 3/2) clay films; neutral; clear smooth boundary.

Bk1—12 to 16 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine tubular pores; few or common soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—16 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure in the upper part grading to weak coarse prismatic structure in the lower part, parting to weak medium subangular blocky structure; common very fine and fine roots in the upper part grading to few very fine roots in the lower part; common very fine pores; many soft masses of lime;

20 percent soft shale fragments; violently effervescent; moderately alkaline; clear wavy boundary.

Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated siltstone; grayish brown (2.5Y 5/2) moist; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Cr horizon: 20 to 40 inches

Thickness of the mollic epipedon: 7 to 12 inches

A horizon

Hue: 10YR

Value: 3 to 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 3 to 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

Bk horizons

Hue: 2.5Y or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 15 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Semiconsolidated siltstone or sandstone

377C—Marmarth-Delpoint-Cabbart complex, 2 to 8 percent slopes

Setting

Landform:

- Marmarth—Sedimentary plains
- Delpoint—Sedimentary plains
- Cabbart—Sedimentary plains

Position on landform:

- Marmarth—Foothills
- Delpoint—Backslopes and foothills
- Cabbart—Shoulders

Slope:

- Marmarth—2 to 8 percent
- Delpoint—2 to 8 percent
- Cabbart—2 to 8 percent

Elevation: 3,600 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Marmarth and similar soils: 35 percent

Delpoint and similar soils: 30 percent

Cabbart and similar soils: 20 percent

Minor Components

Yamacall and similar soils: 0 to 6 percent

Evanston and similar soils: 0 to 5 percent

Kremlin and similar soils: 0 to 4 percent

Major Component Description**Marmarth***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 4.2 inches**Delpoint***Surface layer texture:* 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 4.1 inches**Cabbart***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated sedimentary beds*Native plant cover type:* Rangeland*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.

477C—Marmarth-Evanston-Delpoint complex, 2 to 15 percent slopes**Setting***Landform:*

- Marmarth—Hills
- Evanston—Alluvial fans
- Delpoint—Hills

Position on landform:

- Marmarth—Backslopes and shoulders
- Delpoint—Backslopes and shoulders

Slope:

- Marmarth—2 to 15 percent
- Evanston—2 to 8 percent
- Delpoint—2 to 15 percent

Elevation: 3,600 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Marmarth and similar soils: 35 percent

Evanston and similar soils: 30 percent

Delpoint and similar soils: 20 percent

Minor Components

Cabbart and similar soils: 0 to 8 percent

Kremlin and similar soils: 0 to 4 percent

Yamacall and similar soils: 0 to 3 percent

Major Component Description**Marmarth***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 4.2 inches**Evanston***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 10.1 inches

Delpoint

Surface layer texture: 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 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.

Marvan Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Alluvial fans and glaciated till plains

Parent material: Alluvium and lacustrine deposits

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Sodic Haplusterts

Typical Pedon

Marvan clay, in an area of Vanda-Marvan clays, 0 to 2 percent slopes, in an area of rangeland, 400 feet north and 900 feet west of the southeast corner of sec. 29, T. 23 N., R. 1 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure parting to strong medium subangular blocky; extremely hard, firm, very sticky, very plastic; common very fine and fine roots; few very fine vesicular pores; neutral; clear smooth boundary.

Bw—4 to 13 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate

fine subangular blocky; extremely hard, firm, very sticky, very plastic; common fine and medium roots; few very fine pores; common cracks; neutral; clear wavy boundary.

Bss—13 to 20 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; extremely hard, firm, very sticky, very plastic; common fine roots; common very fine pores; common cracks and common slickensides that intersect at 20 to 50 degree angles; slightly effervescent; neutral; gradual wavy boundary.

Bssy—20 to 33 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine pores; few slickensides; few fine masses and seams of gypsum; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bnssyz—33 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky, very plastic; few very fine roots; few slickensides; common medium masses and seams of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Average annual summer temperature: 60 to 68 degrees F

Depth to the Bssy horizon: 10 to 24 inches

Soil phases: Wet

A horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay or silty clay

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 6.6 to 8.4

Bw horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 6.6 to 9.0

Bss horizon

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Clay or silty clay
 Clay content: 45 to 60 percent
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 4 to 13
 Calcium carbonate equivalent: 1 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 to 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: 1 to 10 percent
 Reaction: pH 7.9 to 9.0

Bnssyz horizon

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Clay or silty clay that includes thin layers
 of silty clay loam and silt loam material
 Clay content: 45 to 60 percent
 Gypsum: 1 to 5 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 38
 Calcium carbonate equivalent: 1 to 10 percent
 Reaction: pH 7.9 to 9.0

45B—Marvan clay, 0 to 4 percent slopes**Setting**

Landform: Till plains
Slope: 0 to 4 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Marvan and similar soils: 85 percent

Minor Components

Marias and similar soils: 0 to 12 percent
 McKenzie and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: 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 6.4 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.

145A—Marvan, wet-Nobe silty clays, 0 to 2 percent slopes**Setting***Landform:*

- Marvan, wet—Alluvial fans
- Nobe—Alluvial fans

Position on landform:

- Marvan, wet—Microlows
- Nobe—Microhighs

Slope:

- Marvan, wet—0 to 2 percent
- Nobe—0 to 2 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Marvan, wet and similar soils: 50 percent
 Nobe and similar soils: 35 percent

Minor Components

Vanda and similar soils: 0 to 6 percent
 Lardell and similar soils: 0 to 5 percent
 Absher and similar soils: 0 to 4 percent

Major Component Description**Marvan, wet**

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
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.2 inches

Nobe

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 4.4 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.

540B—Marvan silty clay, wet, 0 to 4 percent slopes

Setting

Landform: Till plains
Slope: 0 to 4 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Marvan and similar soils: 85 percent

Minor Components

Marias and similar soils: 0 to 8 percent
 Nobe and similar soils: 0 to 5 percent
 Lardell and similar soils: 0 to 1 percent
 McKenzie and similar soils: 0 to 1 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
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.2 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.

722C—Marvan, wet-Trudau complex, 0 to 8 percent slopes

Setting

Landform:

- Marvan, wet—Alluvial fans
- Trudau—Alluvial fans

Position on landform:

- Marvan, wet—Toeslopes
- Trudau—Footslopes

Slope:

- Marvan, wet—0 to 4 percent
- Trudau—0 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marvan, wet, and similar soils: 45 percent
 Trudau and similar soils: 45 percent

Minor Components

Rothiemay and similar soils: 0 to 4 percent
 Kremlin and similar soils: 0 to 2 percent
 McKenzie and similar soils: 0 to 2 percent
 Nobe and similar soils: 0 to 2 percent

Major Component Description

Marvan, wet

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
Water table: Apparent
Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.2 inches

Trudau

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 9.3 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.

McKenzie Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow
Landform: Closed depressions
Parent material: Alluvium
Slope range: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
 Chromic Endoaquerts

Typical Pedon

McKenzie clay, 0 to 2 percent slopes, in an area of rangeland, 50 feet north and 2,500 feet west of the southeast corner of sec. 29, T. 23 N., R. 1 E.

(Colors are for moist soil unless otherwise noted.)

A—0 to 7 inches; dark gray (5Y 4/1) clay, gray (5Y 6/1) dry; 1/2 inch light gray (5Y 7/1) vesicular crust; common fine yellowish brown (10YR 5/6) redox concentrations; moderate medium granular structure; extremely hard, very firm, moderately sticky, very plastic; few fine and medium roots; common very fine and fine pores; weakly effervescent; moderately alkaline; clear smooth boundary.

Bg—7 to 30 inches; dark gray (5Y 4/1) clay, gray (5Y 5/1) dry; few fine distinct yellowish brown

(10YR 5/6) redox concentrations; moderate fine and medium subangular blocky structure; extremely hard, very firm, moderately sticky, very plastic; few fine roots; few very fine and fine tubular pores; weakly effervescent; pressure faces or weakly expressed slickensides in lower part; moderately alkaline; gradual wavy boundary.
 C—30 to 60 inches; olive gray (5Y 4/2) clay, gray (5Y 5/1) dry; few fine faint brownish yellow (10YR 6/6) redox concentrations; massive; extremely hard, very firm, moderately sticky, very plastic; few very fine pores; weakly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A horizon

Hue: 5Y, 2.5Y, or 10YR
 Value: 4 or 5 moist; 4 to 6 dry
 Chroma: 1 or 2
 Clay content: 40 to 60 percent
 Electrical conductivity: 2 to 8 mmhos/cm
 Reaction: pH 6.6 to 9.0

Bg horizon

Hue: 2.5Y or 5Y
 Value: 4 or 5 moist; 5 or 6 dry
 Chroma: 1 or 2
 Texture: Clay or silty clay
 Clay content: 40 to 60 percent
 Electrical conductivity: 2 to 8 mmhos/cm
 Reaction: pH 6.6 to 9.0

C horizon

Hue: 2.5Y or 5Y
 Value: 4 to 6 moist; 5 to 7 dry
 Chroma: 1 to 3
 Texture: Clay or silty clay
 Clay content: 40 to 60 percent
 Electrical conductivity: 2 to 8 mmhos/cm
 Reaction: pH 7.9 to 9.0

38A—McKenzie clay, 0 to 2 percent slopes

Setting

Landform: Closed depressions
Slope: 0 to 2 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

McKenzie and similar soils: 90 percent

Minor Components

Soils that are poorly drained and loamy: 0 to 5 percent

Kobase and similar soils: 0 to 2 percent

Marias and similar soils: 0 to 2 percent

Ethridge and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: 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

Ponding: Long

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.

Meadowcreek Series

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderate in upper 32 inches; rapid or very rapid below this depth

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Mean annual precipitation: 14 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Fluvaquent Haploborolls

Typical Pedon

Meadowcreek loam, in an area of Fairway-Meadowcreek loams, 0 to 2 percent slopes, rarely flooded; in an area of rangeland, 1,750 feet south and 2,400 feet east of the northwest corner of sec. 22, T. 26 N., R. 6 W.

A—0 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and few medium roots; many fine irregular pores; strongly effervescent; slightly alkaline; clear smooth boundary.

C1—10 to 20 inches; grayish brown (10YR 5/2) loam that has thin lenses of fine sandy loam, dark grayish brown (10YR 4/2) moist; common fine faint yellowish brown (10YR 5/4) redox concentrations; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine and fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—20 to 32 inches; grayish brown (2.5Y 5/2) loam, grayish brown (2.5Y 4/2) moist; common fine faint yellowish brown (10YR 5/4) redox concentrations; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; common very fine and fine pores; small pebble-size pieces of highly weathered organic material; strongly effervescent; moderately alkaline; clear wavy boundary.

2C—32 to 60 inches; mixed grayish brown and gray (10YR 5/1 and 2.5Y 5/2) extremely gravelly loamy sand, dark gray and dark grayish brown (10YR 4/1 and 2.5Y 4/2) moist; single grain; loose, nonsticky, nonplastic; few fine and medium roots in the upper part; 55 percent pebbles and 10 percent cobbles; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 10 to 15 inches

Depth to the 2C horizon: 20 to 40 inches

Depth to the seasonal high water table: 36 to 60 inches

A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 18 to 25 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

Calcium carbonate equivalent: 0 to 10 percent

C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 1 to 3

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

Clay content: 18 to 25 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

2C horizon

Texture: Sand or loamy sand

Clay content: 0 to 10 percent

Content of rock fragments: 50 to 75 percent—0 to

15 percent stones and cobbles; 50 to 70 percent pebbles

Reaction: pH 6.1 to 7.8

Megonot Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Hills and sedimentary plains

Parent material: Semiconsolidated shale

Slope range: 0 to 60 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Megonot silty clay loam, in an area of Megonot-Tanna clay loams, 2 to 8 percent slopes, in an area of nonirrigated cropland, 1,500 feet north and 1,200 feet east of the southwest corner of sec. 29, T. 23 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, friable, moderately sticky, moderately plastic; many fine roots; many fine vesicular pores; slightly effervescent; neutral; clear smooth boundary.

Bw—5 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine discontinuous tubular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—12 to 21 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, moderately sticky, very plastic; common very fine and fine roots; common very fine discontinuous tubular pores; 10 percent soft weathered shale fragments; few medium soft masses of segregated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cy—21 to 29 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive or platy structure as a result of in situ weathering of shale; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots in cracks and between plates; common fine threadlike seams of gypsum; 25 percent soft shale fragments and 10 percent hard shale fragments; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cr—29 to 60 inches; mixed dark gray (5Y 4/1) and olive gray (5Y 4/2) semiconsolidated shale; hard and firm; neutral.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Depth to the Bk horizon: 11 to 27 inches

Depth to the Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or clay loam

Clay content: 35 to 40 percent

Coarse rock 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 rock fragments: 0 to 15 percent hard pebbles;

0 to 15 percent soft pebbles

Reaction: pH 7.4 to 8.4

Bk 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 rock fragments: 0 to 15 percent hard pebbles;
 0 to 15 percent soft pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Cy horizon

Hue: 2.5Y or 5Y
 Value: 4 to 6 dry; 3 or 4 moist
 Chroma: 2 or 3
 Texture: Silty clay loam, clay loam, or silty clay
 Clay content: 35 to 45 percent
 Coarse rock fragments: 10 to 50 percent soft shale;
 5 to 30 percent hard shale fragments
 Gypsum: 1 to 5 percent
 Reaction: pH 6.6 to 8.4

Cr horizon

Reaction: pH 5.6 to 7.8

**70B—Megonot silty clay loam,
 0 to 4 percent slopes**

Setting

Landform: Sedimentary plains
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Megonot and similar soils: 90 percent

Minor Components

Tanna and similar soils: 0 to 4 percent
 Kobase and similar soils: 0 to 3 percent
 Abor and similar soils: 0 to 2 percent
 Yawdim and similar soils: 0 to 1 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
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.

**148C—Megonot-Richey-Tanna clay loams,
 2 to 8 percent slopes**

Setting

Landform:

- Megonot—Sedimentary plains
- Richey—Sedimentary plains
- Tanna—Sedimentary plains

Position on landform:

- Megonot—Backslopes and shoulders
- Richey—Foothslopes
- Tanna—Foothslopes

Slope:

- Megonot—2 to 8 percent
- Richey—2 to 8 percent
- Tanna—2 to 8 percent

Elevation: 3,400 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Megonot and similar soils: 35 percent
 Richey and similar soils: 30 percent
 Tanna and similar soils: 20 percent

Minor Components

Ethridge and similar soils: 0 to 7 percent
 Kevin and similar soils: 0 to 5 percent
 Scobey and similar soils: 0 to 3 percent

Major Component Description

Megonot

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 4.0 inches

Richey

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 8.7 inches

Tanna

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 5.6 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.

270C—Megonot-Tanna clay loams, 2 to 8 percent slopes

Setting

Landform:

- Megonot—Sedimentary plains
- Tanna—Sedimentary plains

Position on landform:

- Megonot—Backslopes and shoulders
- Tanna—Foothills

Slope:

- Megonot—2 to 8 percent
- Tanna—2 to 8 percent

Elevation: 3,400 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Megonot and similar soils: 45 percent

Tanna and similar soils: 40 percent

Minor Components

Scobey and similar soils: 0 to 6 percent

Ethridge and similar soils: 0 to 5 percent

Kevin and similar soils: 0 to 4 percent

Major Component Description

Megonot

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 3.6 inches

Tanna

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 5.5 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.

367F—Megonot-Yawdim-Crago complex, 15 to 60 percent slopes

Setting

Landform:

- Megonot—Hills
- Yawdim—Hills
- Crago—Hills

Position on landform:

- Megonot—Backslopes
- Yawdim—Backslopes and shoulders
- Crago—Risings

Slope:

- Megonot—15 to 60 percent
- Yawdim—15 to 60 percent
- Crago—15 to 60 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Megonot and similar soils: 35 percent

Yawdim and similar soils: 35 percent

Crago and similar soils: 15 percent

Minor Components

Abor and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Cabbart 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 2.9 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

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 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.

570D—Megonot-Kobase-Yawdim complex, 8 to 15 percent slopes**Setting**

Landform:

- Megonot—Hills
- Kobase—Alluvial fans
- Yawdim—Hills

Position on landform:

- Megonot—Backslopes and footslopes
- Yawdim—Shoulders and summits

Slope:

- Megonot—8 to 15 percent
- Kobase—8 to 15 percent
- Yawdim—8 to 15 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Megonot and similar soils: 35 percent

Kobase and similar soils: 30 percent

Yawdim and similar soils: 20 percent

Minor Components

Tanna and similar soils: 0 to 7 percent

Abor and similar soils: 0 to 6 percent

Cabbart and similar soils: 0 to 2 percent

Major Component Description**Megonot**

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 3.9 inches

Kobase

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

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 9.6 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 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.

589F—Megonot-Yawdim-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:

- Megonot—Hills
- Yawdim—Hills
- Rock outcrop—Escarpments

Position on landform:

- Megonot—Backslopes
- Yawdim—Shoulders and summits

Slope:

- Megonot—25 to 60 percent
- Yawdim—25 to 60 percent
- Rock outcrop—25 to 60 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Megonot and similar soils: 35 percent

Yawdim and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Cabbart and similar soils: 0 to 7 percent

Abor and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 3 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 2.9 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

Rock outcrop

Definition: Semiconsolidated 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.

M-W—Miscellaneous water

Composition

Major Components

Miscellaneous water: 100 percent

Major Component Description

Definition: Open water areas such as sewage lagoons, industrial waste pits, and fish hatcheries

Neldore Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Hills and sedimentary plains

Parent material: Residuum from semiconsolidated shale

Slope range: 2 to 70 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Neldore clay, in an area of Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes, in an area of rangeland, 500 feet south and 300 feet west of the northeast corner of sec. 14, T. 29 N., R. 2 W.

A—0 to 4 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate medium granular structure; hard, friable, moderately sticky, moderately plastic; common fine roots; many fine

pores; thin (1/2 inch) light olive gray (5Y 6/2) vesicular crust on surface; 5 percent pebbles; neutral; clear smooth boundary.

C1—4 to 10 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, friable, moderately sticky, moderately plastic; common fine roots; many fine pores; 20 percent weathered soft shale fragments; neutral; gradual wavy boundary.

C2—10 to 18 inches; olive gray (5Y 5/2) shaly clay, olive gray (5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine roots on plates between shale fragments; 30 percent soft weathered shale fragments and 15 percent hard platy shale fragments; neutral; gradual wavy boundary.

Cr—18 to 60 inches; gray (5Y 5/1) semiconsolidated shale; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Cr horizon: 10 to 20 inches

Other features: Dark colors below the A horizon are inherited from the parent shale.

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 1 or 2

Clay content: 40 to 50 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 5.6 to 7.8

C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2; 4 or 6 for stains of shale

Texture: Clay or silt clay

Clay content: 40 to 60 percent

Content of rock fragments: 5 to 35 percent—5 to 25 percent soft shale fragments; 0 to 10 percent hard shale fragments

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 5.6 to 7.8

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

Electrical conductivity: 0 to 4 mmhos/cm

Content of rock fragments: 65 to 90 percent—65 to 75 percent soft shale fragments; 0 to 15 percent hard shale fragments

Reaction: pH 5.6 to 7.8

Cr horizon

Other features: The shale fragments are extremely hard or very hard when dry and extremely firm or very firm when moist.

Reaction: pH 5.1 to 7.3

286F—Neldore-Bascovy-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:

- Neldore—Hills
- Bascovy—Hills
- Rock outcrop—Escarpments

Position on landform:

- Neldore—Shoulders and summits
- Bascovy—Backslopes and shoulders

Slope:

- Neldore—25 to 60 percent
- Bascovy—25 to 45 percent
- Rock outcrop—25 to 60 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Neldore and similar soils: 45 percent

Bascovy and similar soils: 20 percent

Rock outcrop: 20 percent

Minor Components

Yawdim and similar soils: 0 to 12 percent

Kobase and similar soils: 0 to 3 percent

Major Component Description

Neldore

Surface layer texture: 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 2.6 inches

Bascovy

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
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.7 inches

Rock outcrop

Definition: Semiconsolidated 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.

486F—Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes

Setting

Landform:

- Neldore—Hills
- Lambeth—Hills
- Rock outcrop—Escarpments

Position on landform:

- Neldore—Shoulders and summits
- Lambeth—Backslopes and shoulders

Slope:

- Neldore—35 to 70 percent
- Lambeth—35 to 70 percent
- Rock outcrop—35 to 70 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Neldore and similar soils: 40 percent

Lambeth and similar soils: 25 percent

Rock outcrop: 20 percent

Minor Components

Bascovy and similar soils: 0 to 9 percent

Abor and similar soils: 0 to 3 percent

Yawdim and similar soils: 0 to 3 percent

Major Component Description

Neldore

Surface layer texture: 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 2.6 inches

Lambeth

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 11.4 inches

Rock outcrop

Definition: Semiconsolidated 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.

Nesda Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Rapid

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Sandy-skeletal, mixed Fluventic Haploborolls

Typical Pedon

Nesda gravelly loam, in an area of Ridgelawn-Nesda-Korchea complex, 0 to 2 percent slopes, occasionally flooded; in an area of forest land, 850 feet south and 600 feet west of the northeast corner of sec. 36, T. 25 N., R. 7 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; weak medium granular structure; soft, very friable, slightly sticky, nonplastic; many fine roots; many fine vesicular pores; 5 percent pebbles; slightly effervescent; slightly alkaline; clear wavy boundary.

A2—5 to 10 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many fine roots; many very fine and fine vesicular pores; 45 percent pebbles; strongly effervescent; lime coats on undersides of larger coarse rock fragments; slightly alkaline; clear wavy boundary.

2C1—10 to 24 inches; grayish brown (10YR 5/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; nonsticky, nonplastic; common very fine and fine roots; 70 percent pebbles and 10 percent cobbles; strongly effervescent; lime coats on undersides of larger coarse rock fragments; moderately alkaline; gradual wavy boundary.

2C2—24 to 60 inches; grayish brown (10YR 5/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; nonsticky, nonplastic; 70 percent pebbles and 10 percent cobbles; lime coats on undersides of larger coarse rock fragments in upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 10 to 16 inches

Depth to the 2C horizon: 10 to 20 inches

A horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 10 to 20 percent

Content of rock fragments: 0 to 65 percent—0 to 15 percent stones and cobbles; 0 to 55 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 7.8

2C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 1 to 4

Texture: Sand or loamy sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 80 percent—0 to 10 percent stones and cobbles; 35 to 70 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 7.4 to 8.4

109B—Nesda, occasionally flooded-Riverwash complex, 0 to 4 percent slopes

Setting

Landform:

- Nesda—Flood plains
- Riverwash—Flood plains

Slope:

- Nesda—0 to 4 percent
- Riverwash—0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Nesda and similar soils: 50 percent

Riverwash: 35 percent

Minor Components

Ridgelawn and similar soils: 0 to 10 percent

Korchea and similar soils: 0 to 5 percent

Major Component Description

Nesda

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Occasional

Available water capacity: Mainly 3.4 inches

Riverwash

Definition: Areas of recently deposited alluvial material reworked often by flood waters. These areas support little or no vegetation.

Flooding: Frequent

Water table: Apparent

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 (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces and relict stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, carbonatic Aridic
Calciborolls

Typical Pedon

Niart clay loam, in an area of Rothiemay-Niart clay loams, 0 to 4 percent slopes, in an area of irrigated cropland, 1,000 feet north and 2,600 feet east of the southwest corner of sec. 20, T. 22 N., R. 2 W.

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 weak fine granular; slightly hard, very friable, moderately sticky, moderately plastic; common fine roots; many fine irregular pores; 5 percent pebbles; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—6 to 10 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, moderately sticky, moderately plastic; common fine roots; common fine and medium tubular pores; 10 percent pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—10 to 19 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, moderately sticky, moderately plastic; few fine roots; common fine tubular pores; 10 percent pebbles; many medium soft masses of lime throughout; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—19 to 30 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure parting to strong fine and medium subangular blocky; hard, friable, moderately sticky, moderately plastic; few very fine roots; many very fine vesicular pores; 5 percent pebbles; many medium and coarse soft

masses of lime throughout; violently effervescent; moderately alkaline; gradual wavy boundary.
2C—30 to 60 inches; white (2.5Y 8/2) very gravelly loam, light brownish gray (2.5Y 6/2) moist; massive; hard, friable, moderately sticky, moderately plastic; 55 percent pebbles with lime crusts on undersides of larger pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the Bk horizon: 6 to 17 inches

Depth to the 2C horizon: 19 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 5 to 45 percent—0 to 5 percent cobbles; 5 to 40 percent pebbles

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 30 percent

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

Reaction: pH 7.8 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 25 to 35 percent (20 to 30 percent noncarbonate clay)

Content of 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 8.4

2C horizon

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 or 4

Texture: Loam, sandy clay loam, or sandy loam

Clay content: 20 to 30 percent (15 to 25 percent noncarbonate clay)

Content of rock fragments: 35 to 80 percent—5 to 10 percent cobbles; 30 to 70 percent pebbles
 Calcium carbonate equivalent: 45 to 55 percent
 Reaction: pH 7.9 to 8.4

115B—Niart-Crago-Arrod gravelly loams, 0 to 4 percent slopes

Setting

Landform:

- Niart—Relict stream terraces
- Arrod—Relict stream terraces
- Crago—Relict stream terraces

Slope:

- Niart—0 to 4 percent
- Arrod—0 to 4 percent
- Crago—0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Niart and similar soils: 35 percent

Arrod and similar soils: 30 percent

Crago and similar soils: 30 percent

Minor Components

Rothiemy and similar soils: 0 to 4 percent

Varney and similar soils: 0 to 1 percent

Major Component Description

Niart

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Arrod

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 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.

230B—Niart-Crago gravelly loams, 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: 3,200 to 4,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Niart and similar soils: 55 percent

Crago and similar soils: 30 percent

Minor Components

Arrod and similar soils: 0 to 6 percent

Rothiemy and similar soils: 0 to 5 percent

Varney and similar soils: 0 to 4 percent

Major Component Description

Niart

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.2 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.

230C—Niart-Crago gravelly loams, 4 to 8 percent slopes

Setting

Landform:

- Niart—Relict stream terraces
- Crago—Relict stream terraces

Position on landform:

- Niart—Foothills
- Crago—Backslopes and shoulders

Slope:

- Niart—4 to 8 percent
- Crago—4 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Niart and similar soils: 50 percent

Crago and similar soils: 35 percent

Minor Components

Arrod and similar soils: 0 to 6 percent

Rothiemay and similar soils: 0 to 6 percent

Varney and similar soils: 0 to 3 percent

Major Component Description

Niart

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

Crago

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 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.

330B—Niart gravelly loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Niart and similar soils: 85 percent

Minor Components

Crago and similar soils: 0 to 7 percent

Rothiemay and similar soils: 0 to 4 percent

Arrod and similar soils: 0 to 3 percent

Varney and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

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

Management

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

Nishon Series

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Permeability: Very slow

Landform: Closed depressions

Parent material: Alluvium

Slope range: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Typic Albaqualfs

Typical Pedon

Nishon silt loam, 0 to 2 percent slopes, in an area of nonirrigated cropland, 850 feet north and 850 feet east of the southwest corner of sec. 36, T. 30 N., R. 3 W.

Ap1—0 to 3 inches; light brownish gray (10YR 6/2) silt loam, dark gray (10YR 4/1) moist; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations; moderate medium granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine and fine roots; many fine tubular pores; slightly alkaline; clear smooth boundary.

Ap2—3 to 6 inches; light brownish gray (10YR 6/2) silt loam, dark gray (10YR 4/1) moist; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; many fine tubular pores; slightly alkaline; abrupt smooth boundary.

Bt1—6 to 11 inches; grayish brown (10YR 5/2) silty clay, dark gray (10YR 4/1) moist; strong medium and coarse prismatic structure parting to moderate fine and medium angular blocky; extremely hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine tubular pores; common distinct clay films; moderately alkaline; clear smooth boundary.

Bt2—11 to 24 inches; grayish brown (10YR 5/2) silty clay, dark gray (10YR 4/1) moist; strong medium and coarse prismatic structure parting to moderate medium angular blocky; extremely hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine tubular pores; common distinct clay films; moderately alkaline; gradual wavy boundary.

Bt3—24 to 32 inches; pale brown (10YR 6/3) silty clay, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; extremely hard, firm, very sticky, moderately plastic; few very fine roots; common very fine irregular pores; few faint clay films; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—32 to 46 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; common fine faint dark yellowish brown (10YR 4/4) redox concentrations; massive; very hard, friable, very sticky, very plastic; common very fine irregular pores; common fine threads of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bky—46 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; common fine and medium distinct dark yellowish brown (10YR 4/4) redox concentrations; massive; very hard, friable, very sticky, very plastic; common very fine irregular pores; common fine soft threads of lime and gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Bk horizon: 15 to 35 inches

Ap horizons

Hue: 2.5Y or 10YR

Value: 4 or 5 moist; 5 to 7 dry

Chroma: 1 or 2

Redox features: None to common, distinct to prominent (10YR 5/3, 4/3, 4/4) concentrations

Clay content: 20 to 27 percent

Reaction: pH 6.1 to 8.4

Bt horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 3 to 5 moist; 4 to 6 dry

Chroma: 1 to 3

Redox features: None to common, distinct to prominent (10YR 5/3, 4/3, 4/4, or 2.5Y 5/3) concentrations

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Reaction: pH 6.6 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 1 to 3

Redox features: None to common, distinct to prominent (10YR 4/4, 6/4 moist) concentrations

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

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

Bky horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Redox features: None to common, distinct to prominent (10YR 4/4, 6/4 moist) concentrations

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

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 1 to 12 percent

Gypsum: 1 to 3 percent

Reaction: pH 7.4 to 9.0

52A—Nishon silt loam, 0 to 2 percent slopes

Setting

Landform: Closed depressions

Slope: 0 to 2 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Nishon and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 7 percent

McKenzie and similar soils: 0 to 5 percent

Scobey and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Perched

Ponding: Long

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.

Nobe Series

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents

Typical Pedon

Nobe silty clay, in an area of Marvan, wet-Nobe silty clays, 0 to 2 percent slopes, in an area of rangeland, 1,000 feet south and 200 feet east of the northwest corner of sec. 2, T. 22 N., R. 4 W.

E—0 to 1 inch; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; hard crust, hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine irregular and few very fine and fine tubular pores; slightly effervescent; very strongly alkaline; clear smooth boundary.

Bt—1 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine prismatic structure parting to moderate fine and medium angular and subangular blocky; hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine irregular and few very fine and fine tubular pores; slightly effervescent; very strongly alkaline; gradual smooth boundary.

By—3 to 6 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine subangular blocky; hard, friable, very sticky, very plastic; few very fine roots; common very fine irregular and few very fine and fine tubular pores; common fine masses and threads of gypsum; strongly effervescent; very strongly alkaline; gradual smooth boundary.

Byz1—6 to 20 inches; olive (5Y 5/3) silty clay, olive gray (5Y 5/2) moist; flocculated granular structure; hard, friable, very sticky, very plastic;

few very fine roots; few very fine irregular and few very fine and fine tubular pores; common fine masses and threads of gypsum and other salts; strongly effervescent; very strongly alkaline; gradual wavy boundary.

Byz2—20 to 48 inches; pale olive (5Y 6/3) silty clay, olive (5Y 5/3) moist; flocculated granular structure; very hard, firm, very sticky, very plastic; few very fine irregular and few very fine and fine tubular pores; many fine masses and threads of gypsum and other salts; strongly effervescent; very strongly alkaline; gradual wavy boundary.

Byz3—48 to 60 inches; pale olive (5Y 6/3) silty clay and silty clay loam, olive (5Y 5/3) moist; stratified; hard, firm, very sticky, very plastic; few very fine irregular pores; common fine masses and threads of gypsum and other salts; strongly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Other features: In some areas, the Bt horizon is recognized as having characteristics of an argillic or cambic horizon but does not meet the minimum requirements of thickness for either one.

Depth to the Byz horizon: 5 to 16 inches

E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 3 to 5 moist; 5 to 7 dry

Chroma: 2 or 3

Clay content: 27 to 40 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 5 to 13

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 6.6 to 8.4

Bt horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Clay or silty clay

Clay content: 40 to 50 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 5 to 30

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: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum: 1 to 6 percent

Sodium adsorption ratio: 15 to 40 percent

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 10.0

Byz2 and Byz3 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam that is stratified with loam, clay loam, and silt loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum: 1 to 6

Sodium adsorption ratio: 15 to 70

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 10.0

Nunemaker Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Glaciated till plains

Parent material: Glacial till

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Nunemaker silty clay loam, in an area of Nunemaker-Ethridge silty clay loams, 4 to 8 percent slopes, in an area of nonirrigated cropland, 1,600 feet north and 300 feet west of the southeast corner of sec. 7, T. 25 N., R. 3 W.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; cloddy with moderate fine granular structure; clods hard and granules slightly hard, friable, moderately sticky, moderately plastic; common fine roots; less than 5 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—6 to 16 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common fine roots; many fine pores; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk—16 to 33 inches; brown (2.5Y 5/3) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; common fine roots; many very fine and fine pores; few pebbles; common fine soft masses of lime; strongly effervescent; slightly alkaline; clear wavy boundary.

2Bky—33 to 42 inches; pale brown (2.5Y 6/3) clay loam, dark grayish brown (2.5Y 5/2) moist; massive; hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine pores; few pebbles; common fine soft masses of lime; few threads and soft masses of gypsum crystals; strongly effervescent; moderately alkaline; gradual wavy boundary.

2By—42 to 60 inches; pale brown (2.5Y 6/3) clay loam, dark grayish brown (2.5Y 5/2) moist; massive; hard, friable, moderately sticky, moderately plastic; few pebbles; common threads and soft masses of gypsum crystals; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Depth to the Bk horizon: 10 to 16 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 35 to 40 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam, clay, or silty clay

Clay content: 35 to 55 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 1 to 10 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

2Bky and 2By horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay or clay loam (Below 40 inches, textures include sandy clay loam and loam.)

Clay content: 35 to 50 percent (Clay content is 25 to 45 percent below 40 inches.)

Content of rock fragments: 0 to 20 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum: 1 to 3 percent

Reaction: pH 7.4 to 8.4

250B—Nunemaker silty clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Elevation: 3,300 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Nunemaker and similar soils: 90 percent

Minor Components

Marias and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 3 percent

Scobey and similar soils: 0 to 2 percent

Kevin and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 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.

250C—Nunemaker silty clay loam, 4 to 8 percent slopes

Setting

Landform: Till plains

Slope: 4 to 8 percent

Elevation: 3,300 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Nunemaker and similar soils: 90 percent

Minor Components

Kevin and similar soils: 0 to 3 percent

Scobey and similar soils: 0 to 3 percent

Ethridge and similar soils: 0 to 2 percent

Marias and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 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.

550C—Nunemaker-Marias complex, 4 to 8 percent slopes

Setting

Landform:

- Nunemaker—Till plains

- Marias—Till plains

Position on landform:

- Nunemaker—Shoulders

- Marias—Footslopes

Slope:

- Nunemaker—4 to 8 percent

- Marias—4 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Nunemaker and similar soils: 55 percent

Marias and similar soils: 35 percent

Minor Components

Ethridge and similar soils: 0 to 3 percent

Linnet and similar soils: 0 to 2 percent

McKenzie and similar soils: 0 to 2 percent

Scobey and similar soils: 0 to 2 percent

Kevin and similar soils: 0 to 1 percent

Major Component Description

Nunemaker

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Marias

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

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.

650C—Nunemaker-Ethridge silty clay loams, 4 to 8 percent slopes

Setting

Landform:

- Nunemaker—Till plains
- Ethridge—Till plains

Position on landform:

- Nunemaker—Shoulders
- Ethridge—Footslopes

Slope:

- Nunemaker—4 to 8 percent
- Ethridge—4 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Nunemaker and similar soils: 45 percent

Ethridge and similar soils: 40 percent

Minor Components

Marias and similar soils: 0 to 9 percent

Scobey and similar soils: 0 to 4 percent

Kevin and similar soils: 0 to 2 percent

Major Component Description

Nunemaker

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Ethridge

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 9.9 inches

Pendroy Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains

Parent material: Glaciolacustrine deposits

Slope range: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Very-fine, montmorillonitic, frigid
Chromic Udic Haplusterts

Typical Pedon

Pendroy clay, 0 to 2 percent slopes, in an area of nonirrigated cropland, 50 feet north and 300 feet west of the southeast corner of sec. 35, T. 23 N., R. 2 E.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, friable, very sticky, very plastic; many fine and medium roots; common very fine and fine irregular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bss1—6 to 30 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; extremely hard, firm, very sticky, very plastic; common fine roots; common very fine tubular pores; common distinct shiny grooved slickensides that intersect at a 30 to 60 degree angle; slightly effervescent; moderately alkaline; diffuse smooth boundary.

Bss2—30 to 48 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very fine, very sticky, very plastic; common fine roots; few very fine tubular pores; many distinct shiny grooved slickensides that intersect at a 30 to 60 degree angle; slightly effervescent; moderately alkaline; diffuse smooth boundary.

BCy—48 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky, very plastic; few very fine and fine roots in cracks; few very fine tubular pores; common medium seams and masses of gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to gypsum: 26 to 50 inches

Other features: When dry, these soils form cracks 1- to 4-inches wide at the surface. These cracks extend to depths of 20 inches or more where they are still 1/2-inch wide or more. A bedrock substratum phase is recognized.

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 60 to 75 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

Bss horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 60 to 75 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

BCy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 60 to 75 percent

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum: 2 to 6 percent

Reaction: pH 7.9 to 8.4

46A—Pendroy clay, 0 to 2 percent slopes

Setting

Landform: Lake plains

Slope: 0 to 2 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Pendroy and similar soils: 90 percent

Minor Components

Marias and similar soils: 0 to 8 percent

McKenzie and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

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.

800—Pits, gravel

Composition

Major Components

Pits, gravel: 100 percent

Major Component Description

Definition: Areas mined as a source of gravel, presently supporting little or no vegetation

Pylon Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Sedimentary plains

Parent material: Semiconsolidated shale

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Eutroboralfs

Typical Pedon

Pylon silty clay loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 20 feet south and 2,500 feet west of the northeast corner of sec. 18, T. 23 N., R. 1 E.

Ap—0 to 6 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, moderately sticky, moderately plastic; common fine and medium roots; many medium vesicular pores; slightly alkaline; abrupt wavy boundary.

Bt1—6 to 9 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; strong fine columnar

structure parting to moderate medium subangular blocky; very hard, firm, moderately sticky, very plastic; common fine roots; common very fine and fine tubular pores; common distinct clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bt₂—9 to 17 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, moderately sticky, very plastic; few very fine and fine roots; common very fine and fine tubular pores; common distinct clay films on faces of peds; slightly alkaline; gradual wavy boundary.

Bk—17 to 26 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; very hard, friable, moderately sticky, very plastic; few very fine roots; common very fine tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bky—26 to 36 inches; light brownish gray (2.5Y 6/2) shaly silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; extremely hard, friable, moderately sticky, moderately plastic; common fine soft masses of lime; few fine threadlike seams of gypsum; 20 percent soft shale fragments; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cr—36 to 60 inches; gray (N 6/) semiconsolidated platy shale; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Content of rock fragments: Less than 5 percent pebbles throughout

Depth to the Bk horizon: 12 to 18 inches

Depth to the Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 1 or 2

Clay content: 30 to 40 percent

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 55 percent

Reaction: pH 6.6 to 7.8

Bk and Bky horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Cr horizon

Material: Semiconsolidated shale

80B—Pylon silty clay loam, 0 to 4 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Pylon and similar soils: 85 percent

Minor Components

Abor and similar soils: 0 to 6 percent

Creed and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 4 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

Available water capacity: Mainly 5.0 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.

Raynesford Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow

Landform: Stream terraces

Parent material: Alluvium derived from limestone or sandstone

Slope range: 0 to 4 percent

Mean annual precipitation: 18 to 20 inches

Annual air temperature: 38 to 40 degrees F

Frost-free period: 60 to 90 days

Taxonomic Class: Fine-loamy, carbonatic Calcic Cryoborolls

Typical Pedon

Raynesford cobbly loam, in an area of Hanson-Raynesford complex, 0 to 4 percent slopes, in an area of rangeland, 250 feet north and 2,000 feet west of the southeast corner of sec. 11, T. 27 N., R. 9 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; 10 percent cobbles and 10 percent limestone pebbles; neutral clear smooth boundary.

Bw—6 to 12 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; 10 percent limestone pebbles; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bk1—12 to 20 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; 10 percent limestone pebbles; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—20 to 28 inches; light gray (10YR 7/2) gravelly loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; 20 percent limestone pebbles and 10 percent cobbles; many fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk3—28 to 60 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 6/3) moist; massive structure; slightly hard, friable, slightly sticky, nonplastic; few very fine roots; 50 percent limestone pebbles and 10 percent cobbles; lime coats on pebbles with lime crusts on undersides of larger pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 36 to 41 degrees F

Thickness of the mollic epipedon: 12 to 16 inches

Depth to the 2Bk horizon: 24 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 dry; 1 to 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—10 to 20 percent cobbles; 5 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 3 to 5 dry; 1 to 3 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 to 8 dry; 5 to 7 moist

Chroma: 1 to 4

Texture: Loam, clay loam, or silt loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles

Calcium carbonate equivalent: 40 to 50 percent

Reaction: pH 7.9 to 8.4

2Bk3 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 1 to 4

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 30 to 50 percent pebbles

Calcium carbonate equivalent: 40 to 50 percent

Reaction: pH 7.9 to 8.4

Rentsac Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Sedimentary plains
Parent material: Residuum from hard sandstone bedrock
Slope range: 0 to 8 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Loamy-skeletal, mixed (calcareous), frigid Lithic Ustorthents

Typical Pedon

Rentsac channery loam, in an area of Rootel-Rentsac complex, 0 to 4 percent slopes, in an area of rangeland, 2,000 feet south and 350 feet west of the northeast corner of sec. 3, T. 25 N., R. 6 W.

A—0 to 4 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; many fine roots; many fine irregular pores; 25 percent channers; lime coats on undersides of larger rock fragments; slightly alkaline; clear smooth boundary.

Bk—4 to 14 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 4/3) moist; weak fine and medium granular structure; slightly hard, very friable, slightly sticky, nonplastic; many very fine and fine roots; many very fine and fine pores; 50 percent channers and 110 percent flagstones; lime crusts on undersides of larger rock fragments; strongly effervescent; slightly alkaline; abrupt wavy boundary.

R—14 inches; indurated sandstone with roots in cracks in upper few inches.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
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 to 4
 Clay content: 7 to 18 percent
 Content of rock fragments: 15 to 35 percent flagstones and channers
 Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 to 4 or 6
 Texture: Loam or sandy loam
 Clay content: 7 to 18 percent
 Content of rock fragments: 35 to 70 percent—0 to 35 percent flagstones and cobbles; 25 to 55 percent pebbles and channers
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: Less than 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

Richey Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans and sedimentary plains
Parent material: Alluvium
Slope range: 0 to 8 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Haploborolls

Typical Pedon

Richey silty clay loam, 0 to 4 percent slopes, in an area of irrigated cropland, 2,600 feet south and 800 feet west of the northeast corner of sec. 9, T. 28 N., R. 3 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; hard, friable, very sticky, moderately plastic; many fine roots; many fine pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—7 to 16 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, firm, very sticky, moderately plastic; common very fine and fine roots; common very fine and fine tubular pores; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—16 to 22 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, friable, very sticky, moderately plastic;

common very fine and fine roots; common very fine and fine tubular pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk₂—22 to 36 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, very sticky, moderately plastic; few very fine and fine roots; common very fine and fine tubular pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

By—36 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky, moderately plastic; few very fine pores; common fine threads and soft masses of gypsum crystals; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the Bk horizon: 12 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 40 percent

Content of rock fragments: 0 to 5 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 or silty clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 7.9 to 9.0

Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

By horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

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

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

41B—Richey silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Richey and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 9 percent

Nunemaker and similar soils: 0 to 6 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 8.9 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.

Ridgelawn Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate to 26 inches; rapid below this depth

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy over sandy or sandy skeletal, mixed (calcareous), frigid Typic Ustifluvents

Typical Pedon

Ridgelawn loam, in an area of Ridgelawn-Nesda-Korchea complex, 0 to 2 percent slopes, occasionally flooded, in an area of forest land, 1,400 feet south and 100 feet west of the northeast corner of sec. 35, T. 25 N., R. 7 W.

A—0 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky, nonplastic; many fine roots; many vesicular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

C1—8 to 16 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; common fine roots; common vesicular pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—16 to 26 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine roots; common vesicular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

2C3—26 to 32 inches; grayish brown (10YR 5/2) very gravelly loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; very friable, slightly sticky, nonplastic; common very fine and fine roots; 55 percent coarse rock fragments; strongly effervescent; lime coats on upper sides and lime crusts on undersides of coarse rock fragments; moderately alkaline; clear wavy boundary.

2C4—32 to 60 inches; grayish brown (10YR 5/2) very gravelly sand, grayish brown (10YR 5/2) moist; single grain; nonsticky, nonplastic; few medium roots in upper part; 60 percent coarse rock fragments; strongly effervescent; lime coats and few thin lime crusts on undersides of larger coarse rock fragments; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A horizon

Hue: 5Y, 2.5Y, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Clay content: 18 to 27 percent
Reaction: pH 6.6 to 7.8

C horizons

Hue: 5Y, 2.5Y, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Loam, silt loam, or silty clay loam
Clay content: 18 to 35 percent
Reaction: pH 7.4 to 8.4

2C horizons

Hue: 5Y, 2.5Y, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Fine sand, loamy fine sand, loamy sand, or sand
Clay content: 0 to 10 percent
Content of rock fragments: 10 to 35 percent pebbles
Reaction: pH 7.4 to 8.4

308A—Ridgelawn-Nesda-Korchea complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Ridgelawn—Flood plains
- Nesda—Flood plains
- Korchea—Flood plains

Slope:

- Ridgelawn—0 to 2 percent
- Nesda—0 to 2 percent
- Korchea—0 to 2 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Ridgelawn and similar soils: 40 percent
Nesda and similar soils: 25 percent
Korchea and similar soils: 20 percent

Minor Components

Straw and similar soils: 0 to 10 percent
Tetonview and similar soils: 0 to 5 percent

Major Component Description

Ridgelawn

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: Occasional
Available water capacity: Mainly 7.2 inches

Nesda

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 3.2 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: Forest land
Flooding: Occasional
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.

500—Riverwash

Composition

Major Components

Riverwash: 90 percent

Minor Components

Havre, poorly drained: 0 to 5 percent
 Nesda and similar soils: 0 to 3 percent
 Rivra and similar soils: 0 to 2 percent

Major Component Description

Definition: Areas of recently deposited alluvial material reworked often by flood waters. These areas support little or no vegetation.

Flooding: Frequent
Water table: Apparent

Rivra Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very rapid below 7 inches
Landform: Flood plains

Parent material: Alluvium
Slope range: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
 Aridic Ustifluvents

Typical Pedon

Rivra gravelly sandy loam, in an area of Rivra, occasionally flooded-Riverwash complex, 0 to 4 percent slopes, in an area of forest land, 1,100 feet south and 500 feet west of the northeast corner of sec. 5, T. 24 N., R. 5 W.

- A—0 to 8 inches; brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, very friable, slightly sticky, nonplastic; common fine and few coarse roots; common vesicular pores; 20 percent pebbles; strongly effervescent; slightly alkaline; clear wavy boundary.
- C1—8 to 29 inches; pale brown (10YR 6/3) very gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky, nonplastic; few fine and medium roots; 50 percent pebbles and 10 percent cobbles; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C2—29 to 60 inches; pale brown (10YR 6/3) very gravelly sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky, nonplastic; few medium roots; 60 percent pebbles and 10 percent cobbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Soil phases: Rarely flooded
 Other features: Thin buried A horizons do occur above 40 inches.

A horizon

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 5 to 15 percent
 Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles
 Reaction: pH 6.6 to 8.4

C horizons

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 or 3

Texture: Sand, loamy sand, and loamy coarse sand that consist of stratification of these and some finer sands

Clay content: 0 to 5 percent

Content of rock fragments: 55 to 80 percent—10 to 20 percent stones and cobbles; 45 to 70 percent pebbles

Reaction: pH 7.4 to 8.4

110B—Rivra, occasionally flooded-Riverwash complex, 0 to 4 percent slopes

Setting

Landform: Flood plains

Slope:

- Rivra—0 to 4 percent
- Riverwash—0 to 4 percent

Elevation: 3,200 to 4,400 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rivra and similar soils: 50 percent

Riverwash: 35 percent

Minor Components

Ryell and similar soils: 0 to 10 percent

Havre and similar soils: 0 to 5 percent

Major Component Description

Rivra

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Occasional

Available water capacity: Mainly 2.1 inches

Riverwash

Definition: Areas of recently deposited alluvial material reworked often by flood waters. These areas support little or no vegetation.

Flooding: Frequent

Water table: Apparent

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.

Rootel Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Hills and sedimentary plains

Parent material: Residuum from sandstone bedrock

Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed, frigid Haplocalcidic Ustochrepts

Typical Pedon

Rootel loam, in an area of Rootel-Rentsac complex, 0 to 4 percent slopes, in an area of rangeland, 2,200 feet north and 2,300 feet west of the southeast corner of sec. 3, T. 25 N., R. 6 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; many vesicular pores; 10 percent channers; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—3 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine pores; 10 percent channers; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—10 to 18 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine pores; 10 percent channers; common medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—18 to 28 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium

prismatic structure parting to weak medium subangular blocky; hard, very friable, moderately sticky, slightly plastic; common very fine and fine roots; many fine pores; 10 percent channers with lime casts on undersides; common medium soft masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

R—28 inches; hard sandstone, fractured in the upper few inches; lime coats between fragments.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the R horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Reaction: pH 7.4 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam or silt loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent flagstones; 5 to 30 percent channers

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.9 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or silt loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent flagstones; 5 to 30 percent channers

Calcium carbonate equivalent: 25 to 35 percent

Reaction: pH 7.9 to 9.0

177C—Rootel-Marmarth loams, 2 to 8 percent slopes

Setting

Landform:

- Rootel—Sedimentary plains
- Marmarth—Sedimentary plains

Position on landform:

- Rootel—Shoulders and summits
- Marmarth—Foothills

Slope:

- Rootel—2 to 8 percent
- Marmarth—2 to 8 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rootel and similar soils: 50 percent

Marmarth and similar soils: 35 percent

Minor Components

Rentsac and similar soils: 0 to 8 percent

Cabbart and similar soils: 0 to 7 percent

Major Component Description

Rootel

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Marmarth

Surface layer texture: 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 5.2 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.

277B—Rootel-Rentsac complex, 0 to 4 percent slopes

Setting

Landform:

- Rootel—Sedimentary plains
- Rentsac—Sedimentary plains

Slope:

- Rootel—0 to 4 percent
- Rentsac—0 to 4 percent

Elevation: 3,600 to 4,200 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Rootel and similar soils: 45 percent

Rentsac and similar soils: 40 percent

Minor Components

Areas of rock outcrop: 0 to 9 percent

Marmarth and similar soils: 0 to 6 percent

Major Component Description**Rootel***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Sandstone residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.5 inches**Rentsac***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 1.4 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.

Rothiemay Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Stream terraces, relict stream terraces, hills, alluvial fans, or sedimentary plains*Parent material:* Alluvium*Slope range:* 0 to 15 percent*Mean annual precipitation:* 11 to 14 inches*Annual air temperature:* 41 to 45 degrees F*Frost-free period:* 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Calciborolls

Typical Pedon

Rothiemay clay loam, in an area of Varney-Rothiemay clay loams, 0 to 4 percent slopes, in an area of irrigated cropland, 600 feet north and 2,600 feet east of the southwest corner of sec. 11, T. 22 N., R. 3 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine and medium roots; 5 percent pebbles; many fine irregular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—8 to 16 inches; pale brown (10YR 6/3) clay loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine irregular pores; 5 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—16 to 26 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; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine and medium pores; 5 percent pebbles; common fine masses and threads of segregated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—26 to 36 inches; light gray (2.5Y 7/2) clay loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, firm, moderately sticky, moderately plastic; few fine roots; few fine irregular pores; 5 percent pebbles; many fine and medium soft masses and threads of segregated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—36 to 42 inches; light gray (2.5Y 7/2) clay loam, light yellowish brown (2.5Y 6/4) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few fine irregular pores; 5 percent pebbles; few fine masses and threads of segregated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk4—42 to 50 inches; pale olive (5Y 6/3) sandy clay loam, olive (5Y 5/3) moist; massive; slightly hard, very firm, slightly sticky, slightly plastic; few very fine roots; few fine irregular pores; 5 percent pebbles; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

BC—50 to 60 inches; olive gray (5Y 7/2) gravelly clay loam, pale olive (2.5Y 6/3) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few fine irregular pores; 20 percent pebbles; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the calcic horizon: 13 to 20 inches

Soil phases: Calcareous and gravelly

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 1 or 2

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 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 to 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

Content of 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 and Bk2 horizons

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

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

Content of 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, Bk4, and BC horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

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

Content of rock fragments: 5 to 35 percent pebbles

Calcium carbonate equivalent: 15 to 60 percent

Reaction: pH 7.9 to 9.0

23B—Rothiemay clay loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiemay and similar soils: 85 percent

Minor Components

Niart and similar soils: 0 to 6 percent

Varney and similar soils: 0 to 4 percent

Crago and similar soils: 0 to 3 percent

Arrod and similar soils: 0 to 2 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 9.2 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.

**123B—Rothiemay-Niart clay loams,
0 to 4 percent slopes****Setting***Landform:*

- Rothiemay—Stream terraces
- Niart—Stream terraces

Slope:

- Rothiemay—0 to 4 percent
- Niart—0 to 4 percent

Elevation: 3,200 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Rothiemay and similar soils: 50 percent

Niart and similar soils: 35 percent

Minor Components

Arrod and similar soils: 0 to 4 percent

Crago and similar soils: 0 to 6 percent

Varney and similar soils: 0 to 5 percent

Major Component Description**Rothiemay***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 9.2 inches**Niart***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 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.

**223D—Rothiemay-Crago complex,
4 to 15 percent slopes****Setting***Landform:*

- Rothiemay—Relict stream terraces
- Crago—Relict stream terraces

Position on landform:

- Rothiemay—Backslopes and footslopes
- Crago—Shoulders and summits

Slope:

- Rothiemay—4 to 15 percent
- Crago—4 to 15 percent

Elevation: 3,200 to 4,000 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Rothiemay and similar soils: 55 percent

Crago and similar soils: 30 percent

Minor Components

Niart and similar soils: 0 to 7 percent

Arrod and similar soils: 0 to 5 percent

Varney and similar soils: 0 to 3 percent

Major Component Description**Rothiemay***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 9.2 inches**Crago***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.2 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.

523B—Rothiemay gravelly clay loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiemay and similar soils: 85 percent

Minor Components

Crago and similar soils: 0 to 5 percent

Arrod and similar soils: 0 to 4 percent

Niart and similar soils: 0 to 4 percent

Varney and similar soils: 0 to 2 percent

Major Component Description

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 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.

523C—Rothiemay gravelly clay loam, 4 to 8 percent slopes

Setting

Landform: Stream terraces

Slope: 4 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiemay and similar soils: 85 percent

Minor Components

Crago and similar soils: 0 to 7 percent

Arrod and similar soils: 0 to 4 percent

Niart and similar soils: 0 to 4 percent

Major Component Description

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 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.

623C—Rothiemay-Delpoint gravelly clay loams, 2 to 8 percent slopes

Setting

Landform:

- Rothiemay—Alluvial fans
- Delpoint—Sedimentary plains

Position on landform:

- Rothiemay—Footslopes
- Delpoint—Backslopes and shoulders

Slope:

- Rothiemay—2 to 8 percent
- Delpoint—2 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiemay and similar soils: 50 percent

Delpoint and similar soils: 40 percent

Minor Components

Niart and similar soils: 0 to 4 percent

Crago and similar soils: 0 to 3 percent

Kremlin and similar soils: 0 to 3 percent

Major Component Description

Rothiemay

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 9.0 inches

Delpoint

Surface layer texture: Gravelly 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 3.4 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.

623D—Rothiemay-Delpoint gravelly clay loams, 8 to 15 percent slopes

Setting

Landform:

- Rothiemay—Alluvial fans
- Delpoint—Hills

Position on landform:

- Rothiemay—Backslopes and footslopes
- Delpoint—Shoulders

Slope:

- Rothiemay—8 to 15 percent
- Delpoint—8 to 15 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Crago and similar soils: 0 to 6 percent
 Niart and similar soils: 0 to 6 percent
 Kremlin and similar soils: 0 to 3 percent

Major Component Description

Rothiemay

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 9.0 inches

Delpoint

Surface layer texture: Gravelly 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 3.4 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.

630B—Rothiemay, calcareous-Niart gravelly clay loams, 0 to 4 percent slopes

Setting

Landform:

- Rothiemay—Stream terraces
- Niart—Stream terraces

Slope:

- Rothiemay—0 to 4 percent
- Niart—0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiemay and similar soils: 50 percent
Niart and similar soils: 35 percent

Minor Components

Arrod and similar soils: 0 to 6 percent
Crago and similar soils: 0 to 6 percent
Varney and similar soils: 0 to 3 percent

Major Component Description

Rothiemay

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 9.0 inches

Niart

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 6.7 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.

630C—Rothiemay-Niart gravelly clay loams, 4 to 8 percent slopes

Setting

Landform:

- Rothiemay—Stream terraces
- Niart—Stream terraces

Position on landform:

- Rothiemay—Foothills
- Niart—Backslopes and shoulders

Slope:

- Rothiemay—4 to 8 percent
- Niart—4 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiemay and similar soils: 50 percent
Niart and similar soils: 35 percent

Minor Components

Crago and similar soils: 0 to 9 percent
Arrod and similar soils: 0 to 6 percent

Major Component Description

Rothiemay

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 9.0 inches

Niart

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 6.7 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.

723B—Rothiemay-Niart gravelly clay loams, 0 to 4 percent slopes

Setting

Landform:

- Rothiemay—Stream terraces
- Niart—Stream terraces

Slope:

- Rothiemay—0 to 4 percent
- Niart—0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rothiema and similar soils: 50 percent
Niart and similar soils: 35 percent

Minor Components

Crago and similar soils: 0 to 7 percent
Varney and similar soils: 0 to 5 percent
Arrod and similar soils: 0 to 3 percent

Major Component Description

Rothiema

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 9.1 inches

Niart

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 6.7 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.

Roundor Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Hills
Parent material: Semiconsolidated sedimentary beds
Slope range: 2 to 60 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Calciborolls

Typical Pedon

Roundor loam, in an area of Kiev-Roundor loams, 2 to 15 percent slopes, in an area of rangeland, 1,650 feet south and 450 feet west of the northeast corner of sec. 12, T. 24 N., R. 7 W.

- A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and few medium roots; many fine vesicular pores; 5 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.
- Bw—5 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, slightly plastic; common fine roots; common very fine and fine pores; 5 percent pebbles; strongly effervescent; slightly alkaline; clear smooth boundary.
- Bk1—12 to 26 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common fine roots; common very fine pores; 5 percent pebbles; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.
- 2Bk2—26 to 31 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; stratified parting to weak medium granular structure; hard, friable, slightly sticky, slightly plastic; few fine roots; 10 percent soft shale fragments; common fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.
- Cr—31 to 60 inches; very pale brown (10YR 7/3) semiconsolidated shale; pale brown (10YR 6/3) moist; strongly effervescent; strongly alkaline.

Range in Characteristics

- Soil temperature:* 41 to 47 degrees F
Thickness of the mollic epipedon: 7 to 12 inches; may include the upper part of the Bw horizon.
Depth to the Cr horizon: 20 to 40 inches
- A horizon*
Hue: 2.5Y, 10YR, or 7.5YR
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Reaction: pH 7.4 to 7.8

Bw horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Loam, silt loam, clay loam, or silty clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 0 to 15 percent either rounded pebbles or soft shale fragments
Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Loam, silt loam, fine sandy loam, or clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 0 to 15 percent either rounded pebbles or soft shale fragments
Calcium carbonate equivalent: 15 to 35 percent
Reaction: pH 7.9 to 8.4

Ryell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to 26 inches; rapid below this depth
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Ryell loam, in an area of Havre-Ryell loams, 0 to 2 percent slopes, rarely flooded, in an area of cropland, 400 feet south and 1,250 feet west of the northeast corner of sec. 14, T. 24 N., R. 5 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, slightly sticky, nonplastic; many fine and few medium roots;

common fine irregular pores; slightly effervescent; slightly alkaline; clear wavy boundary.

C1—5 to 16 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky, nonplastic; many fine and few medium roots; many fine irregular pores; strongly effervescent; slightly alkaline; clear wavy boundary.

C2—16 to 26 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine roots; common very fine and fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

2C3—26 to 60 inches; brown (10YR 5/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain, loose, nonsticky, nonplastic; few very fine and fine roots on the upper part; 55 percent pebbles and 5 percent cobbles; strongly effervescent; lime crusts on undersides of coarse rock fragments; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the 2C3 horizon: 18 to 36 inches

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
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

C1 and C2 horizons

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Very fine sandy loam, loamy very fine sand, and loam consisting of very fine sandy loam with thin strata of silt loam and/or fine sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

2C3 horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3

Texture: Sand or loamy sand
 Clay content: 0 to 10 percent
 Content of rock fragments: 35 to 70 percent—0 to 15 percent cobbles; 35 to 55 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

111A—Ryell-Rivra complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Ryell—Flood plains
- Rivra—Flood plains

Slope:

- Ryell—0 to 2 percent
- Rivra—0 to 2 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ryell and similar soils: 50 percent

Rivra and similar soils: 35 percent

Minor Components

Areas of riverwash: 0 to 7 percent

Fairway and similar soils: 0 to 5 percent

Havre and similar soils: 0 to 3 percent

Major Component Description

Ryell

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: Occasional

Available water capacity: Mainly 5.3 inches

Rivra

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Occasional

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.

207A—Ryell-Havre loams, 0 to 2 percent slopes, occasionally flooded

Setting

Landform:

- Ryell—Flood plains
- Havre—Flood plains

Slope:

- Ryell—0 to 2 percent
- Havre—0 to 2 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ryell and similar soils: 45 percent

Havre and similar soils: 40 percent

Minor Components

Rivra and similar soils: 0 to 6 percent

Havre, poorly drained: 0 to 5 percent

Areas of riverwash: 0 to 2 percent

Fairway and similar soils: 0 to 2 percent

Major Component Description

Ryell

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: Occasional

Available water capacity: Mainly 5.3 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: Occasional

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.

211A—Ryell-Rivra complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Ryell—Flood plains
- Rivra—Flood plains

Slope:

- Ryell—0 to 2 percent
- Rivra—0 to 2 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ryell and similar soils: 50 percent

Rivra and similar soils: 35 percent

Minor Components

Havre and similar soils: 0 to 10 percent

Fairway, poorly drained: 0 to 5 percent

Major Component Description

Ryell

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 5.3 inches

Rivra

Surface layer texture: Gravelly 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 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.

Saypo Series

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: Flood plains, stream terraces, and closed depressions

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 13 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed Aquic Calciborolls

Typical Pedon

Saypo clay loam, 0 to 2 percent slopes, rarely flooded, in an area of rangeland, 1,000 feet south and 1,700 feet east of the northwest corner of sec. 22, T. 26 N., R. 7 W.

(Colors are for moist soil unless otherwise noted.)

A—0 to 7 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many fine and few medium roots; many fine and medium pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—7 to 15 inches; light brownish gray (2.5Y 6/2) clay loam, light gray (2.5Y 7/2) dry; weak medium prismatic structure parting to moderate fine and medium granular; hard, very friable, moderately sticky, moderately plastic; common fine and few medium roots; common fine pores; few fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—15 to 25 inches; brown (10YR 5/3) clay loam, very pale brown (10YR 7/3) dry; common fine distinct yellowish brown (10YR 5/6) redox concentrations; weak medium prismatic structure parting to moderate medium granular; very hard, friable, moderately sticky, moderately plastic; few very fine and fine roots; common very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—25 to 48 inches; dark brown (10YR 4/3) clay loam, pale brown (10YR 6/3) dry; many medium distinct yellowish brown (10YR 5/6) redox concentrations and few fine distinct gray (10YR 5/1) redox depletions; massive; very hard, friable,

moderately sticky, moderately plastic; few very fine roots; common very fine pores; 10 percent pebbles; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C—48 to 60 inches; dark brown (10YR 4/3) gravelly clay loam, pale brown (10YR 6/3) dry; many medium distinct yellowish brown (10YR 5/6) redox concentrations and common fine gray (10YR 5/1) redox depletions; massive; very hard, friable, moderately sticky, moderately plastic; 25 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the seasonal high water table: 3 to 5 feet, except in flood-irrigated areas where it is near the surface for short periods.

Depth to the calcic horizon: 5 to 12 inches

Soil phases: Saline

A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist; 3 or 4 dry

Chroma: 1 or 2

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 12 mmhos/cm; saline phase is 4 to 12 mmhos/cm

Sodium adsorption ratio: 0 to 30; sodic phase is 13 to 30

Reaction: pH 7.4 to 9.4; saline phase is pH 8.4 to 9.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 20 to 25 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.4 to 9.0; saline phase is pH 7.9 to 9.0

Bk2 and Bk3 horizons

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles

Calcium carbonate equivalent: 30 to 35 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is pH 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.9 to 9.0

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 22 to 40 percent

Content of rock fragments: 5 to 50 percent—0 to 10 percent cobbles; 5 to 40 percent pebbles

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is pH 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.9 to 9.0

68A—Saypo clay loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 13 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Truchot and similar soils: 0 to 6 percent

Tetonview and similar soils: 0 to 3 percent

Niart and similar soils: 0 to 2 percent

Rothiemay and similar soils: 0 to 2 percent

Winginaw and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 7.8 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.

168A—Saypo-Truchot clay loams, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Saypo—Flood plains
- Truchot—Flood plains

Slope:

- Saypo—0 to 2 percent
- Truchot—0 to 2 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 14 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Saypo and similar soils: 45 percent

Truchot and similar soils: 40 percent

Minor Components

Rothiemy and similar soils: 0 to 6 percent

Niart and similar soils: 0 to 4 percent

Ridgelawn and similar soils: 0 to 3 percent

Birchfield and similar soils: 0 to 2 percent

Major Component Description

Saypo

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 7.8 inches

Truchot

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

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.

268A—Saypo-Tetonview complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Saypo—Flood plains
- Tetonview—Flood plains

Slope:

- Saypo—0 to 2 percent
- Tetonview—0 to 2 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 13 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Saypo and similar soils: 45 percent

Tetonview and similar soils: 45 percent

Minor Components

Birchfield and similar soils: 0 to 5 percent

Truchot and similar soils: 0 to 5 percent

Major Component Description

Saypo

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 7.8 inches

Tetonview

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 8.9 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.

368A—Saypo clay loam, saline, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,200 to 4,600 feet
Mean annual precipitation: 13 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Trudau and similar soils: 0 to 10 percent
 Tetonview and similar soils: 0 to 3 percent
 Birchfield and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 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.

468A—Saypo-Tetonview complex, saline, 0 to 2 percent slopes, rarely flooded

Setting

Landform:
 • Saypo—Flood plains
 • Tetonview—Flood plains
Slope:
 • Saypo—0 to 2 percent
 • Tetonview—0 to 2 percent
Elevation: 3,200 to 4,600 feet
Mean annual precipitation: 13 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Saypo and similar soils: 45 percent
 Tetonview and similar soils: 45 percent

Minor Components

Birchfield and similar soils: 0 to 5 percent
 Trudau and similar soils: 0 to 5 percent

Major Component Description

Saypo

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

Tetonview

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
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.

823A—Saypo clay loam, sodic, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 13 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Saypo and similar soils: 85 percent

Minor Components

Fairway and similar soils: 0 to 5 percent

Trudau and similar soils: 0 to 5 percent

Tetonview and similar soils: 0 to 3 percent

Birchfield and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.1 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.

923B—Saypo-Niart clay loams, 0 to 4 percent slopes

Setting

Landform:

- Saypo—Stream terraces

- Niart—Stream terraces

Position on landform:

- Saypo—Foothslopes and toeslopes

- Niart—Backslopes and shoulders

Slope:

- Saypo—0 to 2 percent

- Niart—0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 13 to 14 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Saypo and similar soils: 50 percent

Niart and similar soils: 35 percent

Minor Components

Rothiemay and similar soils: 0 to 6 percent

Truchot and similar soils: 0 to 4 percent

Trudau and similar soils: 0 to 3 percent

Birchfield and similar soils: 0 to 1 percent

Tetonview and similar soils: 0 to 1 percent

Major Component Description

Saypo

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.1 inches

Niart

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 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.

Scobey Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Glaciated till plains and hills

Parent material: Glacial till

Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Scobey clay loam, in an area of Scobey-Kevin clay loams, 4 to 8 percent slopes, in an area of nonirrigated cropland, 1,600 feet north and 500 feet east of the southwest corner of sec. 9, T. 25 N., R. 2 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; 5 percent pebbles; neutral; gradual smooth boundary.

Bt—6 to 16 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; strong fine and medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, very sticky, very plastic; common very fine and fine roots; many very fine and fine tubular pores; common distinct clay films on faces of peds; 5 percent pebbles; neutral; gradual smooth boundary.

Btk—16 to 24 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, very sticky, very plastic; few very fine and fine roots; many very fine tubular pores; few faint clay films on faces of peds; 5 percent pebbles; few soft masses of segregated lime and few lime-coated pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—24 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure; hard, friable, very sticky, very plastic; few very fine roots; common very fine tubular pores; 5 percent pebbles; common soft masses of segregated

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

Cy—42 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, very sticky, very plastic; few pebbles; common threadlike masses and seams of gypsum accumulated in cracks; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Btk horizon: 10 to 18 inches

Depth to the Cy horizon: 30 to 55 inches

Other features: These soils have air dry bulk density greater than 1.35 g/cm³ above 40 inches and a moist bulk density greater than 1.35 g/cm³ at depths as shallow as 20 inches.

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Clay loam or clay

Clay content: 35 to 45 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; trace to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Btk and Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 30 to 40 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; trace to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Cy 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

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; trace to 10 percent pebbles

Calcium carbonate equivalent: 5 to 12 percent

Sodium adsorption ratio: 1 to 8

Gypsum: 1 to 6 percent
Reaction: pH 7.4 to 9.0

164B—Scobey-Kevin clay loams, 0 to 4 percent slopes

Setting

Landform:

- Scobey—Till plains
- Kevin—Till plains

Position on landform:

- Scobey—Foothills and toeslopes
- Kevin—Backslopes and foothills

Slope:

- Scobey—0 to 4 percent
- Kevin—0 to 4 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 50 percent

Kevin and similar soils: 35 percent

Minor Components

Nishon and similar soils: 0 to 5 percent

Hillon and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 2 percent

McKenzie and similar soils: 0 to 1 percent

Major Component Description

Scobey

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Kevin

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.1 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.

263C—Scobey-Kevin clay loams, 4 to 8 percent slopes

Setting

Landform:

- Scobey—Till plains
- Kevin—Till plains

Position on landform:

- Scobey—Foothills
- Kevin—Backslopes and shoulders

Slope:

- Scobey—4 to 8 percent
- Kevin—4 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 45 percent

Kevin and similar soils: 40 percent

Minor Components

Hillon and similar soils: 0 to 9 percent

Joplin and similar soils: 0 to 3 percent

Nishon soils: 0 to 2 percent

McKenzie and similar soils: 0 to 1 percent

Major Component Description

Scobey

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Kevin

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.1 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.

264B—Scobey-Acel complex, 0 to 4 percent slopes

Setting

Landform:

- Scobey—Till plains
- Acel—Till plains

Position on landform:

- Scobey—Foothills
- Acel—Toeslopes

Slope:

- Scobey—0 to 4 percent
- Acel—0 to 4 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 55 percent

Acel and similar soils: 30 percent

Minor Components

Kevin and similar soils: 0 to 8 percent

Ethridge and similar soils: 0 to 5 percent

Nishon soils: 0 to 2 percent

Major Component Description

Scobey

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Acel

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 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.

364D—Scobey-Hillon clay loams, 2 to 15 percent slopes

Setting

Landform:

- Scobey—Hills
- Hillon—Hills

Position on landform:

- Scobey—Foothills
- Hillon—Backslopes and shoulders

Slope:

- Scobey—2 to 15 percent
- Hillon—2 to 15 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 55 percent

Hillon and similar soils: 30 percent

Minor Components

Kevin and similar soils: 0 to 10 percent

Ethridge and similar soils: 0 to 3 percent

Nishon and similar soils: 0 to 2 percent

Major Component Description

Scobey

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Hillon

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 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.

Scravo Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate to 10 inches; rapid below this depth

Landform: Stream terraces and relict stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
Haplocalcidic Ustochrepts

Typical Pedon

Scravo gravelly loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 1,600 feet north and 1,800 feet east of the southwest corner of sec. 26, T. 30 N., R. 7 W.

A—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; many fine irregular pores; 25 percent pebbles; lime coats on undersides of larger coarse rock fragments; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—5 to 10 inches; light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist; moderate medium granular structure;

slightly hard, very friable, nonsticky, nonplastic; many fine roots; 50 percent cobbles and 5 percent pebbles; lime coats on undersides of larger cobbles and pebbles; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—10 to 15 inches; light brownish gray (10YR 6/2) extremely gravelly sandy loam, brown (10YR 5/3) moist; single grain; nonsticky, nonplastic; common fine roots; 55 percent pebbles and 10 percent cobbles; lime coats on all surfaces with lime crusts on undersides of larger coarse rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—15 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; nonsticky, nonplastic; few fine roots; 65 percent pebbles and 10 percent cobbles; lime coats on all surfaces with lime crusts on undersides of larger coarse rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Depth to the Bk horizon: 3 to 6 inches

Depth to the 2C horizon: 9 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.4 to 7.8

Bk horizons

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 70 percent—0 to 15 percent cobbles; 35 to 55 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

2C horizon

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Loamy sand or sand

Clay content: 0 to 10 percent
 Content of rock fragments: 35 to 80 percent—0 to 15 percent cobbles; 35 to 65 percent pebbles
 Electrical conductivity: 0 to 2 mmhos/cm
 Calcium carbonate equivalent: 10 to 30 percent
 Reaction: pH 7.9 to 8.4

218B—Scravo gravelly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 3,500 to 3,900 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Scravo and similar soils: 90 percent

Minor Components

Binna and similar soils: 0 to 10 percent

Major Component Description

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

Sebud Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountain slopes
Parent material: Colluvium from glacial till
Slope range: 4 to 35 percent
Mean annual precipitation: 19 to 24 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 60 to 90 days

Taxonomic Class: Loamy-skeletal, mixed Typic Cryoborolls

Typical Pedon

Sebud stony loam, in an area of Adel-Burnette-Sebud complex, 4 to 35 percent slopes, in an area of forest land, 150 feet south and 150 feet west of the northeast corner of sec. 31, T. 28 N., R. 9 W.

O_i—1 inch to 0; organic mat.

A—0 to 4 inches; dark grayish brown (10YR 4/2) stony loam, black (10YR 2/1) moist; weak medium granular structure; soft, friable, nonsticky, slightly plastic; many fine and few coarse roots; many fine vesicular pores; 15 percent stones and 10 percent pebbles; neutral; clear smooth boundary.

Bw₁—4 to 10 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and few coarse roots; common fine vesicular pores; 30 percent stones and cobbles; neutral; clear wavy boundary.

Bw₂—10 to 20 inches; brown (7.5YR 5/2) stony sandy clay loam, dark brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common fine and few coarse roots; common fine vesicular pores; 15 percent stones and 15 percent pebbles; neutral; gradual wavy boundary.

C—20 to 60 inches; brown (7.5YR 5/2) very cobbly sandy clay loam, dark brown (7.5YR 4/2) moist; massive; slightly hard, friable, slightly sticky, moderately plastic; few coarse roots; 35 percent stones and cobbles and 15 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 36 to 46 degrees F

Thickness of the mollic epipedon: 10 to 16 inches

A horizon

Hue: 2.5Y or 10YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 35 percent—5 to 15 percent stones; 10 to 20 percent pebbles

Content of rock fragments, surface cover: 0 to 3 percent stones

Reaction: pH 6.6 to 7.8

Bw and C horizons

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 4 to 7 dry; 3 to 5 moist
 Chroma: 2 to 4
 Texture: Clay loam, sandy clay loam, and coarse sandy loam
 Clay content: 15 to 35 percent
 Content of rock fragments: 35 to 60 percent—
 30 to 45 percent stones or cobbles; 5 to
 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Shambo Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 2 to 15 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic
 Haploborolls

Typical Pedon

Shambo loam, in an area of Shambo-Amor loams, 8 to 15 percent slopes, in an area of rangeland, 1,100 feet north and 1,200 feet east of the southwest corner of sec. 14, T. 27 N., R. 7 W.

- A—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure in the upper part grading to moderate medium granular in the lower part; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; many very fine and fine vesicular pores; neutral; clear smooth boundary.
- Bw1—7 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; common fine pores; slightly alkaline; clear smooth boundary.
- Bw2—13 to 18 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; many fine roots; common very fine and fine pores; slightly alkaline; gradual wavy boundary.

- Bk1—18 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, brown (2.5Y 5/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, moderately plastic; common fine roots; common very fine and fine pores; few fine soft masses of lime; 5 percent pebbles; strongly effervescent; slightly alkaline; gradual wavy boundary.
- Bk2—24 to 30 inches; light gray (2.5Y 6/2) clay loam, olive (5Y 5/3) moist; moderate medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; few fine roots; few very fine pores; many fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bk3—30 to 48 inches; pale yellow (5Y 7/3) clay loam, light yellowish brown (5Y 6/4) moist; moderate medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; few fine soft masses of lime; violently effervescent; strongly alkaline; clear wavy boundary.
- C—48 to 60 inches; pale olive (5Y 6/3) loam, olive (5Y 5/3) moist; massive; hard, friable, slightly sticky, slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 14 to 32 inches

A horizon

Hue: 10YR
 Value: 3 to 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 10 to 27 percent
 Reaction: pH 6.6 to 7.8

Bw horizons

Hue: 10YR or 2.5Y
 Value: 4 to 6 dry; 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 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam, clay loam, silty clay loam, or silt loam
 Content of rock fragments: 0 to 5 percent pebbles
 Clay content: 18 to 35 percent
 Calcium carbonate equivalent: 10 to 15 percent
 Reaction: pH 7.4 to 9.0

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or loam stratified with sandy loam, fine sandy loam, very fine sandy loam, silty clay loam, sandy clay loam, and clay loam

Reaction: pH 7.4 to 9.0

**384C—Shambo-Amor loams,
2 to 8 percent slopes****Setting***Landform:*

- Shambo—Alluvial fans
- Amor—Sedimentary plains

Position on landform:

- Shambo—Foothills
- Amor—Backslopes and shoulders

Slope:

- Shambo—2 to 8 percent
- Amor—2 to 8 percent

Elevation: 3,800 to 4,800 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 90 to 110 days**Composition****Major Components**

Shambo and similar soils: 45 percent

Amor and similar soils: 40 percent

Minor Components

Kiev and similar soils: 0 to 7 percent

Roundor and similar soils: 0 to 5 percent

Fairfield and similar soils: 0 to 3 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**Amor***Surface layer texture:* 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 5.4 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.

**384D—Shambo-Amor loams,
8 to 15 percent slopes****Setting***Landform:*

- Shambo—Alluvial fans
- Amor—Hills

Position on landform:

- Shambo—Backslopes and foothills
- Amor—Shoulders and summits

Slope:

- Shambo—8 to 15 percent
- Amor—8 to 15 percent

Elevation: 3,800 to 4,800 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 90 to 110 days**Composition****Major Components**

Shambo and similar soils: 45 percent

Amor and similar soils: 40 percent

Minor Components

Kiev and similar soils: 0 to 7 percent

Cabba and similar soils: 0 to 4 percent

Roundor and similar soils: 0 to 4 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**Amor***Surface layer texture:* 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 5.4 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.

Shawmut Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed Typic Argiborolls

Typical Pedon

Shawmut gravelly loam, in an area of Shawmut-Windham gravelly loams, 0 to 4 percent slopes, in an area of nonirrigated cropland, 500 feet north and 400 feet east of the southwest corner of sec. 6, T. 23 N., R. 7 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many medium irregular pores; 20 percent pebbles; neutral; clear smooth boundary.

Bt—6 to 10 inches; brown (10YR 4/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine subangular blocky; hard, very friable, slightly sticky, moderately plastic; many very fine and fine roots; many fine and medium irregular pores; common distinct clay films on faces of peds; 25 percent pebbles and 5 percent cobbles; neutral; clear smooth boundary.

Bk1—10 to 14 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; weak

medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky, moderately plastic; common very fine and fine roots; common fine irregular pores; 45 percent limestone pebbles and 5 percent cobbles; lime crusts on undersides of rock fragments; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—14 to 24 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; massive; hard, very friable, slightly sticky, moderately plastic; few very fine roots; few very fine irregular pores; 45 percent limestone pebbles and 5 percent cobbles; lime crusts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—24 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy clay loam, brown (10YR 5/3) moist; massive; hard, very friable, slightly sticky, moderately plastic; few very fine roots; few very fine irregular pores; 55 percent pebbles and 5 percent cobbles; lime crusts on undersides of rock fragments; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the calcic horizon: 9 to 20 inches

Ap horizon

Hue: 7.5YR or 10YR

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 7.5YR or 10YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Sandy clay loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 15 to 80 percent—0 to 15 percent stones; 0 to 20 percent cobbles;

15 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

Bk1 horizon

Hue: 2.5Y or 10YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Sandy loam, clay loam, or loam

Clay content: 15 to 30 percent

Content of rock fragments: 35 to 80 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 30 to 75 percent pebbles
 Calcium carbonate equivalent: 15 to 30 percent
 Reaction: pH 7.9 to 8.4

Bk2 and Bk3 horizons

Hue: 2.5Y or 10YR
 Value: 5 to 8 dry; 4 to 7 moist
 Chroma: 2 or 3
 Texture: Sandy loam, loam, or sandy clay loam
 Clay content: 5 to 25 percent
 Content of rock fragments: 50 to 85 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 45 to 70 percent pebbles
 Calcium carbonate equivalent: 10 to 25 percent
 Electrical conductivity: Less than 2 mmhos/cm
 Reaction: pH 7.9 to 9.0

126B—Shawmut-Windham gravelly loams, 0 to 4 percent slopes

Setting

Landform:

- Shawmut—Relict stream terraces
- Windham—Relict stream terraces

Slope:

- Shawmut—0 to 4 percent
- Windham—0 to 4 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Shawmut and similar soils: 50 percent

Windham and similar soils: 40 percent

Minor Components

Judith and similar soils: 0 to 5 percent

Kiev and similar soils: 0 to 3 percent

Utica and similar soils: 0 to 2 percent

Major Component Description

Shawmut

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

Windham

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

Shedhorn Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow
Landform: Mountains
Parent material: Alluvium
Slope range: 0 to 8 percent
Mean annual precipitation: 19 to 22 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 60 to 90 days

Taxonomic Class: Fine, mixed Typic Cryoborolls

Typical Pedon

Shedhorn clay loam, in an area of Adel-Gallatin-Shedhorn complex, 0 to 8 percent slopes, in an area of forest land, 1,350 feet south and 1,850 feet west of the northeast corner of sec. 20, T. 27 N., R. 8 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, moderately sticky, moderately plastic; many very fine and common fine roots; common very fine vesicular pores; slightly acid; clear smooth boundary.

A2—6 to 15 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; many very fine and common fine roots; common very fine vesicular pores; neutral; gradual smooth boundary.

- Bw—15 to 30 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine vesicular pores; 5 percent pebbles; slightly alkaline; gradual wavy boundary.
- C—30 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; few fine vesicular pores; 10 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 36 to 40 degrees F
Thickness of the mollic epipedon: 12 to 16 inches
Depth to the seasonal high water table: 48 to 60 inches

A horizons

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry; 3 moist
 Chroma: 1 or 2
 Clay content: 27 to 35 percent
 Content of rock fragments: 0 to 15 percent shale and sandstone fragments—trace cobbles; 0 to 15 percent pebbles
 Reaction: pH 6.1 to 6.5

Bw horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 or 2
 Texture: Clay loam or clay
 Clay content: 35 to 45 percent
 Content of rock fragments: 5 to 35 percent shale and sandstone fragments—0 to 5 percent cobbles; 5 to 30 percent pebbles
 Reaction: pH 6.1 to 7.3

C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4 to 6 dry; 3 to 5 moist
 Chroma: 2 to 4
 Texture: Clay loam or clay
 Clay content: 35 to 45 percent
 Content of rock fragments: 10 to 35 percent mainly shale fragments—0 to 5 percent flagstones; 10 to 30 percent channers
 Reaction: pH 6.1 to 7.8
 Other features: Colors are lithochromic, varying with the color of the parent material.

Starley Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountain slopes
Parent material: Limestone bedrock
Slope range: 15 to 70 percent
Mean annual precipitation: 20 to 24 inches
Annual air temperature: 38 to 41 degrees F
Frost-free period: 55 to 75 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Cryoborolls

Typical Pedon

Starley stony loam, in an area of Whitore-Starley, stony loams, 15 to 45 percent slopes, in an area of forest land, 200 feet south and 1,200 feet east of the northwest corner of sec. 29, T. 25 N., R. 8 W.

A—0 to 6 inches; dark grayish brown (10YR 5/2) stony loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; 10 percent flagstones and 15 percent channers; slightly alkaline; gradual wavy boundary.

Bw—6 to 15 inches; dark brown (10YR 4/3) very channery loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; 35 percent channers and 20 percent stones or flagstones; slightly effervescent; slightly alkaline; clear smooth boundary.

R—15 inches; fractured limestone bedrock.

Range in Characteristics

Soil temperature: 36 to 40 degrees F
Thickness of the mollic epipedon: 12 to 16 inches

A horizon

Hue: 7.5YR, 10YR, 2.5Y, or 5Y
 Value: 3 to 5 dry; 2 or 3 moist
 Chroma: 1 to 3
 Clay content: 15 to 27 percent
 Content of rock fragments: 15 to 35 percent—10 to 15 percent stones or flagstones; 5 to 20 percent channers
 Reaction: pH 6.6 to 8.4

Bw horizon

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

Value: 4 to 8 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 18 to 35 percent

Content of rock fragments: 35 to 70 percent—
10 to 20 percent flagstones; 25 to 50 percent
channers

Reaction: pH 7.9 to 9.0

291F—Starley-Rock outcrop-Rubble land complex, 25 to 70 percent slopes**Setting***Landform:* Mountains*Slope:*

- Starley—25 to 70 percent
- Rock outcrop—25 to 70 percent
- Rubble land—25 to 70 percent

Elevation: 5,000 to 6,300 feet*Mean annual precipitation:* 20 to 24 inches*Frost-free period:* 55 to 75 days**Composition****Major Components**

Starley and similar soils: 50 percent

Rock outcrop: 20 percent

Rubble land: 15 percent

Minor Components

Whitore and similar soils: 0 to 8 percent

Hanson and similar soils: 0 to 7 percent

Major Component Description**Starley***Surface layer texture:* Stony loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Limestone residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 1.5 inches**Rock outcrop***Definition:* Limestone or sandstone bedrock**Rubble land***Definition:* Areas having more than 90 percent of the surface area covered by boulders or stones of limestone and sandstone, with little or no vegetation

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.

Straw Series*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Flood plains*Parent material:* Alluvium*Slope range:* 0 to 2 percent*Mean annual precipitation:* 15 to 19 inches*Annual air temperature:* 40 to 44 degrees F*Frost-free period:* 90 to 110 days**Taxonomic Class:** Fine-loamy, mixed Cumulic Haploborolls**Typical Pedon**

Straw loam, in an area of Korchea-Straw loams, 0 to 2 percent slopes, rarely flooded, in an area of native grass-hay meadowland, 50 feet south and 1,500 feet east of the northwest corner of sec. 25, T. 23 N., R. 7 W.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many vesicular pores; slightly effervescent; slightly alkaline; clear wavy boundary.

A2—8 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many fine irregular pores; strongly effervescent; slightly alkaline; clear wavy boundary.

C1—18 to 36 inches; light brownish gray (10YR 6/2) loam with thin lenses of silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—36 to 60 inches; light brownish gray (10YR 6/2) stratified fine sandy loam and loam, dark grayish brown (10YR 4/2) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; massive; slightly hard, very friable, slightly sticky, nonplastic; few very fine roots in upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 16 to 36 inches

A horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 22 to 27 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

C horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silt loam, or clay loam stratified with sandy loam or fine sandy loam

Clay content: 22 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 3 to 15 percent

Reaction: pH 7.4 to 8.4

Tanna Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow

Landform: Sedimentary plains

Parent material: Semiconsolidated shale

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Tanna clay loam, in an area of Tanna clay loam, 0 to 4 percent slopes, in an area of nonirrigated cropland, 1,000 feet south and 1,200 feet east of the northwest corner of sec. 19, T. 24 N., R. 2 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many fine irregular pores; neutral; clear smooth boundary.

Bt—6 to 11 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate medium subangular blocky; slightly hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine tubular pores; common distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

Bk—11 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine pores; few medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—25 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse prismatic structure; very hard, firm, very sticky, very plastic; few very fine roots; few very fine pores; 15 percent weathered shale chips; common medium soft masses of lime; common fine soft threads of gypsum; violently effervescent; moderately alkaline; clear wavy boundary.

Cr—35 to 60 inches; grayish brown (2.5Y 5/2) semiconsolidated shale with thin strata of hard shale and sandstone, dark grayish brown (2.5Y 4/2) moist; few fine soft masses of lime and gypsum in upper few inches; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 7 to 12 inches; includes part of the argillic horizon.

Depth to the Bk horizon: 10 to 20 inches

Depth to the Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Content of 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 45 percent
 Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers
 Electrical conductivity: Less than 4 mmhos/cm
 Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Clay loam, silty clay loam, or clay
 Clay content: 35 to 45 percent
 Content of 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 8.4

Bky horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 to 4
 Texture: Loam, clay loam, clay, or silty clay loam
 Clay content: 15 to 30 percent
 Content of 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 8.4

Cr horizon

Material: Semiconsolidated shale

82B—Tanna clay loam, 0 to 4 percent slopes

Setting

Landform: Sedimentary plains
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Tanna and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 8 percent
 Meganot and similar soils: 0 to 7 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 shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 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.

Telstad Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Glaciated till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Telstad loam, in an area of Telstad-Joplin loams, 0 to 4 percent slopes, in an area of nonirrigated cropland, 2,200 feet south and 250 feet east of the northwest corner of sec. 17, T. 26 N., R. 3 W.

Ap—0 to 7 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, slightly sticky, slightly plastic; common fine and medium roots; common fine irregular pores; neutral; clear smooth boundary.
 Bt—7 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium

prismatic structure parting to moderate fine and medium angular and subangular blocky; hard, friable, moderately sticky, moderately plastic; common fine and medium roots; common fine tubular pores; few pebbles; common faint clay films; neutral; gradual smooth boundary.

Bk1—14 to 20 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; few fine roots; many fine tubular pores; few pebbles; common soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 42 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; hard, friable, moderately sticky, moderately plastic; few very fine and fine roots; few pebbles; many soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—42 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few lignite fragments; few pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 15 inches

Depth to the Bk horizon: 10 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 10 percent—0 to 2 percent cobbles; 0 to 8 percent pebbles

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent—0 to 2 percent cobbles; 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent—0 to 2 percent cobbles; 0 to 8 percent pebbles

Calcium carbonate equivalent: 5 to 12 percent

Electrical conductivity: 2 to 4 mmhos/cm

Air dry bulk density: 1.7 g/cm³ or more

Reaction: pH 7.9 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent—0 to 2 percent cobbles; 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum: 0 to 3 percent

Air dry bulk density: 1.7 g/cm³ or more

Reaction: pH 7.4 to 9.0

162C—Telstad-Joplin loams, 4 to 8 percent slopes

Setting

Landform:

- Telstad—Till plains

- Joplin—Till plains

Position on landform:

- Telstad—Foothills

- Joplin—Backslopes and shoulders

Slope:

- Telstad—4 to 8 percent

- Joplin—4 to 8 percent

Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Telstad and similar soils: 50 percent
 Joplin and similar soils: 40 percent

Minor Components

Evanston and similar soils: 0 to 3 percent
 Hillon and similar soils: 0 to 3 percent
 Kevin and similar soils: 0 to 2 percent
 Nishon and similar soils: 0 to 2 percent

Major Component Description

Telstad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

Joplin

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

165B—Telstad-Joplin loams, 0 to 4 percent slopes

Setting

Landform:

- Telstad—Till plains
- Joplin—Till plains

Position on landform:

- Telstad—Toeslopes
- Joplin—Backslopes and footslopes

Slope:

- Telstad—0 to 4 percent
- Joplin—0 to 4 percent

Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Telstad and similar soils: 50 percent
 Joplin and similar soils: 35 percent

Minor Components

Chinook and similar soils: 0 to 5 percent
 Kremlin and similar soils: 0 to 5 percent
 Hillon and similar soils: 0 to 3 percent
 Nishon and similar soils: 0 to 2 percent

Major Component Description

Telstad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

Joplin

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

Teton Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountain slopes
Parent material: Hard sandstone residuum
Slope range: 4 to 35 percent

Mean annual precipitation: 18 to 21 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 60 to 90 days

Taxonomic Class: Fine-loamy, mixed Typic
 Cryoborolls

Typical Pedon

Teton cobbly loam, in an area of Teton-Tibson-Cheadle complex, 4 to 35 percent slopes, in an area of rangeland, 600 feet south and 800 feet west of the northeast corner of sec. 7, T. 24 N., R. 8 W.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) cobbly loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, very friable, nonsticky, nonplastic; many fine and common medium roots; neutral; gradual smooth boundary.

A2—6 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable, nonsticky, nonplastic; many fine roots; 10 percent channers; neutral; gradual smooth boundary.

Bw—12 to 20 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; 10 percent pebbles; slightly alkaline; gradual wavy boundary.

C—20 to 30 inches; pale brown (10YR 6/3) channery loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky, slightly plastic; common very fine roots; 25 percent channers; slightly effervescent; slightly alkaline.

R—30 inches; indurated fractured sandstone bedrock.

Range in Characteristics

Soil temperature: 40 to 44 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to bedrock: 20 to 40 inches

A horizons

Value: 3 to 5 dry; 2 or 3 moist
 Chroma: 1 to 3
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles
 Reaction: pH 6.1 to 7.3

Bw horizon

Hue: 10YR or 7.5YR
 Value: 5 or 6 dry; 3 to 5 moist
 Chroma: 2 to 4
 Texture: Loam or clay loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles
 Reaction: pH 6.1 to 7.3

C horizon

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam, clay loam, or sandy loam
 Clay content: 18 to 35 percent
 Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles or channers
 Reaction: pH 6.6 to 8.4

196E—Teton-Tibson-Cheadle complex, 4 to 35 percent slopes

Setting

Landform:

- Teton—Mountains
- Tibson—Mountains
- Cheadle—Mountains

Position on landform:

- Teton—Shoulders and summits
- Tibson—Backslopes and footslopes
- Cheadle—Shoulders and summits

Slope:

- Teton—4 to 35 percent
- Tibson—4 to 35 percent
- Cheadle—4 to 35 percent

Elevation: 4,600 to 5,800 feet

Mean annual precipitation: 18 to 21 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Teton and similar soils: 30 percent
 Tibson and similar soils: 30 percent
 Cheadle and similar soils: 25 percent

Minor Components

Whitore and similar soils: 0 to 9 percent
 Babb and similar soils: 0 to 6 percent

Major Component Description

Teton

Surface layer texture: Cobbly loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.0 inches

Tibson

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

Cheadle

Surface layer texture: Stony 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 1.6 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.

Tetonview Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Flood plains and stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Mean annual precipitation: 13 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, frigid Typic Calciaquolls

Typical Pedon

Tetonview loam, 0 to 2 percent slopes, in an area of irrigated native grass hayland, 850 feet south and 2,300 feet west of the northeast corner of sec. 22, T. 25 N., R. 6 W.

(Colors are for moist soil unless otherwise noted.)

- Oi—2 inches to 0; partially decomposed fibers and roots of sedges and rushes.
- A1—0 to 7 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many fine and medium roots; common fine irregular tubular pores; slightly effervescent; slightly alkaline; clear smooth boundary.
- A2—7 to 12 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; moderate medium granular structure; slightly hard, friable, moderately sticky, moderately plastic; common fine roots; common fine irregular tubular pores; strongly effervescent; moderately alkaline; gradual wavy boundary.
- Bkg1—12 to 26 inches; grayish brown (10YR 5/2) clay loam, light gray (10YR 7/2) dry; few fine distinct yellowish brown (10YR 5/4) redox concentrations; moderate medium granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bkg2—26 to 36 inches; grayish brown (10YR 5/2) clay loam, light gray (10YR 7/2) dry; common fine distinct yellowish brown (10YR 5/4) redox concentrations; massive; hard, firm, moderately sticky, moderately plastic; few fine roots; few medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bkg3—36 to 60 inches; grayish brown (10YR 5/2) gravelly clay loam, light gray (10YR 7/2) dry; common medium prominent yellowish brown (10YR 5/4) redox concentrations; massive; very hard, firm, moderately sticky, moderately plastic; 15 percent rounded pebbles; few fine soft masses of lime; lime coats on undersides of rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to the seasonal high water table: 1 to 2 feet
Depth to the calcic horizon: 7 to 13 inches
Soil phases: Saline
Thickness of the mollic epipedon: 7 to 16 inches

Oi horizon

Material: Mat of organic and fibrous materials

A1 horizon

Hue: 10YR or 2.5Y
 Value: 2 or 3 moist; 3 or 4 dry
 Chroma: 1 or 2
 Clay content: 20 to 27 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 1 to 5 percent
 Electrical conductivity: 0 to 12 mmhos/cm; saline phase is 4 to 12 mmhos/cm
 Reaction: pH 6.6 to 7.8

A2 horizon

Hue: 10YR or 2.5Y
 Value: 2 or 3 moist; 4 or 5 dry
 Chroma: 1 or 2
 Texture: Loam, clay loam, or silt loam
 Clay content: 20 to 30 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Electrical conductivity: 0 to 12 mmhos/cm; saline phase is 4 to 12 mmhos/cm
 Reaction: pH 7.4 to 8.4

Bkg1 horizon

Hue: 10YR or 2.5Y
 Value: 3 to 6 moist; 5 to 7 dry
 Texture: Loam, clay loam, silt loam
 Clay content: 20 to 35 percent
 Redox features: None to common, faint to prominent redox concentrations
 Content of rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm
 Reaction: pH 7.9 to 8.4

Bkg2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4 to 6 moist; 6 or 7 dry
 Texture: Loam, clay loam, or silt loam
 Clay content: 20 to 35 percent
 Redox features: None to common, faint to many redox concentrations

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 15 to 35 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

Bkg3 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist; 6 or 7 dry

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

Clay content: 20 to 30 percent

Redox features: None to common, faint to many redox concentrations

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

55A—Tetonview loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Tetonview and similar soils: 85 percent

Minor Components

Truchot and similar soils: 0 to 6 percent

Saypo and similar soils: 0 to 4 percent

Winginaw and similar soils: 0 to 3 percent

Birchfield and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 8.9 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.

119A—Tetonview-Birchfield complex, 0 to 2 percent slopes

Setting

Landform:

- Tetonview—Stream terraces
- Birchfield—Stream terraces

Slope:

- Tetonview—0 to 2 percent
- Birchfield—0 to 2 percent

Elevation: 4,500 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Tetonview and similar soils: 45 percent

Birchfield and similar soils: 40 percent

Minor Components

Kiev and similar soils: 0 to 5 percent

Windham and similar soils: 0 to 5 percent

Winginaw and similar soils: 0 to 5 percent

Major Component Description

Tetonview

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 8.9 inches

Birchfield

Surface layer texture: Mucky peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 7.5 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.

Tibson Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow

Landform: Mountain slopes

Parent material: Alpine till

Slope range: 4 to 45 percent

Mean annual precipitation: 18 to 22 inches

Annual air temperature: 18 to 21 degrees F

Frost-free period: 60 to 90 days

Taxonomic Class: Loamy-skeletal, mixed Calcic Cryoborolls

Typical Pedon

Tibson cobbly loam, in an area of Babb-Tibson-Adel complex, 4 to 35 percent slopes, in an area of rangeland, 2,500 feet south and 800 feet east of the northwest corner of sec. 4, T. 24 N., R. 8 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) cobbly loam, black (10YR 2/1) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; common very fine irregular pores; 10 percent cobbles and 10 percent pebbles; slightly alkaline; clear wavy boundary.

Bw—4 to 8 inches; dark brown (10YR 3/3) cobbly loam, very dark brown (10YR 2/2) moist; moderate fine prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine irregular pores; 10 percent cobbles and 10 percent pebbles; slightly effervescent; gradual wavy boundary.

Bk1—8 to 14 inches; pale brown (10YR 6/3) very cobbly clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; friable, slightly sticky, moderately plastic; common very fine and fine roots; common fine tubular pores; 20 percent pebbles and 15 percent cobbles;

common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—14 to 60 inches; pale brown (10YR 6/3) very cobbly clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure; very hard, friable, slightly sticky, moderately plastic; common very fine roots to 42 inches and few very fine roots below this depth; 30 percent pebbles and 20 percent cobbles; common medium soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 37 to 45 degrees F

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the calcic horizon: 6 to 12 inches

A horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 30 percent—0 to 15 percent stones and cobbles; 10 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bw horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 65 percent—0 to 20 percent stones and cobbles; 5 to 45 percent pebbles

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 20 to 35 percent

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

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 15 to 40 percent

Content of rock fragments: 35 to 60 percent—0 to

25 percent stones and cobbles; 20 to 50 percent pebbles

Moist bulk density: 1.8 g/cm³

Reaction: pH 7.9 to 8.4

Truchot Series

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: Stream terraces and flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Mean annual precipitation: 13 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 120 days

Taxonomic Class: Loamy-skeletal, mixed Aquic Calciborolls

Typical Pedon

Truchot clay loam, 0 to 2 percent slopes, in an area of rangeland, 2,000 feet south and 2,500 feet west of the northeast corner of sec. 14, T. 26 N., R. 8 W.

(Colors are for moist soil unless otherwise noted.)

A—0 to 7 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; hard, friable, slightly sticky, moderately plastic; many fine and medium roots; many fine and medium pores; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—7 to 12 inches; dark grayish brown (10YR 4/2) gravelly clay loam, light grayish brown (10YR 5/2) dry; few fine faint yellowish brown (10YR 5/4) redox concentrations; weak fine subangular blocky structure; hard, friable, slightly sticky, moderately plastic; many fine and few medium roots; many fine and medium pores; 25 percent pebbles; few medium soft masses of lime; lime coats on rock fragments; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—12 to 16 inches; brown (10YR 5/3) very gravelly clay loam, pale brown (10YR 6/3) dry; common fine distinct yellowish brown (10YR 5/6) redox concentrations; weak fine subangular blocky structure; very hard, friable, slightly sticky, moderately plastic; few fine and medium roots; common very fine and fine pores; 50 percent pebbles and 5 percent cobbles; thick lime coats on undersides and common soft masses of lime between rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—16 to 26 inches; dark brown (10YR 4/3) extremely gravelly clay loam, pale brown (10YR 6/3) dry; few fine faint yellowish brown (10YR 5/6) redox concentrations; massive; very hard, friable, slightly sticky, moderately plastic; few fine and medium roots; few very fine and fine pores; 55 percent pebbles and 5 percent cobbles; thick lime coats on undersides and few soft masses of lime between fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk4—26 to 60 inches; dark brown (10YR 4/3) extremely gravelly sandy clay loam, pale brown (10YR 6/3) dry; massive; hard, friable, slightly sticky, moderately plastic; few fine and medium roots in upper part; 60 percent pebbles and 5 percent cobbles; lime coats on rock fragments; violently effervescent; water table at 40 inches; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the seasonal high water table: 36 to 60 inches

Depth to the Bk horizon: 5 to 15 inches

Soil phases: Saline

A horizon

Value: 2 or 3 moist; 3 or 4 dry

Chroma: 1 or 2

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 30 percent—0 to 5 percent cobbles; 0 to 25 percent pebbles

Electrical conductivity: 0 to 12 mmhos/cm; saline phase 4 to 12 mmhos/cm

Sodium adsorption ratio: 0 to 30; sodic phase is 13 to 30

Reaction: pH 7.4 to 9.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 1 to 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Calcium carbonate equivalent: 10 to 25 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 4 to 7 moist; 6 to 8 dry

Chroma: 1 to 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 25 to 60 percent—0 to 10 percent cobbles; 25 to 50 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Bk3 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 6 to 8 dry

Chroma: 1 to 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 65 percent—5 to 10 percent cobbles; 30 to 55 percent pebbles

Calcium carbonate equivalent: 15 to 35 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Bk4 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 6 or 7 dry

Chroma: 2 to 4

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

Clay content: 15 to 30 percent

Content of rock fragments: 45 to 80 percent—5 to 10 percent cobbles; 40 to 70 percent pebbles

Calcium carbonate equivalent: 10 to 30 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

56A—Truchot clay loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 14 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Truchot and similar soils: 85 percent

Minor Components

Saypo and similar soils: 0 to 6 percent

Rothiemay and similar soils: 0 to 5 percent

Niart and similar soils: 0 to 2 percent
Tetonview and similar soils: 0 to 2 percent

Major Component Description

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

156A—Truchot-Saypo clay loams, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Truchot—Flood plains
- Saypo—Flood plains

Slope:

- Truchot—0 to 2 percent
- Saypo—0 to 2 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 13 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Truchot and similar soils: 45 percent

Saypo and similar soils: 40 percent

Minor Components

Rothiemy and similar soils: 0 to 6 percent

Havre and similar soils: 0 to 5 percent

Niart and similar soils: 0 to 4 percent

Major Component Description

Truchot

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.3 inches

Saypo

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.7 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.

356A—Truchot-Tetonview-Saypo complex, 0 to 2 percent slopes, rarely flooded

Setting

Landform:

- Truchot—Flood plains
- Tetonview—Flood plains
- Saypo—Flood plains

Slope:

- Truchot—0 to 2 percent
- Tetonview—0 to 2 percent
- Saypo—0 to 2 percent

Elevation: 3,800 to 4,600 feet

Mean annual precipitation: 13 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Truchot and similar soils: 35 percent

Tetonview and similar soils: 30 percent

Saypo and similar soils: 20 percent

Minor Components

Trudau and similar soils: 0 to 10 percent

Birchfield and similar soils: 0 to 5 percent

Major Component Description

Truchot

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.8 inches

Tetonview

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 8.9 inches

Saypo

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 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.

Trudau Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 8 percent
Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Trudau loam, 0 to 4 percent slopes, in an area of pasture, 150 feet south and 350 feet east of the northwest corner of sec. 19, T. 23 N., T. 3 W.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; many very fine and fine vesicular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bz—6 to 13 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky, slightly plastic; many fine roots; many fine pores; common fine soft masses of salts; strongly effervescent; strongly alkaline; clear smooth boundary.

Bkz—13 to 28 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium blocky; hard, friable, slightly sticky, slightly plastic; common fine roots; common fine pores; common fine soft masses of salts; common medium soft masses of lime; strongly effervescent; strongly alkaline; clear wavy boundary.

C1—28 to 48 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, moderately sticky, moderately plastic; few fine roots; few fine pores; few fine salt crystals; strongly effervescent; strongly alkaline; clear wavy boundary.

C2—48 to 60 inches; grayish brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, moderately sticky, moderately plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 0 to 2 mmhos/cm
 Calcium carbonate equivalent: 1 to 10 percent
 Reaction: pH 7.4 to 9.0; pH 7.4 to 7.8 (reclaimed)

Bz horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam or clay loam
 Clay content: 20 to 35 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 1 to 16 mmhos/cm; less than 4 mmhos/cm (reclaimed)
 Sodium adsorption ratio: Less than 5
 Calcium carbonate equivalent: 1 to 10 percent
 Reaction: pH 7.4 to 9.0; pH 7.4 to 8.4 (reclaimed)

Bkz horizon

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 5 to 7 moist
 Chroma: 2 or 3
 Texture: Loam or clay loam
 Clay content: 20 to 35 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 2 to 16 mmhos/cm; less than 8 mmhos/cm (reclaimed)
 Sodium adsorption ratio: 2 to 13
 Reaction: pH 7.4 to 9.0

C horizons

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 4 to 7 moist
 Chroma: 2 to 4
 Texture: Mainly loam stratified with sandy loam, silt loam, or clay loam
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 2 to 16 mmhos/cm; less than 8 mmhos/cm (reclaimed)
 Sodium adsorption ratio: 2 to 13
 Reaction: pH 7.4 to 9.0

222B—Trudau loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent
Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Trudau and similar soils: 85 percent

Minor Components

Saypo and similar soils: 0 to 8 percent
 Kremlin and similar soils: 0 to 5 percent
 Tetonview and similar soils: 0 to 2 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
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 9.3 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.

Twilight Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated sandy sedimentary beds
Slope range: 2 to 25 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Twilight fine sandy loam, in an area of Twilight-Yetull-Rock outcrop complex, 8 to 25 percent slopes, in an area of rangeland, 650 feet south and 1,400 feet east of the northwest corner of sec. 13, T. 28 N., R. 5 W.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine and medium granular structure; slightly hard, very

friable, nonsticky, nonplastic; many fine and few medium roots; many very fine and fine vesicular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—4 to 11 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium granular; slightly hard, very friable, nonsticky, nonplastic; many fine and few medium roots; common fine pores; few fine soft masses of lime in lower part; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 22 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky, nonplastic; common fine roots; few fine pores; 5 percent channers, mostly sandstone fragments; common medium and large soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Cr1—22 to 30 inches; light gray (10YR 7/2) slightly indurated sandstone that has loamy fine sand in cracks and between plates; few fine roots in soil and between plates; common soft masses of lime on underside of plates; abrupt wavy boundary.

Cr2—30 to 60 inches; semiconsolidated sandstone.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Bk horizon: 10 to 20 inches

Depth to the Cr horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 5 to 18 percent

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 to 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Reaction: pH 6.6 to 7.8

Bk horizon

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

Content of rock fragments: 5 percent channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

181E—Twilight-Yetull-Rock outcrop complex, 8 to 25 percent slopes

Setting

Landform:

- Twilight—Hills

- Yetull—Hills

Position on landform:

- Twilight—Backslopes and shoulders

- Yetull—Backslopes and footslopes

Slope:

- Twilight—8 to 25 percent

- Yetull—8 to 25 percent

- Rock outcrop—8 to 25 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Twilight and similar soils: 35 percent

Yetull and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Chinook and similar soils: 0 to 6 percent

Rentsac and similar soils: 0 to 5 percent

Assinniboine and similar soils: 0 to 4 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: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Yetull

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

Rock outcrop

Definition: Sandstone bedrock

Surface layer texture: Unweathered 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.

**281C—Twilight-Chinook-Yetull complex,
2 to 8 percent slopes****Setting**

Landform:

- Twilight—Sedimentary plains
- Chinook—Sedimentary plains
- Yetull—Sedimentary plains

Position on landform:

- Twilight—Backslopes and footslopes
- Chinook—Footslopes
- Yetull—Backslopes and footslopes

Slope:

- Twilight—2 to 8 percent
- Chinook—2 to 8 percent
- Yetull—2 to 8 percent

Elevation: 3,200 to 4,000 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Twilight and similar soils: 35 percent

Chinook and similar soils: 30 percent

Yetull and similar soils: 20 percent

Minor Components

Assinniboine and similar soils: 0 to 9 percent

Rentsac and similar soils: 0 to 6 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: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Chinook

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.2 inches

Yetull

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

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.

**381C—Twilight-Rentsac complex,
2 to 8 percent slopes****Setting**

Landform:

- Twilight—Sedimentary plains
- Rentsac—Sedimentary plains

Slope:

- Twilight—2 to 8 percent
- Rentsac—2 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Twilight and similar soils: 50 percent

Rentsac and similar soils: 40 percent

Minor Components

Chinook and similar soils: 0 to 7 percent

Assinniboine and similar soils: 0 to 3 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: Rangeland
Flooding: None
Available water capacity: Mainly 3.1 inches

Rentsac

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 1.4 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.

700—Urban land

Composition

Major Components

Urban land: 100 percent

Major Component Description

Definition: Areas dominated by development including buildings and streets with remaining soil areas highly disturbed

Utica Series

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Sandy-skeletal, carbonatic Typic Calciborolls

Typical Pedon

Utica very gravelly loam, in an area of Utica-Windham very gravelly loams, 0 to 4 percent slopes, in an area of rangeland, 2,450 feet north and 1,450 feet west of the southeast corner of sec. 30, T. 25 N., R. 7 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine and fine roots; many fine and medium interstitial pores; 30 percent pebbles and 5 percent cobbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—4 to 11 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; soft, friable, nonsticky, nonplastic; common very fine and fine roots; few fine irregular pores; common lime crusts on undersides of cobbles and pebbles; 50 percent pebbles and 5 percent cobbles; violently effervescent; moderately alkaline; clear smooth boundary.

2C—11 to 60 inches; light gray (10YR 7/2) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; few very fine and fine roots; many lime crusts on cobbles and pebbles; 55 percent pebbles and 15 percent cobbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the calcic horizon: 5 to 10 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

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Clay content: 5 to 10 percent

Content of rock fragments: 25 to 60 percent—0 to 10 percent cobbles; 25 to 50 percent pebbles

Calcium carbonate equivalent: 35 to 60 percent
Reaction: pH 7.9 to 9.0

2C horizon

Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Sand or loamy sand
Clay content: 0 to 5 percent
Content of rock fragments: 50 to 80 percent—
10 to 20 percent cobbles; 40 to 60 percent
pebbles
Calcium carbonate equivalent: 40 to 60 percent
Reaction: pH 7.9 to 9.0

128B—Utica-Windham very gravelly loams, 0 to 4 percent slopes

Setting

Landform:

- Utica—Relict stream terraces
- Windham—Relict stream terraces

Slope:

- Utica—0 to 4 percent
- Windham—0 to 4 percent

Elevation: 4,000 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Utica and similar soils: 50 percent

Windham and similar soils: 40 percent

Minor Components

Judith and similar soils: 0 to 7 percent

Kiev and similar soils: 0 to 3 percent

Major Component Description

Utica

Surface layer texture: Very gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

Windham

Surface layer texture: Very gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 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.

Vanda Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Very slow

Landform: Alluvial fans and hills

Parent material: Alluvium

Slope range: 0 to 15 percent

Mean annual precipitation: 11 to 17 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 90 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Vanda clay, in an area of Vanda-Marvan clays, 0 to 2 percent slopes, in an area of rangeland, 2,300 feet north and 150 feet west of the southeast corner of sec. 29, T. 23 N., R. 1 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium granular structure; very hard, firm, very sticky, moderately plastic; common very fine and fine roots; few fine pores; thin light brownish gray (2.5Y 6/2) vesicular crust 1/4-inch thick on surface; slightly effervescent; strongly alkaline; clear wavy boundary.

C—3 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky, moderately plastic; few very fine and fine roots; few very fine tubular pores; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cy1—10 to 24 inches; light olive (5Y 6/3) silty clay, olive gray (5Y 5/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; few very fine and fine pores; common very fine soft masses of gypsum crystals; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cy2—24 to 40 inches; light olive (5Y 6/3) clay, olive gray (5Y 5/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine and fine pores; few very fine soft masses of gypsum crystals; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cyz—40 to 60 inches; olive (5Y 5/3) clay, olive (5Y 4/2) moist; massive; extremely hard, very firm, very sticky, very plastic; few fine threads of gypsum and few soft masses of salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 20 to 30

Reaction: pH 7.9 to 9.6

C and Cy horizons

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

Hardness: Very hard or extremely hard

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Reaction: pH 7.9 to 9.6

Cyz 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

Hardness: Very hard or extremely hard

Gypsum: 1 to 5 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.6

160A—Vanda-Marvan clays, 0 to 2 percent slopes

Setting

Landform:

- Vanda—Alluvial fans
- Marvan—Alluvial fans

Slope:

- Vanda—0 to 2 percent
- Marvan—0 to 2 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Vanda and similar soils: 60 percent

Marvan and similar soils: 30 percent

Minor Components

Gerdrum and similar soils: 0 to 5 percent

Nobe and similar soils: 0 to 3 percent

Lardell and similar soils: 0 to 2 percent

Major Component Description

Vanda

Surface layer texture: 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

Marvan

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

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.

Varney Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Mean annual precipitation: 12 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Varney clay loam, in an area of Varney-Rothiemay clay loams, 0 to 4 percent slopes, in an area of irrigated cropland, 700 feet south and 2,400 feet east of the northwest corner of sec. 2, T. 22 N., R. 2 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, friable, moderately sticky, slightly plastic; common fine roots; common fine vesicular pores; neutral; clear smooth boundary.

Bt—6 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; hard, friable, moderately sticky, moderately plastic; common fine roots; common very fine and fine pores; common distinct clay films on faces of peds; 5 percent pebbles; neutral; clear wavy boundary.

Bk1—10 to 22 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common very fine and fine pores; few fine soft masses of lime; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk2—22 to 36 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; weak coarse

prismatic structure; very hard, friable, moderately sticky, slightly plastic; few very fine and fine roots; few very fine pores; 5 percent pebbles; many large soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—36 to 48 inches; very pale brown (10YR 7/3) sandy clay loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky, moderately plastic; few very fine roots; few very fine pores; 5 percent pebbles; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—48 to 60 inches; very pale brown (10YR 7/3) gravelly sandy clay loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky, moderately plastic; 30 percent pebbles; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Bk horizon: 9 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Clay loam or sandy clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 30 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

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

Clay content: 10 to 30 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons

Hue: 10YR or 2.5Y
 Value: 6 to 8 dry; 4 to 7 moist
 Chroma: 2 to 4
 Texture: Sandy loam, loam, sandy clay loam, or clay loam
 Clay content: 10 to 30 percent
 Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles
 Calcium carbonate equivalent: 15 to 30 percent
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 7.4 to 8.4

BC horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Clay content: 10 to 30 percent
 Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles
 Electrical conductivity: 0 to 2 mmhos/cm
 Calcium carbonate equivalent: 5 to 25 percent
 Reaction: pH 7.9 to 8.4

124B—Varney-Rothiemay clay loams, 0 to 4 percent slopes**Setting***Landform:*

- Varney—Stream terraces
- Rothiemay—Stream terraces

Slope:

- Varney—0 to 4 percent
- Rothiemay—0 to 4 percent

Elevation: 3,200 to 4,200 feet*Mean annual precipitation:* 12 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Varney and similar soils: 50 percent
 Rothiemay and similar soils: 40 percent

Minor Components

Niart and similar soils: 0 to 7 percent
 Crago and similar soils: 0 to 3 percent

Major Component Description**Varney**

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 7.5 inches**Rothiemay**

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 9.2 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.

224B—Varney-Rothiemay gravelly clay loams, 0 to 4 percent slopes**Setting***Landform:*

- Varney—Stream terraces
- Rothiemay—Stream terraces

Slope:

- Varney—0 to 4 percent
- Rothiemay—0 to 4 percent

Elevation: 3,600 to 4,200 feet*Mean annual precipitation:* 12 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Varney and similar soils: 50 percent
 Rothiemay and similar soils: 40 percent

Minor Components

Niart and similar soils: 0 to 7 percent
 Crago and similar soils: 0 to 3 percent

Major Component Description**Varney**

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 7.4 inches

Rothiemay

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 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.

Wabek Series

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Permeability: Very rapid

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed Entic Haploborolls

Typical Pedon

Wabek gravelly loam, in an area of Attewan-Wabek complex, 0 to 8 percent slopes, in an area of rangeland, 600 feet north and 400 feet west of the southeast corner of sec. 3, T. 29 N., R. 2 W.

A—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, dark brown (10YR 3/2) moist; weak fine granular structure; slightly hard; very friable, slightly sticky, slightly plastic; many fine roots; 20 percent pebbles; slightly alkaline; clear wavy boundary.

Bk—5 to 10 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine roots; 35 percent pebbles with lime crusts on undersides; strongly effervescent; moderately alkaline; diffuse wavy boundary.

2C—10 to 60 inches; pale brown (10YR 6/3) very gravelly loamy coarse sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky,

nonplastic; common fine roots in upper part; 55 percent pebbles with lime crusts on undersides of larger pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Thickness of the mollic epipedon: 7 to 14 inches

Depth to the Bk horizon: 4 to 9 inches

Depth to sand and gravel: 7 to 14 inches

A horizon

Hue: 10YR or 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 4 to 8 dry; 2 to 6 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 50 percent—0 to 5 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 6.6 to 9.0

2C horizon

Hue: 10YR or 2.5Y

Value: 4 to 7 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Sand, loamy sand, or loamy coarse sand

Clay content: 0 to 5 percent

Content of rock fragments: 35 to 80 percent—0 to 5 percent cobbles; 35 to 75 percent pebbles

Reaction: pH 7.4 to 9.0

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

Landform: Hills

Parent material: Residuum from semiconsolidated shale

Slope range: 2 to 45 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Wayden silty clay loam, in an area of Winifred-Wayden-Cabba complex, 2 to 15 percent slopes, in an area of rangeland, 2,500 feet north and 100 feet east of the southwest corner of sec. 22, T. 25 N., R. 7 W.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and medium roots; few very fine vesicular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—3 to 8 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common fine roots; few very fine tubular pores; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk—8 to 12 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots; few very fine vesicular and tubular pores; few fine threads of segregated lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr1—12 to 18 inches; light gray (5Y 7/1) weathered shale, gray (5Y 5/1) moist; gradual wavy boundary.

Cr2—18 to 60 inches; white (5Y 8/1) semiconsolidated silty shale, gray (5Y 6/1) moist; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 2.5Y or 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 35 to 40 percent

Reaction: pH 7.4 to 8.4

Bw and Bk horizons

Hue: 2.5Y or 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 1 to 4

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

Clay content: 35 to 50 percent

Reaction: pH 7.4 to 8.4

187F—Wayden-Cabba-Winifred complex, 15 to 45 percent slopes

Setting

Landform:

- Wayden—Hills
- Cabba—Hills
- Winifred—Hills

Position on landform:

- Wayden—Backslopes and shoulders
- Cabba—Backslopes and shoulders
- Winifred—Backslopes and footslopes

Slope:

- Wayden—15 to 45 percent
- Cabba—15 to 45 percent
- Winifred—15 to 45 percent

Elevation: 4,200 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Wayden and similar soils: 35 percent

Cabba and similar soils: 30 percent

Winifred and similar soils: 20 percent

Minor Components

Amor and similar soils: 0 to 6 percent

Linwell and similar soils: 0 to 6 percent

Shambo and similar soils: 0 to 3 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 1.9 inches

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 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 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.

Whitore Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountain slopes
Parent material: Colluvium and alpine till
Slope range: 8 to 60 percent
Mean annual precipitation: 18 to 24 inches
Annual air temperature: 37 to 40 degrees F
Frost-free period: 50 to 90 days

Taxonomic Class: Loamy-skeletal, carbonatic Typic Cryochrepts

Typical Pedon

Whitore stony loam, in an area of Whitore-Starley, stony loams, 15 to 45 percent slopes, in an area of

forest land, 2,600 feet north and 500 feet east of the southwest corner of sec. 31, T. 23 N., R. 8 W.

A—0 to 5 inches; brown (10YR 5/3) stony loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; many medium vesicular pores; 20 percent stones and cobbles and 5 percent pebbles; slightly effervescent; neutral; clear smooth boundary.

Bw—5 to 9 inches; brown (10YR 5/3) very cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; common medium vesicular pores; 25 percent stones and cobbles and 15 percent pebbles; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bk1—9 to 24 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; few medium vesicular pores; 35 percent stones and cobbles and 25 percent pebbles; many medium masses of lime and lime concretions coating fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 60 inches; light gray (10YR 7/2) extremely cobbly loam, light brownish gray (10YR 6/2) moist; massive structure; loose, nonsticky, nonplastic; common lime concretions coating fragments; 40 percent stones and cobbles and 35 percent pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 42 degrees F

Depth to the calcic horizon: 5 to 15 inches

A horizon

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 1 to 3

Clay content: 20 to 27 percent

Content of rock fragments: 15 to 35 percent—
 10 to 25 percent stones and cobbles; 5 to
 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay loam or loam

Clay content: 20 to 35 percent

Content of rock fragments: 15 to 60 percent—
 10 to 25 percent stones and cobbles; 5 to
 35 percent pebbles or channers

Effervescence: Slightly to violently in the lower half

Reaction: pH 7.4 to 9.0

Bk horizons

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Clay loam or loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 85 percent—0 to 40 percent stones and cobbles; 25 to 45 percent pebbles or channers

Calcium carbonate equivalent: 40 to 50 percent

Reaction: pH 7.4 to 9.0

**191F—Whitore-Starley stony loams,
15 to 45 percent slopes**

Setting

Landform:

- Whitore—Mountains
- Starley—Mountains

Position on landform:

- Whitore—Backslopes and shoulders
- Starley—Shoulders and summits

Slope:

- Whitore—15 to 45 percent
- Starley—15 to 45 percent

Elevation: 5,000 to 6,300 feet

Mean annual precipitation: 20 to 24 inches

Frost-free period: 55 to 75 days

Composition

Major Components

Whitore and similar soils: 45 percent

Starley and similar soils: 40 percent

Minor Components

Tibson and similar soils: 0 to 6 percent

Hanson and similar soils: 0 to 5 percent

Garlet and similar soils: 0 to 4 percent

Major Component Description

Whitore

Surface layer texture: Stony 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 4.3 inches

Starley

Surface layer texture: Stony loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Limestone residuum

Native plant cover type: Forest land

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.

**596E—Whitore-Babb-Tibson complex,
8 to 45 percent slopes**

Setting

Landform:

- Whitore—Mountains
- Babb—Mountains
- Tibson—Mountains

Position on landform:

- Whitore—Backslopes and shoulders
- Babb—Backslopes and footslopes
- Tibson—Backslopes and shoulders

Slope:

- Whitore—15 to 45 percent
- Babb—8 to 45 percent
- Tibson—8 to 45 percent

Elevation: 5,000 to 6,000 feet

Mean annual precipitation: 18 to 21 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Whitore and similar soils: 35 percent

Babb and similar soils: 25 percent

Tibson and similar soils: 25 percent

Minor Components

Hanson and similar soils: 0 to 7 percent

Garlet and similar soils: 0 to 3 percent

Starley and similar soils: 0 to 3 percent

Gallatin and similar soils: 0 to 2 percent

Major Component Description

Whitore

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.5 inches

Babb

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.7 inches

Tibson

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

693F—Whitore-Garlet-Starley stony loams, 15 to 60 percent slopes

Setting

Landform:

- Whitore—Mountains
- Garlet—Mountains
- Starley—Mountains

Position on landform:

- Whitore—Backslopes and shoulders
- Garlet—Backslopes and footslopes
- Starley—Shoulders and summits

Slope:

- Whitore—15 to 60 percent
- Garlet—15 to 60 percent
- Starley—15 to 60 percent

Elevation: 5,000 to 6,800 feet

Mean annual precipitation: 20 to 24 inches
Frost-free period: 55 to 75 days

Composition

Major Components

Whitore and similar soils: 35 percent
 Garlet and similar soils: 30 percent
 Starley and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 8 percent
 Hanson and similar soils: 0 to 4 percent
 Tibson and similar soils: 0 to 3 percent

Major Component Description

Whitore

Surface layer texture: Stony 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 4.5 inches

Garlet

Surface layer texture: Stony 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 4.8 inches

Starley

Surface layer texture: Stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forest land
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.

696E—Whitore-Teton-Tibson complex, 8 to 35 percent slopes

Setting

Landform:

- Whitore—Mountains
- Teton—Mountains
- Tibson—Mountains

Position on landform:

- Whitore—Backslopes and shoulders
- Teton—Shoulders
- Tibson—Backslopes and footslopes

Slope:

- Whitore—15 to 35 percent
- Teton—8 to 35 percent
- Tibson—8 to 35 percent

Elevation: 5,000 to 6,000 feet

Mean annual precipitation: 18 to 21 inches

Frost-free period: 60 to 90 days

Composition

Major Components

Whitore and similar soils: 45 percent

Teton and similar soils: 20 percent

Tibson and similar soils: 20 percent

Minor Components

Garlet and similar soils: 0 to 6 percent

Starley and similar soils: 0 to 5 percent

Cheadle and similar soils: 0 to 4 percent

Major Component Description

Whitore

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.5 inches

Teton

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

Tibson

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.2 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.

Windham Series

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces, hills, and relict stream terraces

Parent material: Alluvium

Slope range: 0 to 60 percent

Mean annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, carbonatic Typic Calciborolls

Typical Pedon

Windham gravelly loam, 0 to 4 percent slopes, in an area of rangeland, 2,000 feet north and 2,600 feet west of the southeast corner of sec. 22, T. 26 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; loose; friable, slightly sticky, slightly plastic; many very fine and fine roots; many medium irregular pores; 25 percent limestone pebbles; slightly alkaline; clear smooth boundary.

Bk1—5 to 11 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine irregular pores; 25 percent limestone pebbles with lime crusts on undersides; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—11 to 19 inches; light gray (10YR 7/3) extremely gravelly loam, light brownish gray (10YR 6/2) moist; weak fine subangular blocky structure;

slightly hard, firm, slightly sticky, slightly plastic; common very fine and fine roots; common fine irregular pores; 55 percent limestone pebbles and 5 percent cobbles; lime crusts on undersides of rock fragments; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—19 to 60 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots in the upper few inches; few very fine irregular pores; 55 percent limestone pebbles and 10 percent cobbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the calcic horizon: 5 to 10 inches

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 60 percent—0 to 10 percent cobbles; 15 to 50 percent pebbles

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 to 6 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Content of 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 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy loam

Clay content: 18 to 35 percent

Content of 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 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy loam

Clay content: 18 to 35 percent

Content of 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

29B—Windham gravelly loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Windham and similar soils: 90 percent

Minor Components

Judith and similar soils: 0 to 5 percent

Kiev and similar soils: 0 to 2 percent

Utica and similar soils: 0 to 2 percent

Arrod and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: 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.

29C—Windham gravelly loam, 4 to 8 percent slopes

Setting

Landform: Relict stream terraces

Slope: 4 to 8 percent

Elevation: 3,800 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Windham and similar soils: 90 percent

Minor Components

Judith and similar soils: 0 to 6 percent

Kiev and similar soils: 0 to 2 percent

Utica and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: 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.

Winginaw Series

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Permeability: Moderately slow

Landform: Stream terraces

Parent material: Peat

Slope range: 0 to 2 percent

Mean annual precipitation: 16 to 19 inches

Annual air temperature: 40 to 43 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy, mixed, euic Terric Borofibrists

Typical Pedon

Winginaw mucky peat, in an area of Winginaw-Birchfield mucky peats, 0 to 2 percent slopes, in an area of marshland, 2,300 feet north and 800 feet east of the southwest corner of sec. 18, T. 24 N., R. 7 W.

(Colors are for moist soil unless otherwise noted.)

Oi1—0 to 8 inches; very dark brown (10YR 2/2) and very dark brown (10YR 2/2) rubbed and pressed fibric material; 80 percent fiber—70 percent rubbed; massive; nonsticky, nonplastic; 50 percent lycopodium mosses and 45 percent

herbaceous species; moderately alkaline; gradual smooth boundary.

Oi2—8 to 20 inches; dark reddish brown (5YR 3/2) rubbed, dark reddish brown (5YR 2/2) pressed; 90 percent fiber—75 percent rubbed; massive; nonsticky, nonplastic; 90 percent herbaceous species and 5 percent lycopodium mosses; slightly alkaline; gradual smooth boundary.

Oe—20 to 27 inches; very dark gray (10YR 3/1) rubbed and pressed; 45 percent fiber—20 percent rubbed; massive; slightly sticky, slightly plastic; 30 percent mineral soil; slightly alkaline; clear smooth boundary.

2Ak—27 to 33 inches; black (5Y 2/1) clay loam; massive; hard, friable, moderately sticky, moderately plastic; few fine roots; 10 percent fiber—less than 5 percent rubbed; few medium soft masses of lime; matrix is slightly effervescent; slightly alkaline; gradual wavy boundary.

2Bkg1—33 to 40 inches; mixed gray (5Y 5/1) and dark gray (5Y 4/1) gravelly clay loam; common prominent olive (5Y 5/4) and olive yellow (5Y 6/6) mottles; massive; very hard, firm, moderately sticky, moderately plastic; few fine roots; 15 percent pebbles; violently effervescent; slightly alkaline; gradual wavy boundary.

2Bkg2—40 to 60 inches; olive gray (5Y 5/2) very gravelly loam; common distinct olive (5Y 5/4) and olive yellow (5Y 6/6) mottles; massive; very hard, firm, moderately sticky, moderately plastic; 40 percent pebbles; violently effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 45 degrees F

Depth to the mineral horizon: 16 to 51 inches but is commonly 20 to 40 inches

Depth to the seasonal high water table: Surface to 12 inches

Oi1 horizon

Hue: 10YR or 7.5YR

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 70 to 90 percent unrubbed; 65 to 85 percent rubbed

Mineral content: 0 to 15 percent

Reaction: pH 6.6 to 8.4

Oi2 horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 75 to 95 percent unrubbed; 65 to 85 percent rubbed

Mineral content: 0 to 15 percent

Reaction: pH 6.6 to 8.4

Oe horizon

Hue: 10YR or 7.5YR

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 40 to 60 percent unrubbed; 20 to 40 percent rubbed

Mineral content: 15 to 40 percent

Reaction: pH 6.6 to 8.4

2Ak horizon

Hue: 5Y or 2.5Y

Value: 2 or 3 moist

Chroma: 1 or 2

Fiber content: 5 to 20 percent unrubbed; 0 to 10 percent rubbed

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 7.4 to 8.4

2Bkg1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist

Chroma: 1 or 2

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 15 to 30 percent—0 to 5 percent cobbles; 15 to 25 percent pebbles

Calcium carbonate equivalent: 20 to 35 percent

Reaction: pH 7.4 to 8.4

2Bkg2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 moist

Chroma: 1 or 2

Texture: Loam or clay loam

Clay content: 17 to 30 percent

Content of rock fragments: 25 to 60 percent—0 to 10 percent cobbles; 25 to 50 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Reaction: pH 7.4 to 8.4

**102A—Winginaw-Birchfield mucky peats,
0 to 2 percent slopes**

Setting

Landform:

- Winginaw—Stream terraces
- Birchfield—Stream terraces

Slope:

- Winginaw—0 to 2 percent
- Birchfield—0 to 2 percent

Elevation: 4,500 to 5,000 feet

Mean annual precipitation: 16 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Winginaw and similar soils: 45 percent

Birchfield and similar soils: 40 percent

Minor Components

Dougcliff and similar soils: 0 to 8 percent

Tetonview and similar soils: 0 to 7 percent

Major Component Description

Winginaw

Surface layer texture: Mucky peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Peat

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Ponding: Long

Available water capacity: Mainly 12.1 inches

Birchfield

Surface layer texture: Mucky peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

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.

**202A—Winginaw-Dougcliff mucky peats,
0 to 2 percent slopes**

Setting

Landform:

- Winginaw—Stream terraces
- Dougcliff—Stream terraces

Slope:

- Winginaw—0 to 2 percent
- Dougcliff—0 to 1 percent

Elevation: 4,500 to 5,000 feet*Mean annual precipitation:* 17 to 19 inches*Frost-free period:* 90 to 100 days**Composition****Major Components**

Winginaw and similar soils: 50 percent

Dougcliff and similar soils: 35 percent

Minor Components

Birchfield and similar soils: 0 to 10 percent

Tetonview and similar soils: 0 to 5 percent

Major Component Description**Winginaw***Surface layer texture:* Mucky peat*Depth class:* Very deep (more than 60 inches)*Drainage class:* Very poorly drained*Dominant parent material:* Peat*Native plant cover type:* Rangeland*Flooding:* None*Water table:* Apparent*Ponding:* Long*Available water capacity:* Mainly 12.1 inches**Dougcliff***Surface layer texture:* Mucky peat*Depth class:* Very deep (more than 60 inches)*Drainage class:* Very poorly drained*Dominant parent material:* Peat*Native plant cover type:* Rangeland*Flooding:* None*Water table:* Apparent*Available water capacity:* Mainly 21.0 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.

Winifred Series*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Permeability:* Slow*Landform:* Hills*Parent material:* Residuum from semiconsolidated shale*Slope range:* 0 to 45 percent*Mean annual precipitation:* 15 to 19 inches*Annual air temperature:* 40 to 44 degrees F*Frost-free period:* 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Haploborolls

Typical Pedon

Winifred silty clay loam, in an area of Wayden-Cabba-Winifred complex, 15 to 45 percent slopes, in an area of rangeland, 2,200 feet south and 1,900 feet west of the northeast corner of sec. 14, T. 24 N., R. 8 W.

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

Bw—5 to 16 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, firm, moderately sticky, very plastic; common very fine and fine roots; few very fine tubular pores; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk—16 to 26 inches; light gray (5Y 7/2) clay, light olive gray (5Y 6/2) moist; weak coarse prismatic structure in the upper part grading to moderate medium platy in the lower part; very hard, firm, moderately sticky, very plastic; few fine roots; few very fine tubular pores; 15 percent soft shale fragments; common fine threads of segregated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—26 to 60 inches; light gray (5Y 7/1) semiconsolidated shale; slightly effervescent.

Range in Characteristics*Soil temperature:* 42 to 47 degrees F*Thickness of the mollic epipedon:* 7 to 15 inches*Depth to the Bk horizon:* 11 to 22 inches*Depth to the Cr horizon:* 20 to 40 inches**A horizon**

Hue: 10YR or 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

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
 Content of rock fragments: 0 to 15 percent—0 to 10 percent cobbles; 0 to 5 percent pebbles
 Effervescence: None to strongly
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 or 3
 Texture: Clay, silty clay, silty clay loam, or clay loam
 Clay content: 35 to 50 percent
 Content of rock fragments: 0 to 15 percent—0 to 10 percent cobbles; 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

285C—Winifred-Wayden-Cabba complex, 2 to 15 percent slopes

Setting

Landform:

- Winifred—Hills
- Wayden—Hills
- Cabba—Hills

Position on landform:

- Winifred—Foothills
- Wayden—Shoulders
- Cabba—Shoulders

Slope:

- Winifred—2 to 15 percent
- Wayden—2 to 15 percent
- Cabba—2 to 15 percent

Elevation: 4,200 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Winifred and similar soils: 35 percent
 Wayden and similar soils: 30 percent
 Cabba and similar soils: 20 percent

Minor Components

Castner and similar soils: 0 to 7 percent
 Linwell and similar soils: 0 to 5 percent
 Amor and similar soils: 0 to 3 percent

Major Component Description

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 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 1.9 inches

Cabba

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

Winspect Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines and hills
Parent material: Alpine till
Slope range: 2 to 35 percent
Mean annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed Typic Calciborolls

Typical Pedon

Winspect cobbly loam, in an area of Beanlake-Winspect cobbly loams, 2 to 15 percent slopes, in an area of rangeland, 2,300 feet north and 2,200 feet west of the southeast corner of sec. 24, T. 25 N., R. 8 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots; common very fine and fine irregular pores; 10 percent cobbles and 10 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—4 to 8 inches; brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; common fine irregular pores; 15 percent cobbles and 10 percent pebbles; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—8 to 18 inches; light brownish gray (10YR 6/2) cobbly clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; common very fine irregular pores; 20 percent cobbles and 10 percent pebbles; many medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—18 to 60 inches; light gray (10YR 7/2) very cobbly clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; 25 percent cobbles and 25 percent pebbles; common medium and soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Thickness of the mollic epipedon: 7 to 14 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 20 to 25 percent

Content of rock fragments: 15 to 30 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 10 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bw horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 20 to 60 percent—0 to 10 percent stones; 5 to 20 percent cobbles; 10 to 30 percent pebbles

Calcium carbonate equivalent: 10 to 20 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 5 to 25 percent cobbles; 20 to 35 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.9 to 8.4

327E—Winspect-Beanlake cobbly loams, 15 to 35 percent slopes

Setting

Landform:

- Winspect—Moraines
- Beanlake—Moraines

Position on landform:

- Winspect—Shoulders and summits
- Beanlake—Backslopes and footslopes

Slope:

- Winspect—15 to 35 percent
- Beanlake—15 to 35 percent

Elevation: 4,200 to 5,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Winspect and similar soils: 45 percent
Beanlake and similar soils: 40 percent

Minor Components

Shawmut and similar soils: 0 to 5 percent
Judith and similar soils: 0 to 4 percent
Windham and similar soils: 0 to 4 percent
Utica and similar soils: 0 to 2 percent

Major Component Description

Winspect

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

Beanlake

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 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.

Yamacall Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 2 to 15 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Yamacall loam, in an area of Yamacall-Delpoint loams, 2 to 8 percent slopes, in an area of rangeland, 2,250 feet south and 1,200 feet east of the northwest corner of sec. 7, T. 23 N., R. 4 W.

A1—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; common very fine irregular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

A2—2 to 4 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; common very fine and fine discontinuous pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 11 inches; grayish brown (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate fine prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, moderately plastic; common fine and medium roots; common very fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—11 to 15 inches; light brownish gray (2.5Y 6/2) loam, brownish gray (2.5Y 5/2) moist; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; common fine roots; many very fine vesicular and irregular pores; 15 percent weathered sandstone fragments; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—15 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; few fine roots; 15 percent weathered sandstone fragments; common medium soft masses of lime; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to the Bk horizon: 10 to 20 inches

A horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4
 Other features: When mixed to 7 inches, this horizon will not meet the requirements for a mollic epipedon.

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam or silt loam
 Clay content: 18 to 27 percent with 15 to 35 percent fine sand and coarser
 Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 to 8 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam or silt loam
 Clay content: 18 to 30 percent with 15 to 35 percent fine sand and coarser
 Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Effervescence: Strongly or violently
 Reaction: pH 7.9 to 9.0

151C—Yamacall-Delpoint loams, 2 to 8 percent slopes

Setting

Landform:

- Yamacall—Alluvial fans
- Delpoint—Sedimentary plains

Position on landform:

- Yamacall—Footslopes
- Delpoint—Backslopes and footslopes

Slope:

- Yamacall—2 to 8 percent
- Delpoint—2 to 8 percent

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Kremlin and similar soils: 0 to 8 percent
 Cabbart and similar soils: 0 to 7 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 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.8 inches

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

Management

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

151D—Yamacall-Delpoint, loams, 8 to 15 percent slopes

Setting

Landform:

- Yamacall—Alluvial fans
- Delpoint—Hills

Position on landform:

- Yamacall—Backslopes and footslopes
- Delpoint—Backslopes and shoulders

Slope:

- Yamacall—8 to 15 percent
- Delpoint—8 to 15 percent

Elevation: 3,200 to 4,200 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Cabbart and similar soils: 0 to 9 percent
 Kremlin and similar soils: 0 to 6 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 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.8 inches

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

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
Landform: Hills
Parent material: Residuum from semiconsolidated shale or interbedded shale and siltstone
Slope range: 4 to 60 percent
Mean annual precipitation: 11 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Yawdim silty clay loam, in an area of Abor-Yawdim silty clay loams, 15 to 35 percent slopes, in an area of rangeland, 1,300 feet south and 200 feet west of the northeast corner of sec. 29, T. 24 N., R. 1 W.

A—0 to 5 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and medium granular structure; hard, friable, moderately sticky, moderately plastic; common fine roots; common very fine pores; slightly effervescent; neutral; clear smooth boundary.

C1—5 to 8 inches; pale brown (10YR 6/3) silty clay loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, moderately sticky, very plastic; common fine roots; few very fine pores; 10 percent weathered shale fragments in lower part; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—8 to 16 inches; pale brown (10YR 6/3) silty clay loam, olive brown (2.5Y 4/4) moist; few faint light olive brown (2.5Y 5/4) mottles; weak fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; 40 percent soft shale fragments; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cr—16 to 60 inches; light yellowish brown (2.5Y 6/4) semiconsolidated shale, grayish brown (2.5Y 5/2) moist; common fine light olive brown (2.5Y 5/6) stains on plates; few fine roots in upper few inches.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3 or 4 moist
 Chroma: 1 to 3
 Clay content: 27 to 40 percent
 Reaction: pH 6.6 to 7.8

C horizons

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

Reaction: pH 7.4 to 8.4

189E—Yawdim-Delpoint-Rock outcrop complex, 8 to 35 percent slopes

Setting

Landform:

- Yawdim—Hills
- Delpoint—Hills

Position on landform:

- Yawdim—Backslopes and shoulders
- Delpoint—Backslopes and footslopes

Slope:

- Yawdim—8 to 35 percent
- Delpoint—8 to 35 percent
- Rock outcrop—8 to 35 percent

Elevation: 3,800 to 4,200 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yawdim and similar soils: 40 percent

Delpoint and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components

Cabbart and similar soils: 0 to 9 percent

Abor and similar soils: 0 to 6 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

Delpoint

Surface layer texture: 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 5.8 inches

Rock outcrop

Definition: Mainly semiconsolidated 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.

Yetull Series

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Hills and sedimentary plains

Parent material: Alluvium or eolian material

Slope range: 0 to 25 percent

Mean annual precipitation: 11 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Mixed, frigid Typic Ustipsamments

Typical Pedon

Yetull loamy fine sand, in an area of Twilight-Chinook-Yetull complex, 2 to 8 percent slopes, in an area of nonirrigated cropland, 1,600 feet north and 1,100 feet west of the southeast corner of sec. 14, T. 28 N., R. 5 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; many fine roots; slightly effervescent; neutral; clear smooth boundary.

C1—7 to 19 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—19 to 30 inches; pale brown (10YR 6/3) loamy fine sand that has thin strata of fine sandy loam, brown (10YR 5/3) moist; single grain; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—30 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; soft, very friable, nonsticky, nonplastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3 or 4 moist
 Chroma: 2 to 4
 Clay content: 0 to 10 percent
 Calcium carbonate equivalent: 0 to 10 percent
 Effervescence: None to strongly
 Reaction: pH 6.6 to 8.4

C1 horizon

Hue: 10YR or 2.5Y
 Value: 4 to 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
 Clay content: 0 to 10 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 1 to 10 percent
 Effervescence: Slightly or strongly
 Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR or 2.5Y
 Value: 4 to 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
 Clay content: 0 to 10 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 3 to 10 percent
 Effervescence: Slightly, strongly, or violently
 Reaction: pH 7.4 to 8.4

C3 horizon

Hue: 10YR or 2.5Y
 Value: 4 to 6 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand

Clay content: 0 to 10 percent
 Effervescence: Strongly or violently
 Calcium carbonate equivalent: 3 to 10 percent
 Reaction: pH 7.4 to 8.4

42C—Yetull loamy fine sand, 0 to 15 percent slopes

Setting

Landform: Hills
Slope: 0 to 15 percent
Elevation: 3,200 to 4,000 feet
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Yetull and similar soils: 90 percent

Minor Components

Chinook and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or eolian material
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.

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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.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

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 hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

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.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

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.

Aspect. The direction in which a slope faces.

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 hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes 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, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

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 cobbles or gravel. 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.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and 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, felled trees generally are 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 directly 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.

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 material. 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 through the use of chemicals.

- Chiseling.** Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.
- 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 stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.
- 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 has 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 has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.
- Codominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.
- COLE (coefficient of linear extensibility).** (See Linear extensibility.)
- Colluvium.** Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.
- Commercial forest.** Forestland 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.
- 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 or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured 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 effects of 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.** Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1962).

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.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

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 to the dip of the underlying bedrock.

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 a full stripcropping pattern to be used.

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 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.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological 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 ecological sites in kind and/or proportion of species or in total production.

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.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

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.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as 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. Synonym: scarp.

- 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 salt (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.
- 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.** Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters 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 has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has 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 flooding unless protected artificially.
- Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.
- Foothill.** A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.
- Footslope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).
- 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.
- 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. 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. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. 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. 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.

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. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

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. 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. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). 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.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E 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.

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, an Arabic numeral, commonly a 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.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it 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 the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration 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. 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.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

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 wind.

Low-residue crops. Such crops 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.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

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.
- Mollic epipedon.** A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.
- 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.** Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)
- Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.
- 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.
- Naturalized pasture.** Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.
- Neutral soil.** A soil having a pH value of 6.6 to 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. The content of organic matter in the surface layer is described as follows:
- | | |
|----------------------|-----------------------|
| Very low | less than 0.5 percent |
| Low | 0.5 to 1.0 percent |
| Moderately low | 1.0 to 2.0 percent |
| Moderate | 2.0 to 4.0 percent |
| High | 4.0 to 8.0 percent |
| Very high | more than 8.0 percent |
- 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 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 or air to move downward through the profile.

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 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains 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. Unless the soils are artificially drained, 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.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

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. (See Similarity index.)

Range site. (See Ecological site.)

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.

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 that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II).

The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

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 generally is 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, boulders, stones, cobbles, and gravel.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the

soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs 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 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.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

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 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. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope 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.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

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 millimeters) to the lower limit of very fine sand (0.05 millimeters). 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.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

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.

Slickspot. 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.

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
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

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 material below the solum. 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 tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind 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. Any surface soil horizon (A, E, AB, or EB) below the 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.

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 generally is 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.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

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.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes 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.

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.

Upland. 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 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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