



United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

In cooperation with  
Montana Agricultural  
Experiment Station

# Soil Survey of Custer County, Montana Part I





# How to Use This Soil Survey

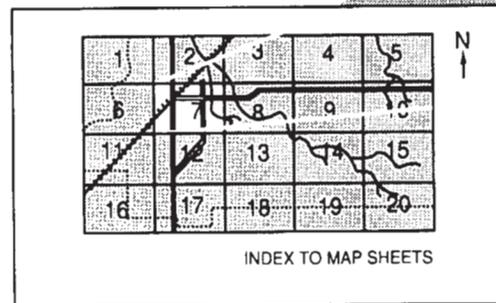
This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties.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

## Detailed Soil Maps

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

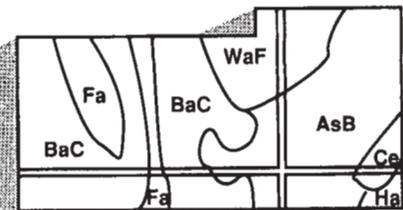
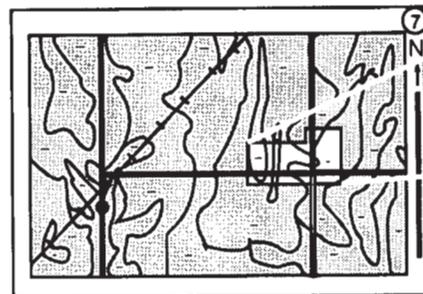
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

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



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

A **State Soil Geographic Data Base** (STATSGO) is available for this survey area. This



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

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

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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 1993. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service, the Fort Keogh Livestock and Range Research Station, Bureau of Land Management, and Montana Agricultural Experiment Station. Financial assistance was provided by the Old West Regional Commission in cooperation with the Montana Department of State Lands, the Montana Association of Conservation Districts, the Montana Department of Natural Resources and Conservation, and the Custer County Board of Commissioners in cooperation with the Custer County Conservation District. It is part of the technical assistance furnished to the Custer County Conservation District.

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

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**Cover: A typical area of intermixed rangeland and grazable woodland in the central part of Custer County.**

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

# Contents

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## Part I

<b>Index to Series</b> .....	6
<b>Index to Map Units</b> .....	8
<b>Summary of Tables</b> .....	14
<b>Foreword</b> .....	17
How This Survey Was Made .....	19
General Nature of the Survey Area .....	20
Industry, Transportation, and Recreation .....	21
Physiography, Ground Water, and Drainage .....	21
Geology and Fossil Fuels .....	22
Climate .....	25
<b>Formation and Classification of the Soils</b> .....	31
Formation of the Soils .....	31
Classification of the Soils .....	32
<b>Soil Series and Detailed Map Units</b> .....	41
<b>References</b> .....	239
<b>Glossary</b> .....	241

## Part II

### Detailed Soil Map Unit Legend

#### Summary of Tables

#### Agronomy

- Cropland Limitations and Hazards
- Crop Yield Estimates
- Pasture and Hayland Interpretations
- Land Capability Classification
- Prime Farmland and Other Important Farmland

#### Erosion Factors

- Windbreaks and Environmental Plantings

#### Range

- Range Condition
- Rangeland Management
- Forest Land Understory Vegetation

#### Forest Land

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

#### Recreation

#### Wildlife Habitat

- Elements of Wildlife Habitat
- Kinds of Wildlife Habitat
- Wildlife of Custer County

#### Engineering

- Building Site Development
- Sanitary Facilities
- Waste Management
- Construction Materials
- Water Management

#### Soil Properties

- Engineering Index Properties
- Physical Properties
- Chemical Properties
- Water Features
- Soil Features

#### References

#### Glossary

## Index to Series

---

Abor Series .....	42	Harlake Series .....	141
Absher Series .....	45	Havre Series .....	142
Alona Series .....	46	Ismay Series .....	147
Antwerp Series .....	48	Ivanell Series .....	148
Archin Series .....	49	Kirby Series .....	150
Armells Series .....	51	Kobase Series .....	152
Benz Series .....	55	Kremlin Series .....	156
Bigsandy Series .....	56	Lallie Series .....	159
Bigsheep Series .....	56	Lamedeer Series .....	160
Birney Series .....	57	Lihen Series .....	162
Bitton Series .....	60	Lilsheep Series .....	163
Blacksheep Series .....	61	Lisk Series .....	164
Bonfri Series .....	62	Lonna Series .....	166
Broadus Series .....	63	Macar Series .....	173
Brushton Series .....	64	Marias Series .....	176
Bullock Series .....	66	Marvan Series .....	178
Busby Series .....	67	Megonot Series .....	180
Cabba Series .....	74	Morton Series .....	181
Cabbart Series .....	74	Neldore Series .....	182
Cambert Series .....	78	Parshall Series .....	186
Cambeth Series .....	83	Pinehill Series .....	187
Chanta Series .....	89	Ralore Series .....	190
Cherry Series .....	90	Ralph Series .....	191
Chinook Series .....	93	Ringling Series .....	193
Cohagen Series .....	98	Rivra Series .....	194
Cooers Series .....	99	Rominell Series .....	195
Creed Series .....	100	Ryell Series .....	197
Dast Series .....	102	Sagedale Series .....	198
Davidell Series .....	103	Savage Series .....	200
Degrad Series .....	106	Shambo Series .....	202
Delpoint Series .....	107	Sonnett Series .....	204
Doney Series .....	114	Spinekop Series .....	208
Eapa Series .....	118	Tally Series .....	209
Ethridge Series .....	121	Tinsley Series .....	211
Farland Series .....	123	Twilight Series .....	214
Farnuf Series .....	124	Vanda Series .....	215
Floweree Series .....	125	Vanstel Series .....	217
Foreleft Series .....	128	Vebar Series .....	219
Gerdrum Series .....	129	Volborg Series .....	219
Glendive Series .....	133	Wabek Series .....	220
Golva Series .....	137	Wayden Series .....	221
Hanly Series .....	138	Weingart Series .....	222

---

Widen Series .....	224
Yamacall Series .....	225
Yawdim Series .....	234

Yetull Series .....	235
Zatoville Series .....	236

## Index to Map Units

---

3F—Cabbart-Rock outcrop-Yawdim complex, 15 to 70 percent slopes .....	77	45A—Glendive fine sandy loam, 0 to 2 percent slopes, rarely flooded .....	134
12E—Wabek gravelly sandy loam, 8 to 35 percent slopes .....	221	46A—Hanly loamy fine sand, 0 to 2 percent slopes, rarely flooded .....	139
14B—Alona silt loam, 0 to 4 percent slopes .....	47	47A—Harlake silty clay, 0 to 2 percent slopes, rarely flooded .....	142
17F—Badland .....	54	50C—Kremlin loam, 2 to 8 percent slopes .....	157
18E—Cabbart-Havre complex, 0 to 35 percent slopes .....	76	51C—Shambo loam, 2 to 8 percent slopes .....	203
19C—Archin loam, 2 to 8 percent slopes .....	50	52A—Sagedale silty clay loam, 0 to 2 percent slopes .....	199
21C—Benz loam, 0 to 8 percent slopes .....	55	52C—Sagedale silty clay loam, 2 to 8 percent slopes .....	200
24B—Davidell silty clay loam, 0 to 4 percent slopes .....	105	53A—Kobase silty clay loam, 0 to 2 percent slopes .....	153
25A—Marias clay, 0 to 2 percent slopes .....	177	53C—Kobase silty clay loam, 2 to 8 percent slopes .....	154
27A—Busby fine sandy loam, 0 to 2 percent slopes .....	68	53D—Kobase silty clay loam, 8 to 15 percent slopes .....	154
27C—Busby fine sandy loam, 2 to 8 percent slopes .....	68	56A—Cherry silt loam, 0 to 2 percent slopes .....	91
30C—Yamacall-Havre, occasionally flooded, loams, 0 to 8 percent slopes .....	233	56C—Cherry silt loam, 2 to 8 percent slopes .....	91
31A—Ryell very fine sandy loam, 0 to 2 percent slopes, rarely flooded .....	198	57A—Lonna silt loam, 0 to 2 percent slopes .....	167
33A—Chanta loam, 0 to 2 percent slopes .....	90	57C—Lonna silt loam, 2 to 8 percent slopes .....	167
34C—Tally fine sandy loam, 2 to 8 percent slopes .....	210	59C—Farland silt loam, 2 to 8 percent slopes .....	123
35C—Chinook fine sandy loam, 2 to 8 percent slopes .....	94	60A—Golva silt loam, 0 to 2 percent slopes .....	137
37B—Degrand loam, 0 to 4 percent slopes .....	107	60C—Golva silt loam, 2 to 8 percent slopes .....	138
39A—Ethridge silty clay loam, 0 to 2 percent slopes .....	122	61A—Marias silty clay, 0 to 2 percent slopes .....	177
39C—Ethridge silty clay loam, 2 to 8 percent slopes .....	122	62A—Marvan silty clay, 0 to 2 percent slopes .....	179
40A—Savage silty clay loam, 0 to 2 percent slopes .....	201	62C—Marvan silty clay, 2 to 8 percent slopes .....	179
40C—Savage silty clay loam, 2 to 8 percent slopes .....	201	64A—Pinehill loam, 0 to 2 percent slopes .....	188
41A—Eapa loam, 0 to 2 percent slopes .....	119	64C—Pinehill loam, 2 to 8 percent slopes .....	188
41C—Eapa loam, 2 to 6 percent slopes .....	120	64D—Pinehill loam, 8 to 15 percent slopes .....	189
43F—Abor-Lilsheep complex, 8 to 45 percent slopes .....	44	67A—Riverwash .....	193
44A—Farnuf loam, 0 to 2 percent slopes .....	125	75C—Weingart-Ivanell clay loams, 2 to 8 percent slopes .....	223
44C—Farnuf loam, 2 to 6 percent slopes .....	125	76B—Vanstel loam, 0 to 4 percent slopes .....	218
		76C—Vanstel silt loam, 2 to 8 percent slopes .....	218
		77A—Havre-Bigsandy loams, 0 to 2 percent slopes, frequently flooded .....	146
		79A—Yamacall loam, 0 to 2 percent slopes .....	226
		79C—Yamacall loam, 2 to 8 percent slopes .....	226
		79D—Yamacall loam, 8 to 15 percent slopes .....	226

81A—Creed loam, 0 to 2 percent slopes .....	101	296F—Cambeth-Cabbart-Rock outcrop complex, 8 to 45 percent slopes .....	89
81C—Creed loam, 2 to 8 percent slopes .....	101	297C—Cambeth, noncalcareous-Megonot complex, 2 to 8 percent slopes .....	86
85C—Foreleft loam, 2 to 8 percent slopes .....	128	297D—Cambeth, noncalcareous-Megonot complex, 8 to 15 percent slopes .....	86
88A—Floweree silt loam, 0 to 2 percent slopes .....	126	297E—Cambeth, calcareous-Cabbart-Yawdim complex, 15 to 25 percent slopes .....	84
88C—Floweree silt loam, 2 to 6 percent slopes .....	127	311A—Ryell loam, 0 to 2 percent slopes, occasionally flooded .....	198
90A—Sonnett loam, 0 to 2 percent slopes .....	206	341D—Tally-Vebar fine sandy loams, 2 to 12 percent slopes .....	211
90C—Sonnett loam, 2 to 8 percent slopes .....	206	342C—Tally-Shambo complex, 2 to 8 percent slopes .....	210
93B—Brushston silt loam, 0 to 4 percent slopes .....	65	352D—Chinook-Twilight fine sandy loams, 2 to 12 percent slopes .....	96
98A—Macar loam, 0 to 2 percent slopes .....	174	353C—Chinook-Kremlin complex, 2 to 6 percent slopes .....	95
98C—Macar loam, 2 to 8 percent slopes .....	174	355C—Chinook-Twilight-Eapa complex, 2 to 8 percent slopes .....	97
112C—Absher silty clay loam, 0 to 8 percent slopes .....	46	357D—Chinook-Lihen-Twilight complex, 8 to 15 percent slopes .....	95
121D—Kremlin-Tinsley-Degrad complex, 4 to 15 percent slopes .....	158	361E—Doney-Broadus-Cabba complex, 15 to 25 percent slopes .....	115
122D—Tinsley-Chanta complex, 4 to 15 percent slopes .....	213	381F—Delpoint-Armells complex, 25 to 70 percent slopes .....	108
123F—Tinsley-Delpoint-Cabbart complex, 8 to 45 percent slopes .....	213	383F—Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes .....	111
151F—Armells-Cabbart-Kirby complex, 25 to 70 percent slopes .....	53	385E—Delpoint-Yamacall-Cabbart loams, 15 to 25 percent slopes .....	113
191C—Archin-Gerdrum loams, 2 to 8 percent slopes .....	51	386F—Cabbart-Rock outcrop-Delpoint complex, 15 to 50 percent slopes .....	77
192C—Archin-Davidell-Bullock complex, 2 to 8 percent slopes .....	50	387D—Delpoint-Busby-Blacksheep complex, 4 to 15 percent slopes .....	109
222D—Floweree-Cambeth, noncalcareous-Lilsheep complex, 4 to 15 percent slopes .....	127	388D—Delpoint-Kobase-Yawdim complex, 4 to 15 percent slopes .....	112
228F—Cambeth, noncalcareous-Lilsheep-Lonna complex, 15 to 45 percent slopes .....	85	421A—Gerdrum-Creed complex, 0 to 2 percent slopes .....	131
241B—Davidell-Antwerp silty clay loams, 0 to 4 percent slopes .....	105	421C—Gerdrum-Creed complex, 2 to 8 percent slopes .....	131
242C—Davidell-Ivanell complex, 2 to 8 percent slopes .....	105	421D—Gerdrum-Creed complex, 4 to 15 percent slopes, gullied .....	132
271E—Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes .....	70		
277D—Busby-Twilight fine sandy loams, 2 to 15 percent slopes .....	71		
278E—Busby-Yetull complex, 2 to 15 percent slopes .....	73		
293E—Cambeth-Cabbart-Kirby complex, 8 to 45 percent slopes .....	88		

432D—Slickspots-Abor complex, 2 to 12 percent slopes .....	204	552D—Neldore-Abor-Marvan complex, 2 to 15 percent slopes .....	184
451A—Glendive fine sandy loam, 0 to 2 percent slopes, occasionally flooded .....	134	554E—Delpoint-Weingart complex, 4 to 25 percent slopes .....	113
452A—Glendive loam, 0 to 2 percent slopes, rarely flooded .....	135	561C—Cherry-Cambert silt loams, 2 to 8 percent slopes .....	92
453A—Glendive-Havre complex, 0 to 2 percent slopes, occasionally flooded .....	136	562D—Cherry-Cambert-Cabba silt loams, 8 to 15 percent slopes .....	92
456A—Havre and Glendive soils, channeled, 0 to 2 percent slopes, frequently flooded .....	143	573D—Lonna, Cambeth, and Yamacall soils, gullied, 8 to 15 percent slopes .....	168
461A—Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded .....	139	574E—Lonna-Cambeth-Cabbart silt loams, 12 to 25 percent slopes .....	171
462A—Hanly-Glendive complex, 0 to 2 percent slopes, nonflooded .....	139	575C—Lonna-Cambeth silt loams, 2 to 8 percent slopes .....	171
471A—Harlake silty clay, 0 to 2 percent slopes, occasionally flooded .....	142	576A—Lonna silty clay loam, 0 to 2 percent slopes .....	167
473A—Lallie silty clay, 0 to 2 percent slopes .....	159	576C—Lonna silty clay loam, 2 to 8 percent slopes .....	168
481A—Havre loam, 0 to 2 percent slopes, occasionally flooded .....	143	577D—Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes .....	172
483A—Havre silty clay, 0 to 2 percent slopes, occasionally flooded .....	145	581C—Ivanell-Cabbart silt loams, 2 to 8 percent slopes .....	149
486A—Glendive-Havre complex, 0 to 2 percent slopes, nonflooded .....	135	602C—Bonfri loam, 2 to 8 percent slopes .....	63
487A—Havre-Harlake complex, 0 to 2 percent slopes, nonflooded .....	146	603D—Busby fine sandy loam, 8 to 15 percent slopes .....	69
488A—Havre silty clay loam, 0 to 2 percent slopes, occasionally flooded .....	144	604E—Busby, gullied-Delpoint-Yawdim complex, 8 to 25 percent slopes .....	69
489A—Spinekop silty clay loam, 0 to 2 percent slopes .....	209	605D—Cabbart-Cambeth silt loams, 8 to 15 percent slopes .....	76
491A—Ismay silty clay loam, 0 to 2 percent slopes, occasionally flooded .....	148	607C—Cambeth-Cabbart silt loams, 2 to 8 percent slopes .....	87
501C—Kremlin-Delpoint loams, 2 to 8 percent slopes .....	157	608C—Chinook sandy loam, 2 to 8 percent slopes .....	94
511C—Shambo-Doney loams, 2 to 8 percent slopes .....	203	612F—Kirby-Blacksheep-Rock outcrop complex, 25 to 60 percent slopes .....	151
531D—Kobase silty clay loam, 2 to 15 percent slopes, gullied .....	153	613C—Kremlin-Cabbart complex, 2 to 8 percent slopes .....	157
532C—Kobase-Gerdrum silty clay loams, 2 to 8 percent slopes .....	155	615C—Yamacall-Havre loams, 2 to 8 percent slopes .....	233
534C—Marias clay, 2 to 8 percent slopes .....	177	621B—Marvan-Vanda silty clays, 0 to 4 percent slopes .....	179
542E—Lihen-Yetull complex, 8 to 35 percent slopes .....	163		

631F—Bitton-Cabba-Ringling complex, 25 to 70 percent slopes .....	61	701E—Lamedeer-Broadus-Ringling complex, 15 to 25 percent slopes .....	160
641D—Pinehill-Absher complex, 2 to 15 percent slopes .....	189	702F—Lamedeer-Cabba-Ringling complex, 25 to 70 percent slopes .....	161
650F—Armells-Delpoint-Cabbart complex, 25 to 70 percent slopes .....	53	731E—Cambert-Cabba-Ringling complex, 8 to 45 percent slopes .....	80
651C—Busby-Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes .....	71	732C—Cambert-Widen complex, 2 to 8 percent slopes .....	82
652C—Chinook fine sandy loam, alkali substratum, 2 to 8 percent slopes .....	94	732D—Cambert-Widen complex, 8 to 15 percent slopes .....	82
653B—Davidell loam, 2 to 4 percent slopes .....	104	733E—Cambert-Cabba-Widen complex, 15 to 25 percent slopes .....	80
654B—Eapa loam, 0 to 4 percent slopes .....	120	734E—Cambert-Cherry-Cabba silt loams, 12 to 25 percent slopes .....	81
656A—Gerdrum clay loam, 0 to 2 percent slopes .....	130	742E—Neldore-Abor silty clays, 4 to 25 percent slopes .....	183
657C—Gerdrum clay loam, 2 to 8 percent slopes .....	130	781A—Vanda clay, wet, 0 to 2 percent slopes .....	216
658C—Gerdrum-Marvan silty clays, 2 to 8 percent slopes .....	133	797E—Yamacall-Busby-Blacksheep complex, 8 to 25 percent slopes .....	230
659A—Glendive loam, 0 to 2 percent slopes, occasionally flooded .....	135	798C—Yamacall-Delpoint loams, 2 to 8 percent slopes .....	231
660A—Hanly-Glendive loams, 0 to 2 percent slopes, occasionally flooded .....	140	799E—Yamacall-Birney-Delpoint complex, 15 to 25 percent slopes .....	228
661A—Havre silty clay loam, saline, 0 to 2 percent slopes, frequently flooded .....	144	802E—Shambo-Lisk-Dast complex, 8 to 25 percent slopes .....	203
662F—Neldore-Abor silty clays, 25 to 60 percent slopes .....	183	811C—Creed-Pinehill loams, 2 to 8 percent slopes .....	102
663F—Neldore-Abor-Rock outcrop complex, 8 to 35 percent slopes .....	184	813C—Creed-Absher complex, 2 to 8 percent slopes .....	101
664F—Neldore-Rock outcrop complex, 15 to 60 percent slopes .....	185	831F—Doney-Cabba-Wayden complex, 25 to 70 percent slopes .....	116
665F—Tinsley-Cabbart complex, 15 to 45 percent slopes .....	212	832E—Doney-Macar-Cabba loams, 15 to 25 percent slopes .....	118
666C—Neldore-Volborg, saline complex, 1 to 8 percent slopes .....	186	841F—Birney, moist-Armells-Cabbart complex, 25 to 70 percent slopes .....	58
667E—Weingart-Neldore complex, 4 to 25 percent slopes .....	223	842F—Cabbart-Yawdim-Rock outcrop complex, 15 to 70 percent slopes .....	78
668A—Zatoville silty clay loam, loamy substratum, 0 to 2 percent slopes .....	237	843E—Delpoint, moist-Delpoint-Cabbart loams, 15 to 25 percent slopes .....	108
681A—Rivra complex, 0 to 2 percent slopes, occasionally flooded .....	194	844A—Havre, Harlake, and Glendive soils, channeled, 0 to 2 percent slopes .....	145
691F—Rock outcrop-Cabbart-Kirby complex, 25 to 70 percent slopes .....	195		

845C—Ivanell-Davidell complex, 2 to 8 percent slopes .....	150	931C—Ralph-Brushton silt loams, 2 to 8 percent slopes .....	192
846F—Blacksheep-Delpoint-Rock outcrop complex, 15 to 50 percent slopes .....	62	940E—Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes .....	110
847E—Busby-Yetull-Rock outcrop complex, 8 to 25 percent slopes .....	73	941C—Gerdrum-Kobase silty clay loams, 2 to 8 percent slopes .....	132
862E—Doney-Lamedeer-Cabba complex, 8 to 25 percent slopes .....	117	942A—Harlake silty clay loam, 0 to 2 percent slopes, occasionally flooded .....	141
862F—Doney-Lamedeer-Cabba complex, 25 to 70 percent slopes .....	116	943F—Kirby-Cabbart-Rock outcrop complex, 25 to 70 percent slopes .....	152
871C—Morton-Farland silt loams, 2 to 8 percent slopes .....	182	944E—Kobase-Cabbart-Yawdim complex, 8 to 25 percent slopes .....	154
891D—Yamacall-Birney-Delpoint complex, 4 to 15 percent slopes .....	228	945A—Lonna-Alona silt loams, 0 to 2 percent slopes .....	169
892D—Yamacall-Delpoint-Cabbart loams, 4 to 15 percent slopes .....	232	945C—Lonna-Alona silt loams, 2 to 8 percent slopes .....	169
901A—Sonnett-Sonnett, thin surface, complex, 0 to 2 percent slopes .....	207	946A—Lonna-Antwerp silty clay loams, 0 to 2 percent slopes .....	169
901C—Sonnett-Sonnett, thin surface, complex, 2 to 8 percent slopes .....	207	946C—Lonna-Antwerp silty clay loams, 2 to 8 percent slopes .....	170
902C—Sonnett, thin surface-Slickspots complex, 0 to 8 percent slopes .....	206	947E—Lonna-Cabbart-Yawdim complex, 8 to 25 percent slopes .....	170
910B—Antwerp silty clay loam, 0 to 4 percent slopes .....	49	948B—Rominell fine sandy loam, 1 to 4 percent slopes, eroded .....	197
911F—Armells-Cabbart complex, 25 to 70 percent slopes .....	52	949E—Tinsley very gravelly sandy loam, 15 to 35 percent slopes .....	212
912F—Armells-Kirby complex, 25 to 70 percent slopes .....	54	951C—Vanstel loam, 2 to 8 percent slopes .....	218
913D—Birney-Cooers-Kirby complex, 2 to 15 percent slopes .....	59	952D—Yamacall-Birney complex, 8 to 15 percent slopes .....	227
914D—Bullock, eroded-Ralore clay loams, 2 to 15 percent slopes .....	67	953E—Yamacall-Birney-Cabbart complex, 15 to 25 percent slopes .....	227
916E—Busby-Twilight-Blacksheep, fine sandy loams, 8 to 25 percent slopes .....	72	954C—Yamacall-Busby complex, 2 to 8 percent slopes .....	229
917D—Cambeth-Cabbart silt loams, 4 to 15 percent slopes .....	88	954D—Yamacall-Busby complex, 8 to 15 percent slopes .....	230
918E—Cambeth-Cabbart complex, dissected, 8 to 25 percent slopes .....	87	955D—Yamacall-Delpoint loams, 4 to 15 percent slopes .....	231
919F—Delpoint-Cabbart loams, 25 to 70 percent slopes .....	110	956F—Yawdim-Cabbart-Kobase complex, 15 to 70 percent slopes .....	234
921F—Twilight-Blacksheep-Busby fine sandy loams, 8 to 45 percent slopes .....	215	957E—Abor-Cabbart-Delpoint complex, 8 to 25 percent slopes .....	43

---

958D—Abor-Delpoint-Kobase complex, 4 to 15 percent slopes .....	43	983E—Macar-Lisk-Cohagen complex, 8 to 25 percent slopes .....	175
959D—Abor-Weingart-Neldore complex, 2 to 15 percent slopes .....	44	990E—Lihen-Tinsley complex, 8 to 35 percent slopes .....	162
960A—Busby loam, 0 to 2 percent slopes .....	69	991F—Neldore-Rock outcrop-Abor complex, 15 to 50 percent slopes .....	185
961C—Busby-Yetull complex, 0 to 8 percent slopes .....	72	992C—Parshall fine sandy loam, 2 to 6 percent slopes .....	187
962F—Cambert-Bigsheep-Golva complex, 8 to 45 percent slopes .....	79	993C—Pinehill-Weingart-Gerdrum complex, 0 to 6 percent slopes .....	190
963E—Cambeth, calcareous-Cabbart- Lonna silt loams, 15 to 35 percent slopes .....	83	994E—Cabbart-Bullock, eroded complex, 2 to 25 percent slopes .....	75
964E—Cambeth, calcareous-Cabbart-Yawdim complex, 4 to 25 percent slopes .....	85	995C—Yamacall-Gerdrum complex, 2 to 8 percent slopes .....	232
965C—Chinook-Twilight fine sandy loams, 2 to 8 percent slopes .....	96	996A—Yetull-Busby complex, 0 to 2 percent slopes .....	236
966D—Chinook-Twilight-Blacksheep fine sandy loams, 8 to 15 percent slopes .....	97	4621A—Hanly-Glendive complex, 0 to 2 percent slopes, occasionally flooded .....	140
967E—Delpoint-Cabbart-Yawdim complex, 4 to 25 percent slopes .....	111	4861A—Glendive-Havre silty clay loams, 0 to 2 percent slopes, nonflooded .....	136
968E—Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes .....	114	4871A—Havre-Harlake complex, 0 to 2 percent slopes, occasionally flooded .....	147
969C—Eapa-Delpoint loams, 2 to 8 percent slopes .....	120	4881A—Havre loam, 0 to 2 percent slopes, rarely flooded .....	144
971E—Lisk-Cohagen-Dast fine sandy loams, 8 to 25 percent slopes .....	165	DA—Denied access .....	114
981C—Macar-Doney loams, 2 to 8 percent slopes .....	174	M-W—Miscellaneous water .....	181
982D—Macar-Doney-Cabba loams, 8 to 15 percent slopes .....	175	W—Water .....	221

# Summary of Tables

---

## Part I

Temperature and precipitation .....	26
Freeze dates in spring and fall.....	28
Growing season.....	30
Classification of the soils .....	34
Acreage and proportionate extent of the soils .....	36

## Part II (For page numbers, see "Summary of Tables" in Part II)

Classification of the soils	
Acreage and proportionate extent of the soils	
Main cropland limitations and hazards	
Land capability and yields per acre of crops	
Prime farmland	
Windbreak suitability groups	
Windbreak suitability group species	
Rangeland productivity and characteristic plant communities	
Woodland understory vegetation	
Forest land management	
Forest land productivity	
Main forest access road limitations and hazards	
Recreation - Table 1	

---

Recreation - Table 2

Building site development - Table 1

Building site development - Table 2

Sanitary facilities - Table 1

Sanitary facilities - Table 2

Construction materials - Table 1

Construction materials - Table 2

Water management

Engineering index properties

Physical properties of the soils

Chemical properties of the soils

Water features

Soil features



# Foreword

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

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

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

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

Shirley Gammon  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Custer County, Montana

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Fieldwork by William J. Drummond, Robert A. Mitchell, Jerome M. Setera, and James H. Smith, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,  
in cooperation with  
the United States Department of Interior, Bureau of Land Management; United States  
Department of Agriculture, Agricultural Research Service; and the Montana Agricultural  
Experiment Station

## How This Survey Was Made

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

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

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil

scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy (Soil Survey Staff, 1975), the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior

of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

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

## General Nature of the Survey Area

This soil survey updates the survey of the Middle Yellowstone Valley Area published in 1940 (DeYoung, 1940). It provides additional information and has larger maps, which show the soils in greater detail.

Custer County is in the southeastern part of Montana (fig. 1). It has an area of 2,428,500 acres or 3,794 square miles. Miles City, the county seat, is in the north-central part of the county. About 78 percent of the county is in private ownership, 16 percent is Federal land, and 6 percent is state land.

Elevation ranges from 2,240 feet on the flood plain of the Yellowstone River to about 3,760 feet in the southern part of the county. Most of the survey area is

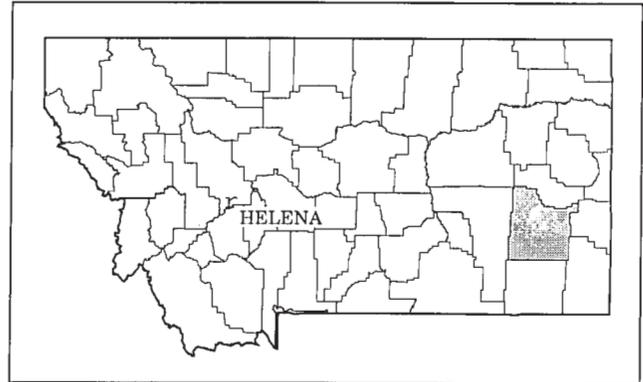


Figure 1. Location of Custer County in Montana.

drained by the Yellowstone River which divides the county in a southwest to northeast direction across the center of the county. The Powder River drains portions of the southern part of the county and converges with the Yellowstone River about 32 miles east of Miles City. The Tongue River drains portions of the southwestern part of the county and converges with the Yellowstone River at Miles City.

Most of the survey area is characterized by undulating to hilly sedimentary uplands with level benches adjacent to the Yellowstone River. Rough breaks or badlands border the benches along the major rivers and their tributaries.

The Soil Survey of Powder River Area, Montana, (Parker, 1971) published in 1971, borders the southern part of Custer County. This survey is out-of-date and requires extensive revision. Many areas of it do not join soil names and soil lines with Custer County.

## History

Prior to the arrival of Europeans, the Custer County area was part of a large area inhabited by the Crow Indians. The first documented European to explore the Custer County area was Charles LeRaye. He explored the Powder River and Tongue River drainages in 1802. In 1806, Captain William Clark and part of the Lewis and Clark Expedition followed the Yellowstone River through what is now Custer County. Throughout the next several decades the area was used by fur trappers. They established no permanent posts in the area now known as Custer County.

Following the Battle of the Little Big Horn in 1876, the Army established several forts in Montana. In 1878, Fort Keogh was established near the mouth of the Tongue River. Fort Keogh served as a military post from 1878 to 1900, and then became an army

remount depot. It is currently an Agricultural Research Service Range and Livestock Research Station. Miles City was organized in across the Tongue River from Fort Keogh in 1878. It was incorporated in 1887. With the subjugation of the Indians and the removal of the bison from eastern Montana, the Custer County area became a center for the livestock industry. The Northern Pacific Railroad arrived in 1881, and established a direct link to eastern markets. Custer County was at the northern end of the Texas Trail, and great herds of cattle were brought north to be fattened on Montana ranges. The ranges eventually became overstocked and along with the blizzard of 1886-1887, caused losses to livestock and forced an end to the days of the open range.

With the passage of the Homestead Act of 1909, and the Three Year Law of 1912, much of the public domain was converted to small homestead farms. With low farm prices in the 1920s, and the severe drought of the 1930s, most of these homesteads were abandoned. During the 1930s a group of ranchers joined together to try to manage grazing on large areas of common pasture. In 1928, the Mizpah-Pumpkin Creek Grazing Association was formed. Private landowners in cooperation with Federal and state agencies formed the association to provide for long term leasing of range, and allow for better range management. This became the precedent for the Taylor Grazing Act of 1933.

## Industry, Transportation, and Recreation

Raising livestock and growing dryland and irrigated crops are the principal industries in Custer County. Livestock, mainly cow-calf operations, account for about 85 percent of the agricultural cash receipts in the county. Dryland crops consist mainly of wheat and barley. Wheat, barley, corn, alfalfa, and sugar beets are grown in areas of irrigated cropland along the Yellowstone and Tongue Rivers.

Ranchers can market livestock at the public sale-yard in Miles City. Grain can also be marketed at the elevator in Miles City.

Interstate Highway 94 runs through the county along the Yellowstone River. U.S. Highway 12 runs east from Miles City, while U.S. Highway 312 runs south from Miles City. Montana Highway 22 runs northwest from Miles City. Secondary roads provide access throughout the rest of the county.

The Burlington Northern Railroad crosses through the county along the Yellowstone River. One

commercial airline serves the area through the Miles City Airport.

There are numerous opportunities for outdoor recreation in Custer County. These include hunting for big game and game birds, as well as fishing in numerous ponds throughout the county. The Yellowstone River provides opportunities for boating and fishing.

## Physiography, Ground Water, and Drainage

### Physiography

Custer County lies within the Unglaciaded Missouri Plateau section of the Northern Great Plains Province. Elevation in the county ranges from about 2,240 feet on the flood plain of the Yellowstone River to about 3,480 feet in the southern part of the county.

The terrain of Custer County is characterized by wide valleys and dissected uplands with undulating to steep slopes. Outcrops of sandstone and clinker form ridges and buttes in the southern and eastern parts of the county. These topographic forms are local expressions of the hardness of strata and their differential resistance to erosion. Bare steep slopes of rugged badlands, most often formed in soft erosive shales, occur in isolated areas in Custer County. The county has not been glaciaded, and has not been subjected to major uplifts.

### Ground Water

The Fort Union formation, primarily the Tullock and Tongue River members, is the main source of ground water in Custer County. The Fox Hills and Hell Creek formations, as well as alluvial deposits, are also commonly used as aquifers in this county.

A total of 1,081 wells have been reported in Custer County (Miller, M.R., et al. 1977). These wells averaged 262 feet in depth and had an average static water level of 64 feet. The static water level was within 190 feet of the surface in 70 percent of the wells.

As of November 1992, there were 1,832 wells in the county registered with the Montana Bureau of Mines and Geology. Water use for these wells is summarized below. Many wells have multiple uses (most commonly domestic and stock water) so the sum of the uses appears to be greater than the total number of wells.

<u>Water use</u>	<u>Number of wells</u>
Stock water	1,248
Domestic	627
Irrigation	89
Commercial	30
Public supply	17
Monitoring	15
Industrial	3
Schools	3
Other	2
Not reported	3

## Drainage

The Yellowstone River flows northeastward through Custer County and drains almost all of the county. Only about 40 square miles in the extreme northwestern corner of the county are drained by creeks. These creeks flow northward to the Missouri River through Garfield and Prairie Counties. The rest of the drainages north of the Yellowstone River flow southeastward into the Yellowstone. The Sunday Creek system drains the western half of this area, while several smaller creeks drain the eastern half.

South of the Yellowstone River, all drainages flow northward into the Yellowstone. Two major tributaries of the Yellowstone, the Tongue and Powder Rivers, originate in Wyoming and flow northward through this portion of the county. The Tongue River drains most of southwestern Custer County and joins the Yellowstone at Miles City. Pumpkin Creek is the largest tributary to the Tongue River in this county. The Powder River drains most of southeastern Custer County and enters the Yellowstone River a few miles downstream of the county border. Mizpah Creek is the largest tributary to the Powder River in this county. O'Fallon Creek drains the eastern arm of the county and flows into the Yellowstone River near the town of Fallon in adjacent Prairie County.

The Tongue, Powder, and Yellowstone Rivers have valleys which are generally one to two miles wide and nearly level. The rivers are typically bordered by wide alluvial terraces.

## Geology and Fossil Fuels

### History

The oldest rocks exposed in the county were deposited after the retreat of an inland sea that flooded eastern Montana during most of the

Cretaceous Period (65 to 136 million years ago). An alternating sequence of marine shale, fresh water shale, and sandstone was deposited as sea level repeatedly rose and fell. These rock units underlie younger strata at depth and are not exposed at the surface.

Permanent withdrawal of marine waters from Montana occurred near the end of the Cretaceous Period, about 70 million years ago. Broad regional uplift in central Montana is believed to have been the cause of the final withdrawal. Vast amounts of erosional debris associated with this and subsequent uplifts were deposited in this region during the late Cretaceous Period and the Paleocene Epoch of the Tertiary Period (54 to 70 million years ago). They formed the rock units which are currently exposed at the surface in Custer County.

Deposition continued into the early Eocene Epoch of the Tertiary Period (38 to 54 million years ago), but a period of erosion during the late Eocene Epoch removed these deposits from this area.

Deposition of volcanic and erosional debris from the Rocky Mountains occurred during the Oligocene and Miocene Epochs of the Tertiary Period (7 to 38 million years ago). These deposits formed the alluvial terrace remnants which cap some of the upland surfaces in Custer County.

Plateau-like upland surfaces and alluvial terrace remnants capping some upland areas are evidence of a long period of erosion. The erosion lowered the stream base level to its current elevation and shaped much of the present landscape. This period of erosion was associated with regional uplift which occurred during the Pliocene Epoch of the Tertiary Period (3 to 7 million years ago).

Glacial ice repeatedly advanced and retreated over northern Montana during the Pleistocene Epoch of the Quaternary Period (10,000 to 3 million years ago). While Custer County was not covered by glacial ice, the area was indirectly affected by glaciation. Glacial Lake Glendive formed when the Yellowstone River was dammed by a lobe of a continental ice sheet during the Illinoian stage of glaciation (70,000 to 130,000 years ago). At its highest level, the lake surface was about 2,500 feet in elevation. It extended up the Yellowstone River into Rosebud County, up the Powder River, and a short distance up the Tongue River. Prior to the Illinoian stage of glaciation, water from Custer County ultimately drained into Hudson Bay. Glaciation rerouted the Yellowstone/Missouri River system, forcing the water to drain into the Gulf of Mexico.

The terraces near the rivers were formed during the glacial epoch. The valley bottoms were formed during

and after the last retreat of glacial ice from northern Montana. At the present time, the streams are in a cycle of downcutting.

## Geologic Structure

Southwestern Custer County lies within the northern-most extension of the Powder River Basin. The Powder River Basin is a broad, gentle syncline (a concave-upward fold containing stratigraphically younger rocks within its core) which extends from southeastern Montana to southeastern Wyoming. The northern extension of the Powder River Basin is known as the Tongue River Syncline. The basin ends at a structure known as the Miles City Arch, located south of Miles City. It trends east-west. The area northeast of Miles City is included in the Williston Basin. Development of these structures began in the Late Cretaceous and Early Tertiary Periods, but modifications occurred into the Pliocene Epoch. Strata generally dips from one to three degrees in the area, though local displacement has resulted in dips up to 45 degrees. Faults are few and of relatively minor displacement. They are often covered by sediment and not easily identifiable.

## Geologic Units

The geologic units exposed in the county are of sedimentary origin and range in age from the Upper Cretaceous Period to recent. Rock units are divided into formations which are further subdivided into members. The geologic units are described from oldest to youngest.

### Upper Cretaceous Rocks

The Fox Hills formation is composed of fine to medium grained sandstone which was deposited during the Upper Cretaceous period (65 to 70 million years ago). The Fox Hills formation does not outcrop in Custer County, however it is significant as a source of ground water. Also, the formation represents the final withdrawal of marine waters from this area.

The oldest rocks exposed in Custer County belong to the Hell Creek formation, which is exposed at the surface only in the extreme southeastern part of the county. This formation, which consists of erosional debris deposited in swamps and floodplains, overlies the Fox Hills formation. The Hell Creek formation is composed of 200- to 600-feet of alternating beds gray to brown lenticular sandstone, green to gray claystone, and sandy shale. It is soft and fine to medium grained. Sandstone beds predominate. They have a calcareous clayey matrix and are often over 25

feet thick. Thin, discontinuous coal seams, carbonaceous shales, and bentonite are also common within the formation. The Hell Creek Formation is commonly eroded to badlands topography with remnants of resistant sandstones capping pedestals and buttes. Bentonite beds tend to form low rounded hills almost devoid of vegetation. The top of the formation marks the end of the Cretaceous Period and the extinction of dinosaurs.

### Paleocene Rocks

The remainder of the survey area is covered by the Fort Union formation which was deposited during the Paleocene Epoch (54 to 65 million years ago). This formation contains variable flood plain sediments deposited in an area of low relief, with an abundance of ponds and swamps. Sandy beds are stream channel deposits. The finer textured beds are flood plain and levee deposits. Coal beds were formed in swampy areas. The formation is more than 2,000 feet thick and is divided into three members. A basal member known as the Tullock, a shaly member known as the Lebo, and an upper member called the Tongue River. East of the Powder River the Tullock and Lebo members are difficult to separate in the field and have been combined into the Ludlow member.

The Tullock member consists of 250- to 500-feet of light yellow sandstone and siltstone interbedded with medium gray to light gray sandy or silty shale, and thin but laterally persistent coal beds which grade upward into light gray, carbonaceous shale. It is fine-grained. Resistance of the sandstone to weathering is related to cementing agents. The more resistant, yellowish-brown calcareous sandstone forms low ledges. The noncalcareous light gray sandstones are less resistant to erosion. Among the soils that have formed in material derived from the Tullock member are the Brushton, Cabbart, Cambeth, Ethridge, Lonna, Mego not, and Ralph.

The Lebo member consists of 150- to 600-feet of dark gray alkaline shale with thin interbeds of fine-grained sandstone and sandy shale. Thin coal layers associated with carbonaceous shale are also present. Calcareous and iron concretions are common. These weather to small reddish brown fragments covering outcrop slopes. The most distinguishing characteristics of the Lebo member are its dark color, barren surface, and iron concretions. In most areas the Lebo member is easily distinguished from the other two members of the Fort Union formation. These two are primarily yellowish in color and do not contain as much clay. Badlands topography is commonly formed in Lebo outcrops which are usually treeless and support sparse vegetation. At the bottom of the

Lebo is a distinctive marker bed known as the Big Dirty which contains coal in mineable thickness and quality. Abor, Absher, Cabbart, Creed, Gerdrum, Ivanell, Kobase, Megonot, Neldore, Weingart, and Yawdim soils are among those developed in material derived from the Lebo member.

The Tongue River member is the thickest of the Fort Union members and is the youngest bedrock exposed in Custer County. This member consists of 700- to 1,400-feet of soft interbedded sandstone and siltstone that is light yellow to light gray. It is fine to medium grained. The sandstone is thick bedded, locally crossbedded, and lenticular. Most sandstones grade into siltstone and shale within short distances, though some persist laterally. The member also commonly contains light buff to light gray shale, siltstone, brown to black carbonaceous shale, and coal seams. Shallow coal seams have been extensively burned. This has baked the overlying sediments into reddish clinker. The Tongue River member is similar in composition to the Tullock member. The Tongue River member contains thicker, more numerous and persistent coal seams and clinker beds. Most sandstones in this member are soft and only weakly cemented by calcium carbonate. Some sandstones are relatively resistant to erosion and cap buttes and ridges in dissected areas. Clinker is more resistant to erosion so the areas in which it outcrops tend to develop more relief and rugged topography. Gypsum crystals and powdery sulfur are located along bedding planes in some carbonaceous shales. Concretions of marcasite and pyrite weathered to limonite are also common. Soils that developed on the sandy strata of this member include the Blacksheep, Busby, Chinook, Twilight, and Yetull series. Soils developed on the interbedded sandstone, siltstone, and shale include Cabbart, Cambeth, Delpoint, Eapa, Floweree, Lonna, Megonot, Kobase, Kremlin, and Yamacall. Red soils that developed on clinker are Armells, Birney, Coopers, and Kirby.

### Upper Tertiary and Quaternary Deposits

Unconsolidated deposits of terrace gravel, glacial lakebed sediments, and alluvium ranging in age from Oligocene to recent form a thin mantle over the bedrock along stream valleys.

Terrace deposits laid down during the Late Tertiary (3 to 38 million years ago) and Quaternary Periods (3 million years ago to present) consist predominantly of gravel interbedded with sand, silt, and clay. Well rounded pebbles and sand-size particles of igneous, sedimentary, and metamorphic rocks are common. These deposits are confined mainly to valley sides and upland areas along the Yellowstone River. The

deposits are also scattered in other parts of the county. Terrace remnants, capping upland areas 400 to 1,000 feet above the Yellowstone River, are 10 to 30 feet thick, and contain well rounded quartzite and argillite pebbles. They are in a matrix of sand, clay, and volcanic ash. These terrace deposits are thought to be the same age as the Flaxville gravel of northeastern Montana. Tinsley and Wabek soils have developed on these terraces.

The youngest terrace deposits are 100 to 400 feet above the Yellowstone and Powder Rivers. These terraces are extensive and well developed, with a maximum thickness of about 50 feet. In several places the gravel forms a conglomerate cemented with carbonate and iron oxide. Where the terraces are intact, they are covered with several inches to several feet of loamy soils. Soils developed on terraces are Degrand, Lihen, Parshall, Tinsley, Wabek, and Yetull series.

Glacial lakebed sediments were deposited in Glacial Lake Glendive. Erosion has removed most of these deposits from the area.

Recent (younger than 10,000 years ago) alluvial deposits are along valleys of the major rivers as well as their tributaries. The most extensive alluvial deposits occur in the valleys of the Yellowstone, Powder, and Tongue Rivers. Most of the alluvium consists of clay, silt, sand, and local lenses of gravel. Coarse, well rounded gravels interbedded with finer material are common along the Yellowstone River. This was derived mainly from terrace deposits. Alluvium developed from the Lebo member of the Fort Union formation. The Hell Creek Formation is predominantly silty with a small amount of sand and no gravel. Alluvium derived from the Tullock and Tongue River members of the Fort Union Formation is sandy and contains more gravel. Alluvial gravel consists of clinker fragments on many smaller streams. Among the soils that formed in recent alluvial deposits are the Busby, Glendive, Hanly, Harlake, Havre, Ismay, Kobase, Lonna, Marias, Rivra, Spinekop, and Yamacall series.

### Fossil Fuels

As of 1990, there were no active coal mines in Custer County, however strippable coal fields are present. Estimated coal reserves of approximately three billion tons are located within the county (Lawson, D.C. 1988).

Natural gas is produced in Custer County at the Liscom Creek field. This field produced 71,482 million cubic feet in 1991 (Dept. of Natural Resources and Conservation, 1992).

## Climate

The climate of Custer County is characterized as warm in the summer and cold in the winter. The winter has periods of very cold weather. The tables in this section give temperature and precipitation recorded at Miles City FAA Airport, Mizpah, and Volborg, for the period 1961 to 1990.

In January the average temperature at the Miles City Airport is 16 degrees F and the average daily minimum is 6 degrees F. The lowest temperature of record occurred in December of 1983, when it was -38 degrees F. In July the average temperature is 75 degrees F and the average daily maximum temperature is 89 degrees F. The highest recorded temperature at this station was 110 degrees F recorded in August 1949. Temperatures at other locations in the county are similar.

Growing degree days are also shown in the tables. Growing degree days accumulate during the month by the amount the average temperature each day

exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Custer County is semi-arid with the average annual precipitation in the 13 to 15 inch range. Of this, about 75 percent falls in the April through September period. The maximum 24-hour rainfall at Miles City was 2.71 inches and occurred in June 1964. There is an average of 28 thunderstorm each year with 15 of these occurring during June and July.

Mean annual snowfall varies between 20 and 40 inches in the county. The ground is bare of snow much of the winter with an average of 70 to 90 days of snow cover.

Other tables show the probable dates of the first freeze in the fall and the last freeze in the spring at three locations in the county. Also shown are probabilities on the length of the growing season for temperatures above 24, 28, and 32 degrees F.

Temperature and Precipitation

(Recorded in the period 1961-90 at Miles City FAA Airport; Mizpah; and Powderville)

Month	Temperature (Degrees F.)						Precipitation				
	Average daily	Average daily	Average	2 years in 10 will have		Average number of	2 years in 10 will have		Average number of days	Average total	
	maximum	minimum		max. temp more than	min. temp less than	growing degree days*	Average (in.)	Less than (in.)	More than (in.)	with 0.10 inch or more	snow fall (in.)
<b>MILES CITY FAA AIRPORT:</b>											
January---	25.7	6.3	16.0	54	-29	3	0.55	0.20	0.83	1	6.0
February--	33.5	13.0	23.2	62	-23	10	0.45	0.14	0.70	1	4.6
March-----	44.3	22.2	33.3	73	-11	57	0.62	0.29	0.90	2	5.0
April-----	58.1	33.8	46.0	86	13	229	1.36	0.37	2.16	3	4.0
May-----	69.1	44.6	56.9	95	28	526	2.27	1.08	3.30	5	0.8
June-----	79.9	54.1	67.0	101	39	810	2.77	1.48	3.90	6	0.0
July-----	88.8	60.7	74.7	106	47	1,076	1.55	0.57	2.46	3	0.0
August-----	86.5	58.5	72.5	103	43	1,008	1.15	0.39	1.85	2	0.0
September--	73.1	46.5	59.8	98	27	597	1.27	0.33	2.02	3	0.4
October---	60.4	35.5	47.9	86	15	281	0.90	0.22	1.55	2	0.8
November--	42.4	21.7	32.0	70	-10	44	0.54	0.19	0.84	1	4.1
December--	29.1	9.5	19.3	58	-28	5	0.62	0.25	0.93	2	6.4
Yearly:											
Average--	57.6	33.9	45.7	-	-	-	-	-	-	-	-
Extreme--	109	-38	-	106	-32	-	-	-	-	-	-
Total----	-	-	-	-	-	4,646	14.05	10.50	17.33	31	32.2
<b>MIZPAH:</b>											
January---	27.8	2.1	14.9	56	-37	1	0.37	0.15	0.55	0	5.7
February--	35.2	9.8	22.5	62	-30	6	0.24	0.08	0.37	0	3.3
March-----	45.9	20.1	33.0	74	-18	47	0.54	0.25	0.79	1	4.8
April-----	60.0	31.4	45.7	86	10	216	1.38	0.45	2.14	3	3.4
May-----	70.3	41.8	56.1	94	23	502	2.29	1.08	3.33	5	0.7
June-----	80.4	50.7	65.5	101	34	762	2.59	1.32	3.69	5	0.0
July-----	89.6	56.0	72.8	106	39	1,013	1.45	0.51	2.22	3	0.0
August-----	87.8	53.2	70.5	104	35	946	1.16	0.41	1.78	2	0.0
September--	75.1	42.1	58.6	100	23	554	1.37	0.40	2.16	2	0.5
October---	62.7	31.2	46.9	88	9	245	0.94	0.30	1.52	2	0.7
November--	44.1	18.3	31.2	71	-15	30	0.47	0.20	0.70	1	4.3
December--	30.9	5.4	18.2	59	-36	3	0.44	0.16	0.66	1	6.8
Yearly:											
Average--	59.2	30.2	44.7	-	-	-	-	-	-	-	-
Extreme--	110	-49	-	107	-41	-	-	-	-	-	-
Total----	-	-	-	-	-	4,324	13.24	9.98	16.02	25	30.1

\* See footnote at end of table.

Temperature and Precipitation (Continued)

Month	Temperature (Degrees F.)					Precipitation					
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have max. temp more than	2 years in 10 will have min. temp less than	Average number of growing degree days*	Average	2 years in 10 will have Less than	2 years in 10 will have More than	Average number of days with 0.10 inch or more	Average total snow fall (in.)
POWDERVILLE:											
January---	29.5	4.3	16.9	55	-32	1	0.43	0.15	0.71	1	5.2
February--	36.5	11.4	24.0	62	-25	7	0.17	0.08	0.31	0	4.5
March-----	47.4	20.8	34.1	74	-16	49	0.40	0.13	0.71	1	5.4
April-----	60.4	31.5	46.0	86	10	216	1.36	0.54	2.05	3	1.0
May-----	71.0	41.3	56.2	95	21	491	2.08	1.02	3.00	5	0.9
June-----	81.2	50.8	66.0	101	35	776	2.92	1.39	4.24	5	0.0
July-----	90.8	56.6	73.7	106	40	1,027	1.43	0.64	2.22	3	0.0
August-----	88.9	53.8	71.4	104	35	964	1.02	0.42	1.94	2	0.0
September--	76.5	42.2	59.4	100	24	563	1.42	0.41	2.45	3	0.2
October---	62.5	30.7	46.6	86	8	229	1.08	0.41	1.99	2	0.5
November--	44.8	18.4	31.6	72	-15	35	0.54	0.16	0.94	1	6.0
December--	32.1	7.1	19.6	60	-34	4	0.51	0.17	0.95	2	9.1
Yearly:											
Average--	60.1	30.7	45.4	-	-	-	-	-	-	-	-
Extreme--	109	-45	-	107	-38	-	-	-	-	-	-
Total----	-	-	-	-	-	4,362	13.37	8.41	15.27	28	32.8

\*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 deg. F)

## Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Miles City FAA Airport; Mizpah; and  
Powderville)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
<b>MILES CITY FAA AIRPORT:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	April 30	May 8	May 20
2 years in 10 later than---	April 24	May 3	May 15
5 years in 10 later than---	April 12	April 24	May 5
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Oct. 7	Sept. 23	Sept. 11
2 years in 10 earlier than-	Oct. 13	Sept. 28	Sept. 17
5 years in 10 earlier than-	Oct. 24	Oct. 9	Sept. 29
<b>MIZPAH:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 10	May 16	May 30
2 years in 10 later than---	May 5	May 12	May 25
5 years in 10 later than---	April 24	May 4	May 15
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 16	Sept. 8	Aug. 29
2 years in 10 earlier than-	Sept. 23	Sept. 13	Sept. 3
5 years in 10 earlier than-	Oct. 4	Sept. 22	Sept. 12

## Freeze Dates in Spring and Fall (Continued)

(Recorded in the period 1961-90 at Miles City FAA Airport; Mizpah; and  
Powderville)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
POWDERVILLE:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 10	May 15	May 29
2 years in 10 later than---	May 6	May 12	May 24
5 years in 10 later than---	April 28	May 5	May 15
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 20	Sept. 14	Sept. 1
2 years in 10 earlier than-	Sept. 26	Sept. 18	Sept. 6
5 years in 10 earlier than-	Oct. 7	Sept. 27	Sept. 15

## Growing Season

(Recorded in the period 1961-90 at Miles City FAA Airport; Mizpah; and  
Powderville)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	Days	Days	Days
<b>MILES CITY FAA AIRPORT:</b>			
9 years in 10-----	170	144	122
8 years in 10-----	178	152	130
5 years in 10-----	194	168	145
2 years in 10-----	209	183	161
1 year in 10-----	217	192	169
<b>MIZPAH:</b>			
9 years in 10-----	140	122	96
8 years in 10-----	147	128	104
5 years in 10-----	162	140	118
2 years in 10-----	176	152	132
1 year in 10-----	184	158	139
<b>POWDERVILLE:</b>			
9 years in 10-----	146	128	103
8 years in 10-----	152	135	110
5 years in 10-----	164	146	123
2 years in 10-----	176	158	137
1 year in 10-----	182	164	144

# Formation and Classification of the Soils

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

## Formation of the Soils

Soil is formed by the action of soil-forming processes on material deposited or accumulated by geological forces. The characteristics of a soil at any given point depend on the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and has existed since accumulation; the plant and animal life on and in the soil; relief, or lay of the land; and the length of time the forces of soil development have acted on the soil material.

All five of these factors are important in the genesis of each soil. Some have had more influence than others on a given soil.

## Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. Erosion and alternative freezing and thawing break down rock into material in which soils form. Water and wind are active agents in transporting and separating weathered material. The weathered material is further broken down by chemical reactions such as solution and hydration. The precipitation and temperature affect the kind and amount of native vegetation that grows on the soil. Vegetation decays to produce organic matter that subsequently becomes part of the soil. Soils with cool temperatures and higher precipitation, such as the Golve series, generally have a dark-colored surface layer. Soils with warm temperatures and lower precipitation, such as the Yamacall series, generally have a light-colored surface layer. In this survey area,

precipitation is 10 to 16 inches per year, and the mean annual temperature is 40 to 46 degrees F.

## Living Organisms

Living organisms are active in the formation of soils. Organic matter is the main source of the dark color of the surface layer of soils. Fungi and algae are among the earliest inhabitants of rock material that contribute to the decomposition of rock. As the rock decomposes, grasses, shrubs, and trees are able to grow and support animal life.

The kinds and amounts of plants and animals present largely determine the kinds and amount of organic matter added to the soil, and the manner in which this matter is incorporated into the mineral part of the soil. Roots, rodents, and insects penetrate the soil and influence its structure. Leaves, roots, and whole plants remain in the surface layer where they are changed to humus by micro-organisms, chemicals in the soil, and insects.

The native vegetation in this survey area consists of short and mid grasses, forbs, and shrubs in most areas. Common rodents are gophers, prairie dogs, badgers, rabbits, and field mice. Many of the pebbles and cobbles on the surface of terraces were brought up by burrowing rodents.

## Topography

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

On the uplands the number, distinctness, and thickness of the soil horizons decreases as slope increases. Steep soils on which runoff is rapid have many characteristics similar to those of soils that formed in arid climates. Nearly level to moderately

sloping soils that receive runoff water from soils above them have many characteristics of soils that formed in a more humid climate.

## Parent Material

Many of the soils in this survey area formed in place over semiconsolidated sedimentary beds or shale. Some soils formed in alluvium and colluvium and were deposited in major valleys and on bordering uplands. Soils that formed in material derived from semiconsolidated, sandy sedimentary beds, such as those of the Yetull series are generally sandy. Soils that formed in residuum derived from shale, such as those of the Neldore series, are clayey because clay is the basic constituent of shale. Soils that formed in mixed alluvium derived from semiconsolidated loamy sedimentary beds, such as those of the Yamacall series, are loamy. Some soils in the area, such as those of the Alona series, have salt and sodium derived from the parent material. The salts and sodium make these soils saline, alkaline, or saline-alkaline, and limit the kind and amount of plants that can grow on them. The density of the parent rock and its mineral composition can limit the rate of weathering and the depth of soil.

## Time

The changes that take place in a soil over a long period are called soil genesis. These changes give the soil distinct layers or horizons. The kinds and arrangement of these horizons are called soil morphology and are described in terms of color, texture, structure, consistence, thickness, and permeability.

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

Havre loam, a soil of the Entisol order, is an example of a young soil. It formed in alluvium on flood plains. The soil contains little organic matter from which to form an A horizon, it has no clay accumulation, and little translocation of carbonates has occurred.

Eapa loam formed in a parent material similar to but much older than that of the Havre soil. Eapa soils formed in alluvium on sedimentary plains and are

mature soils of the Mollisol order. They contain enough organic matter to have a dark surface horizon. They also have a distinct clay accumulation in a Bt horizon, and nearly all the carbonates have been leached below a depth of 10 inches.

## Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

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

**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 Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

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

**SUBGROUP.** Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The typical is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below

plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, calcareous, frigid Typic Fluvaquents.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series. An example is the Bigsheep series which is a fine-loamy, mixed, calcareous, frigid Typic Fluvaquent.

## Classification of the Soils

(An asterisk by the soil name means it is a taxadjunct to the series.)

Soil name	Family or higher taxonomic class
Abor-----	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Absher-----	Fine, montmorillonitic Typic Natriboralfs
Alona-----	Fine-silty, mixed, frigid Aridic Ustochrepts
Antwerp-----	Fine-silty, mixed (calcareous), frigid Aridic Ustorthents
*Archin-----	Fine-loamy, mixed Borollic Natrargids
Armells-----	Loamy-skeletal, mixed (calcareous), frigid Aridic   Ustorthents
Benz-----	Fine-loamy, mixed (calcareous), frigid Aridic   Ustorthents
Bigsandy-----	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Bigsheep-----	Loamy-skeletal, mixed Aridic Haploborolls
Birney-----	Loamy-skeletal, mixed, frigid Aridic Ustochrepts
Bitton-----	Loamy-skeletal, mixed Typic Haploborolls
Blacksheep-----	Loamy, mixed (calcareous), frigid, shallow Aridic   Ustorthents
Bonfri-----	Fine-loamy, mixed Typic Eutroboralfs
Broadus-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Brushton-----	Fine-silty, mixed Aridic Argiborolls
*Bullock-----	Fine-loamy, mixed Borollic Natrargids
Busby-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic   Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Aridic   Ustorthents
Cambert-----	Fine-silty, mixed, frigid Typic Ustochrepts
Cambeth-----	Fine-silty, mixed, frigid Aridic Ustochrepts
Chanta-----	Fine-loamy over sandy or sandy-skeletal, mixed   Aridic Haploborolls
Cherry-----	Fine-silty, mixed, frigid Typic Ustochrepts
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Cohagen-----	Loamy, mixed (calcareous), frigid, shallow   Typic Ustorthents
Coers-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Creed-----	Fine, montmorillonitic Typic Natriboralfs
Dast-----	Coarse-loamy, mixed, frigid Typic Ustochrepts
Davidell-----	Fine-silty, mixed Typic Eutroboralfs
Degradand-----	Fine-loamy over sandy or sandy-skeletal, mixed   Aridic Argiborolls
Delpoint-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Doney-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Eapa-----	Fine-loamy, mixed Aridic Argiborolls
Ethridge-----	Fine, montmorillonitic Aridic Argiborolls
Farland-----	Fine-silty, mixed Typic Argiborolls
Farnuf-----	Fine-loamy, mixed Typic Argiborolls
Floweree-----	Fine-silty, mixed Aridic Haploborolls
Foreleft-----	Fine-loamy, mixed Typic Eutroboralfs
Gerdrum-----	Fine, montmorillonitic Typic Natriboralfs
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Aridic   Ustifluvents
Golva-----	Fine-silty, mixed Typic Haploborolls
Hanly-----	Sandy, mixed, frigid Aridic Ustifluvents
Harlake-----	Fine, montmorillonitic (calcareous), frigid   Aridic Ustifluvents
Havre-----	Fine-loamy, mixed (calcareous), frigid Aridic   Ustifluvents
Ismay-----	Fine-silty, mixed (calcareous), frigid Aridic   Ustifluvents
Ivanell-----	Fine-silty, mixed Typic Eutroboralfs

## Classification of the Soils (Continued)

Soil name	Family or higher taxonomic class
Kirby-----	Loamy-skeletal over fragmental, mixed (calcareous), frigid Aridic Ustorthents
Kobase-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Kremlin-----	Fine-loamy, mixed Aridic Haploborolls
Lallie-----	Fine, montmorillonitic (calcareous), frigid Vertic Fluvaquents
Lamedeer-----	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Lihen-----	Sandy, mixed Entic Haploborolls
Lilsheep-----	Loamy-skeletal, mixed Entic Haploborolls
Lisk-----	Coarse-loamy, mixed, frigid Typic Ustochrepts
Lonna-----	Fine-silty, mixed, frigid Aridic Ustochrepts
Macar-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Marias-----	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marvan-----	Fine, montmorillonitic, frigid Sodic Haplusterts
Megonot-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Morton-----	Fine-silty, mixed Typic Argiborolls
Neldore-----	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Parshall-----	Coarse-loamy, mixed Pachic Haploborolls
Pinehill-----	Fine, montmorillonitic Typic EutroboralFs
Ralph-----	Fine-silty, mixed Aridic Argiborolls
Ralore-----	Clayey, montmorillonitic, shallow Typic Natriboralfs
Ringling-----	Loamy-skeletal over fragmental, mixed Typic Haploborolls
Rivra-----	Sandy-skeletal, mixed, frigid Aridic Ustifluvents
Rominell-----	Fine-loamy, mixed Typic Natriboralfs
Ryell-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents
Sagedale-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage-----	Fine, montmorillonitic Typic Argiborolls
Shambo-----	Fine-loamy, mixed Typic Haploborolls
Sonnett-----	Fine, montmorillonitic Typic EutroboralFs
Spinekop-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Tally-----	Coarse-loamy, mixed Typic Haploborolls
Tinsley-----	Sandy-skeletal, mixed, frigid Typic Ustorthents
Twilight-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Vanda-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Vanstel-----	Fine-silty, mixed Typic EutroboralFs
Vebar-----	Coarse-loamy, mixed Typic Haploborolls
Volborg-----	Clayey, montmorillonitic, acid, frigid, shallow Aridic Ustorthents
Wabek-----	Sandy-skeletal, mixed Entic Haploborolls
Wayden-----	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Weingart-----	Fine, montmorillonitic Typic Natriboralfs
Widen-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Yamacall-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yawdim-----	Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents
Yetull-----	Mixed, frigid Typic Ustipsamments
Zatoville-----	Fine, montmorillonitic, frigid Aridic Ustochrepts

## Acreage and Proportionate Extent of the Soils

Map Symbol	Soil Name	Acres	Percent
3F	Cabbart-Rock outcrop-Yawdim complex, 15 to 70 percent slopes-----	224,927	9.3
12E	Vendome gravelly sandy loam, 8 to 35 percent slopes-----	31,177	1.3
14B	Alona silt loam, 0 to 4 percent slopes-----	2,645	0.1
17F	Badland-----	60,965	2.5
18E	Cabbart-Havre loams, 0 to 35 percent slopes-----	34,342	1.4
19C	Archin loam, 2 to 8 percent slopes-----	15,759	0.6
21C	Benz loam, 0 to 8 percent slopes-----	826	*
24B	Davidell silty clay loam, 0 to 4 percent slopes-----	17,521	0.7
25A	Marias clay, 0 to 2 percent slopes-----	1,626	*
27A	Busby fine sandy loam, 0 to 2 percent slopes-----	2,855	0.1
27C	Busby fine sandy loam, 2 to 8 percent slopes-----	2,171	*
30C	Yamacall-Havre, occasionally flooded, loams, 0 to 8 percent slopes-----	51,580	2.1
31A	Ryell very fine sandy loam, 0 to 2 percent slopes, rarely flooded-----	1,687	*
33A	Chanta loam, 0 to 2 percent slopes-----	1,776	*
34C	Tally fine sandy loam, 2 to 8 percent slopes-----	1,435	*
35C	Chinook fine sandy loam, 2 to 8 percent slopes-----	3,418	0.1
37B	Degrad loam, 0 to 4 percent slopes-----	9,363	0.4
39A	Ethridge silty clay loam, 0 to 2 percent slopes-----	3,244	0.1
39C	Ethridge silty clay loam, 2 to 8 percent slopes-----	4,200	0.2
40A	Savage silty clay loam, 0 to 2 percent slopes-----	269	*
40C	Savage silty clay loam, 2 to 8 percent slopes-----	1,964	*
41A	Eapa loam, 0 to 2 percent slopes-----	5,509	0.2
41C	Eapa loam, 2 to 6 percent slopes-----	20,821	0.9
43F	Abor-Lilsheep complex, 8 to 45 percent slopes-----	6,549	0.3
44A	Farnuf loam, 0 to 2 percent slopes-----	558	*
44C	Farnuf loam, 2 to 6 percent slopes-----	6,662	0.3
45A	Glendive fine sandy loam, 0 to 2 percent slopes, rarely flooded-----	3,229	0.1
46A	Hanly loamy fine sand, 0 to 2 percent slopes, rarely flooded-----	772	*
47A	Harlake silty Clay, 0 to 2 percent slopes, rarely flooded-----	3,978	0.2
50C	Kremlin loam, 2 to 8 percent slopes-----	8,648	0.4
51C	Shambo loam, 2 to 8 percent slopes-----	4,188	0.2
52A	Sagedale silty clay loam, 0 to 2 percent slopes-----	102	*
52C	Sagedale silty clay loam, 2 to 8 percent slopes-----	4,683	0.2
53A	Kobase silty clay loam, 0 to 2 percent slopes-----	12,958	0.5
53C	Kobase silty clay loam, 2 to 8 percent slopes-----	21,755	0.9
53D	Kobase silty clay loam, 8 to 15 percent slopes-----	3,269	0.1
56A	Cherry silt loam, 0 to 2 percent slopes-----	90	*
56C	Cherry silt loam, 2 to 8 percent slopes-----	2,104	*
57A	Lonna silt loam, 0 to 2 percent slopes-----	2,967	0.1
57C	Lonna silt loam, 2 to 8 percent slopes-----	21,303	0.9
59C	Farland silt loam, 2 to 8 percent slopes-----	5,076	0.2
60A	Golva silt loam, 0 to 2 percent slopes-----	373	*
60C	Golva silt loam, 2 to 8 percent slopes-----	2,768	0.1
61A	Marias silty Clay, 0 to 2 percent slopes-----	1,930	*
62A	Marvan silty Clay, 0 to 2 percent slopes-----	4,538	0.2
62C	Marvan silty Clay, 2 to 8 percent slopes-----	2,332	*
64A	Pinehill loam, 0 to 2 percent slopes-----	1,547	*
64C	Pinehill loam, 2 to 8 percent slopes-----	8,148	0.3
64D	Pinehill loam, 8 to 15 percent slopes-----	953	*
67A	Riverwash-----	1,836	*
75C	Weingart-Ivanell clay loams, 2 to 8 percent slopes-----	14,483	0.6
76B	Vanstel loam, 0 to 4 percent slopes-----	1,053	*
76C	Vanstel silt loam, 2 to 8 percent slopes-----	2,068	*
77A	Havre-Bigsandy loams, 0 to 2 percent slopes, frequently flooded-----	3,113	0.1
79A	Yamacall loam, 0 to 2 percent slopes-----	17,840	0.7
79C	Yamacall loam, 2 to 8 percent slopes-----	19,257	0.8
79D	Yamacall loam, 8 to 15 percent slopes-----	2,411	*
81A	Creed loam, 0 to 2 percent slopes-----	106	*
81C	Creed loam, 2 to 8 percent slopes-----	2,323	*
85C	Foreleft loam, 2 to 8 percent slopes-----	2,417	*
88A	Flowerree silt loam, 0 to 2 percent slopes-----	3,997	0.2
88C	Flowerree silt loam, 2 to 6 percent slopes-----	7,450	0.3

## Acreage and Proportionate Extent of the Soils (Continued)

Map Symbol	Soil Name	Acres	Percent
90A	Sonnett loam, 0 to 2 percent slopes-----	8,455	0.3
90C	Sonnett loam, 2 to 8 percent slopes-----	17,061	0.7
93B	Brushton silt loam, 0 to 4 percent slopes-----	10,163	0.4
98A	Macar loam, 0 to 2 percent slopes-----	243	*
98C	Macar loam, 2 to 8 percent slopes-----	6,393	0.3
112C	Absher silty clay loam, 0 to 8 percent slopes-----	1,252	*
121D	Kremlin-Tinsley-Degrad complex, 4 to 15 percent slopes-----	1,488	*
122D	Tinsley-Chanta complex, 4 to 15 percent slopes-----	1,093	*
123F	Tinsley-Delpoint-Cabbart complex, 8 to 45 percent slopes-----	7,224	0.3
151F	Armells-Cabbart-Kirby complex, 25 to 70 percent slopes-----	2,766	0.1
191C	Archin-Gerdrum loams, 2 to 8 percent slopes-----	21,353	0.9
192C	Archin-Davidell-Bullock complex, 2 to 8 percent slopes-----	3,458	0.1
222D	Flowerree-Cambeth, Noncalcareous-Lilsheep complex, 4 to 15 percent slopes-----	4,234	0.2
228F	Cambeth, Noncalcareous-Lilsheep-Lonna complex, 15 to 45 percent slopes-----	9,363	0.4
241B	Davidell-Antwerp silty clay loams, 0 to 4 percent slopes-----	1,876	*
242C	Davidell-Ivanell complex, 2 to 8 percent slopes-----	10,784	0.4
271E	Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes-----	16,317	0.7
277D	Busby-Twilight fine sandy loams, 2 to 15 percent slopes-----	20,911	0.9
278E	Busby-Yetull complex, 2 to 15 percent slopes-----	2,387	*
293E	Cambeth-Cabbart-Kirby complex, 8 to 45 percent slopes-----	5,022	0.2
296F	Cambeth-Cabbart-Rock Outcrop complex, 8 to 45 percent slopes-----	57,048	2.3
297C	Cambeth, Noncalcareous-Megonot complex, 2 to 8 percent slopes-----	29,053	1.2
297D	Cambeth, Noncalcareous-Megonot complex, 8 to 15 percent slopes-----	64,796	2.7
297E	Cambeth, Calcareous-Cabbart-Yawdim complex, 15 to 25 percent slopes-----	253,788	10.5
311A	Ryell loam, 0 to 2 percent slopes, occasionally flooded-----	683	*
341D	Tally-Vebar fine sandy loams, 2 to 12 percent slopes-----	17,851	0.7
342C	Tally-Shambo complex, 2 to 8 percent slopes-----	7,351	0.3
352D	Chinook-Twilight fine sandy loams, 2 to 12 percent slopes-----	26,234	1.1
353C	Chinook-Kremlin complex, 2 to 6 percent slopes-----	5,606	0.2
355C	Chinook-Twilight-Eapa complex, 2 to 8 percent slopes-----	13,563	0.6
357D	Chinook-Lihen-Twilight complex, 8 to 15 percent slopes-----	4,580	0.2
361E	Doney-Broadus-Cabba complex, 15 to 25 percent slopes-----	17,644	0.7
381F	Delpoint-Armells complex, 25 to 70 percent slopes-----	4,364	0.2
383F	Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes-----	41,090	1.7
385E	Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes-----	37,823	1.6
386F	Cabbart-Rock Outcrop-Delpoint complex, 15 to 50 percent slopes-----	50,023	2.1
387D	Delpoint-Busby-Blacksheep complex, 4 to 15 percent slopes-----	5,876	0.2
388D	Delpoint-Kobase-Yawdim complex, 4 to 15 percent slopes-----	1,108	*
421A	Gerdrum-Creed complex, 0 to 2 percent slopes-----	1,131	*
421C	Gerdrum-Creed complex, 2 to 8 percent slopes-----	5,228	0.2
421D	Gerdrum-Creed complex, 4 to 15 percent slopes, gullied-----	20,452	0.8
432D	Slickspots-Abor complex, 2 to 12 percent slopes-----	238	*
451A	Glendive fine sandy loam, 0 to 2 percent slopes, occasionally flooded-----	7,462	0.3
452A	Glendive loam, 0 to 2 percent slopes, rarely flooded-----	4,055	0.2
453A	Glendive-Havre complex, 0 to 2 percent slopes, occasionally flooded-----	4,706	0.2
456A	Havre and Glendive soils, channeled, 0 to 2 percent slopes, frequently flooded-----	12,443	0.5
461A	Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded-----	514	*
462A	Hanly-Glendive complex, 0 to 2 percent slopes, nonflooded-----	2,960	0.1
471A	Harlake silty clay, 0 to 2 percent slopes, occasionally flooded-----	4,202	0.2
473A	Lallie silty clay, 0 to 2 percent slopes-----	1,135	*
481A	Havre loam, 0 to 2 percent slopes, occasionally flooded-----	13,968	0.6
483A	Havre silty Clay, 0 to 2 percent slopes, occasionally flooded-----	2,190	*
486A	Glendive-Havre complex, 0 to 2 percent slopes, nonflooded-----	5,931	0.2
487A	Havre-Harlake complex, 0 to 2 percent slopes, nonflooded-----	1,244	*
488A	Havre silty clay loam, 0 to 2 percent slopes, occasionally flooded-----	6,205	0.3
489A	Spinekop silty clay loam, 0 to 2 percent slopes-----	11,856	0.5
491A	Ismay silty clay loam, 0 to 2 percent slopes, occasionally flooded-----	3,908	0.2
501C	Kremlin-Delpoint loams, 2 to 8 percent slopes-----	6,285	0.3
511C	Shambo-Doney loams, 2 to 8 percent slopes-----	6,204	0.3
531D	Kobase silty clay loam, 2 to 15 percent slopes, gullied-----	6,620	0.3
532C	Kobase-Gerdrum silty clay loams, 2 to 8 percent slopes-----	11,162	0.5
534C	Marias Clay, 2 to 8 percent slopes-----	823	*

## Acreage and Proportionate Extent of the Soils (Continued)

Map Symbol	Soil Name	Acres	Percent
542E	Lihen-Yetull complex, 8 to 35 percent slopes-----	345	*
552D	Neldore-Abor-Marvan complex, 2 to 15 percent slopes-----	4,389	0.2
554E	Delpoint-Weingart complex, 4 to 25 percent slopes-----	4,529	0.2
561C	Cherry-Cambert silt loams, 2 to 8 percent slopes-----	6,991	0.3
562D	Cherry-Cambert-Cabba silt loams, 8 to 15 percent slopes-----	15,729	0.6
573D	Lonna, Cambeth, And Yamacall soils, gullied, 8 to 15 percent slopes-----	10,502	0.4
574E	Lonna-Cambeth-Cabbart silt loams, 12 to 25 percent slopes-----	44,266	1.8
575C	Lonna-Cambeth silt loams, 2 to 8 percent slopes-----	37,553	1.5
576A	Lonna silty clay loam, 0 to 2 percent slopes-----	830	*
576C	Lonna silty clay loam, 2 to 8 percent slopes-----	1,812	*
577D	Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes-----	48,267	2.0
581C	Ivanell-Cabbart silt loams, 2 to 8 percent slopes-----	358	*
602C	Bonfri loam, 2 to 8 percent slopes-----	15	*
603D	Busby fine sandy loam, 8 to 15 percent slopes-----	8	*
604E	Busby, Gullied-Delpoint-Yawdim complex, 8 to 25 percent slopes-----	12	*
605D	Cabbart-Cambeth silt loams, 8 to 15 percent slopes-----	191	*
607C	Cambeth-Cabbart silt loams, 2 to 8 percent slopes-----	27	*
608C	Chinook sandy loam, 2 to 8 percent slopes-----	17	*
612F	Kirby-Blacksheep-Rock Outcrop complex, 25 to 60 percent slopes-----	32	*
613C	Kremlin-Cabbart complex, 2 to 8 percent slopes-----	52	*
615C	Yamacall-Havre loams, 2 to 8 percent slopes-----	78	*
621B	Marvan-Vanda silty clays, 0 to 4 percent slopes-----	5,544	0.2
631F	Bitton-Cabba-Ringling complex, 25 to 70 percent slopes-----	11,889	0.5
641D	Pinehill-Absher complex, 2 to 15 percent slopes-----	4,674	0.2
650F	Armells-Delpoint-Cabbart complex, 25 to 70 percent slopes-----	289	*
651C	Busby-Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes-----	9	*
652C	Chinook fine sandy loam, alkali substratum, 2 to 8 percent slopes-----	13	*
653B	Davidell loam, 2 to 4 percent slopes-----	199	*
654B	Eapa loam, 0 to 4 percent slopes-----	295	*
656A	Gerdrum clay loam, 0 to 2 percent slopes-----	5	*
657C	Gerdrum clay loam, 2 to 8 percent slopes-----	46	*
658C	Gerdrum-Marvan silty clays, 2 to 8 percent slopes-----	25	*
659A	Glendive loam, 0 to 2 percent slopes, occasionally flooded-----	12	*
660A	Hanly-Glendive loams, 0 to 2 percent slopes, occasionally flooded-----	8	*
661A	Havre silty clay loam, saline, 0 to 2 percent slopes, frequently flooded-----	87	*
662F	Neldore-Abor silty clays, 25 to 60 percent slopes-----	90	*
663F	Neldore-Abor-Rock outcrop complex, 8 to 35 percent slopes-----	506	*
664F	Neldore-Rock outcrop complex, 15 to 60 percent slopes-----	156	*
665F	Tinsley-Cabbart complex, 15 to 45 percent slopes-----	407	*
666C	Neldore-Volborg, saline complex, 1 to 8 percent slopes-----	128	*
667E	Weingart-Neldore complex, 4 to 25 percent slopes-----	32	*
668A	Zatoville silty clay loam, loamy substratum, 0 to 2 percent slopes-----	3	*
681A	Rivra complex, 0 to 2 percent slopes, occasionally flooded-----	2,002	*
691F	Rock outcrop-Cabbart-Kirby complex, 25 to 70 percent slopes-----	5,525	0.2
701E	Lamedeer-Broadus-Ringling complex, 15 to 25 percent slopes-----	25,441	1.0
702F	Lamedeer-Cabba-Ringling complex, 25 to 70 percent slopes-----	30,901	1.3
731E	Cambert-Cabba-Ringling complex, 8 to 45 percent slopes-----	5,694	0.2
732C	Cambert-Widen complex, 2 to 8 percent slopes-----	6,097	0.3
732D	Cambert-Widen complex, 8 to 15 percent slopes-----	12,957	0.5
733E	Cambert-Cabba-Widen complex, 15 to 25 percent slopes-----	42,669	1.8
734E	Cambert-Cherry-Cabba silt loams, 12 to 25 percent slopes-----	25,134	1.0
742E	Neldore-Abor silty Clays, 4 to 25 percent slopes-----	8,600	0.4
781A	Vanda Clay, Wet, 0 to 2 percent slopes-----	278	*
797E	Yamacall-Busby-Blacksheep complex, 8 to 25 percent slopes-----	20,845	0.9
798C	Yamacall-Delpoint loams, 2 to 8 percent slopes-----	14,767	0.6
799E	Yamacall-Birney-Delpoint complex, 15 to 25 percent slopes-----	5,254	0.2
802E	Shambo-Lisk-Dast complex, 8 to 25 percent slopes-----	12,425	0.5
811C	Creed-Pinehill loams, 2 to 8 percent slopes-----	2,786	0.1
813C	Creed-Absher complex, 2 to 8 percent slopes-----	1,652	*
831F	Doney-Cabba-Wayden complex, 25 to 70 percent slopes-----	3,055	0.1
832E	Doney-Macar-Cabba loams, 15 to 25 percent slopes-----	14,173	0.6
841F	Birney, Moist-Armells-Cabbart complex, 25 to 70 percent slopes-----	43	*

## Acreage and Proportionate Extent of the Soils (Continued)

Map Symbol	Soil Name	Acres	Percent
842F	Cabbart-Yawdim-Rock outcrop complex, 15 to 70 percent slopes-----	869	*
843E	Delpoint, Moist-Delpoint-Cabbart loams, 15 to 25 percent slopes-----	116	*
844A	Havre, Harlake, and Glendive soils, channeled, 0 to 2 percent slopes-----	909	*
845C	Ivanell-Davidell complex, 2 to 8 percent slopes-----	28	*
846F	Blacksheep-Delpoint-Rock outcrop complex, 15 to 50 percent slopes-----	513	*
847E	Busby-Yetull-Rock outcrop complex, 8 to 25 percent slopes-----	1	*
862E	Doney-Lamedeer-Cabba complex, 8 to 25 percent slopes-----	5,942	0.2
862F	Doney-Lamedeer-Cabba complex, 25 to 70 percent slopes-----	14,805	0.6
871C	Morton-Farland silt loams, 2 to 8 percent slopes-----	2,228	*
891D	Yamacall-Birney-Delpoint complex, 4 to 15 percent slopes-----	6,622	0.3
892D	Yamacall-Delpoint-Cabbart loams, 4 to 15 percent slopes-----	23,962	1.0
901A	Sonnett-Sonnett, thin surface, complex, 0 to 2 percent slopes-----	26,271	1.1
901C	Sonnett-Sonnett, thin surface, complex, 2 to 8 percent slopes-----	102,747	4.2
902C	Sonnett, thin surface-Slickspots complex, 0 to 8 percent slopes-----	14,150	0.6
910B	Antwerp silty clay loam, 0 to 4 percent slopes-----	63	*
911F	Armells-Cabbart complex, 25 to 70 percent slopes-----	351	*
912F	Armells-Kirby complex, 25 to 70 percent slopes-----	137	*
913D	Birney-Cooers-Kirby complex, 2 to 15 percent slopes-----	24	*
914D	Bullock, eroded-Ralore clay loams, 2 to 15 percent slopes-----	108	*
916E	Busby-Twilight-Blacksheep, fine sandy loams, 8 to 25 percent slopes-----	177	*
917D	Cambeth-Cabbart silt loams, 4 to 15 percent slopes-----	1,743	*
918E	Cambeth-Cabbart complex, dissected, 8 to 25 percent slopes-----	656	*
919F	Delpoint-Cabbart loams, 25 to 70 percent slopes-----	287	*
921F	Twilight-Blacksheep-Busby fine sandy loams, 8 to 45 percent slopes-----	6,513	0.3
931C	Ralph-Brushton silt loams, 2 to 8 percent slopes-----	6,872	0.3
940E	Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes-----	662	*
941C	Gerdrum-Kobase silty clay loams, 2 to 8 percent slopes-----	159	*
942A	Harlake silty clay loam, 0 to 2 percent slopes, occasionally flooded-----	8	*
943F	Kirby-Cabbart-Rock outcrop complex, 25 to 70 percent slopes-----	504	*
944E	Kobase-Cabbart-Yawdim complex, 8 to 25 percent slopes-----	818	*
945A	Lonna-Alona silt loams, 0 to 2 percent slopes-----	13	*
945C	Lonna-Alona silt loams, 2 to 8 percent slopes-----	23	*
946A	Lonna-Antwerp silty clay loams, 0 to 2 percent slopes-----	157	*
946C	Lonna-Antwerp silty clay loams, 2 to 8 percent slopes-----	113	*
947E	Lonna-Cabbart-Yawdim complex, 8 to 25 percent slopes-----	20	*
948B	Rominell fine sandy loam, 1 to 4 percent slopes, eroded-----	130	*
949E	Tinsley very gravelly sandy loam, 15 to 35 percent slopes-----	27	*
951C	Vanstel loam, 2 to 8 percent slopes-----	113	*
952D	Yamacall-Birney complex, 8 to 15 percent slopes-----	17	*
953E	Yamacall-Birney-Cabbart complex, 15 to 25 percent slopes-----	67	*
954C	Yamacall-Busby complex, 2 to 8 percent slopes-----	137	*
954D	Yamacall-Busby complex, 8 to 15 percent slopes-----	164	*
955D	Yamacall-Delpoint loams, 4 to 15 percent slopes-----	113	*
956F	Yawdim-Cabbart-Kobase complex, 15 to 70 percent slopes-----	188	*
957E	Abor-Cabbart-Delpoint complex, 8 to 25 percent slopes-----	397	*
958D	Abor-Delpoint-Kobase complex, 4 to 15 percent slopes-----	282	*
959D	Abor-Weingart-Neldore complex, 2 to 15 percent slopes-----	102	*
960A	Busby loam, 0 to 2 percent slopes-----	61	*
961C	Busby-Yetull complex, 0 to 8 percent slopes-----	174	*
962F	Cambert-Bigsheep-Golva complex, 8 to 45 percent slopes-----	23	*
963E	Cambeth, calcareous-Cabbart-Lonna silt loams, 15 to 35 percent slopes-----	73	*
964E	Cambeth, calcareous-Cabbart-Yawdim complex, 4 to 25 percent slopes-----	574	*
965C	Chinook-Twilight fine sandy loams, 2 to 8 percent slopes-----	525	*
966D	Chinook-Twilight-Blacksheep fine sandy loams, 8 to 15 percent slopes-----	433	*
967E	Delpoint-Cabbart-Yawdim complex, 4 to 25 percent slopes-----	75	*
968E	Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes-----	243	*
969C	Eapa-Delpoint loams, 2 to 8 percent slopes-----	90	*
971E	Lisk-Cohagen-Dast fine sandy loams, 8 to 25 percent slopes-----	3,967	0.2
981C	Macar-Doney loams, 2 to 8 percent slopes-----	5,608	0.2
982D	Macar-Doney-Cabba loams, 8 to 15 percent slopes-----	10,886	0.4
983E	Macar-Lisk-Cohagen complex, 8 to 25 percent slopes-----	6,829	0.3
990E	Lihen-Tinsley complex, 8 to 35 percent slopes-----	27	*

## Acreage and Proportionate Extent of the Soils (Continued)

Map Symbol	Soil Name	Acre	Percent
991F	Neldore-Rock Outcrop-Abor complex, 15 to 50 percent slopes-----	2,180	*
992C	Parshall fine sandy loam, 2 to 6 percent slopes-----	97	*
993C	Pinehill-Weingart-Gerdrum complex, 0 to 6 percent slopes-----	60	*
994E	Cabbart-Bullock, eroded complex, 2 to 25 percent slopes-----	378	*
995C	Yamacall-Gerdrum complex, 2 to 8 percent slopes-----	85	*
996A	Yetull-Busby complex, 0 to 2 percent slopes-----	21	*
4621A	Hanly-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	10,382	0.4
4861A	Glendive-Havre silty clay loams, 0 to 2 percent slopes, nonflooded-----	1,014	*
4871A	Havre-Marlake complex, 0 to 2 percent slopes, occasionally flooded-----	5,248	0.2
4881A	Havre loam, 0 to 2 percent slopes, rarely flooded-----	9,655	0.4
M-W	Miscellaneous Water-----	162	*
DA	Denied Access-----	55,548	2.3
W	Water-----	11,893	0.5
	Total-----	2,428,500	100.0

\* Less than 0.1 percent.

## Soil Series and Detailed Soil Map Units

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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 (USDA-SCS, 1993). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (USDA-SCS, 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 on the detailed soil maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

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

Minor components have properties and behavioral characteristics divergent enough to affect use or to require different management. They generally are in small areas and could not be mapped separately

because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in

such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Lonna-Cambeth silt loams, 2 to 8 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Lonna, Cambeth, and Yamacall soils, gullied, 8 to 15 percent slopes, is an undifferentiated group in this survey area.

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

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of the manuscript gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils or miscellaneous areas.

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

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

- "Range" section
- "Agronomy" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

## Abor Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Very slow

*Landform:* Hills and sedimentary plains

*Parent material:* Semiconsolidated shale residuum

*Slope range:* 2 to 45 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Leptic Udic Haplusterts

### Typical Pedon

Abor silty clay in an area of Abor-Lilsheep complex, 8 to 45 percent slopes, in an area of rangeland; 1,300 feet south and 1,400 feet west of the northeast corner of sec. 7, T. 9 N., R. 46 E.

A—0 to 5 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; hard, firm, sticky and plastic; common very fine and fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bss—5 to 11 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; very hard, firm, sticky and plastic; common very fine and fine roots; many fine and very fine pores; few slickensides; slightly effervescent; moderately alkaline; clear smooth boundary.

Bky—11 to 23 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; many fine and very fine pores; common fine masses of lime; few fine masses of gypsum; strongly effervescent; strongly alkaline; clear smooth boundary.

Cr—23 to 60 inches; light brownish gray (10YR 6/2) semiconsolidated shale; light gray (10YR 7/2) moist.

### Range in Characteristics

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

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

*Depth to Bk horizon:* 10 to 20 inches

*Depth to bedrock:* 20 to 40 inches

### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 55 percent  
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  
Reaction: pH 7.4 to 9.0

*Bky horizon*

Hue: 5Y or 10YR  
Value: 6 or 7 dry; 4 or 5 moist  
Texture: Silty clay loam, clay, or silty clay  
Clay content: 35 to 60 percent  
Calcium carbonate equivalent: 5 to 15 percent  
Gypsum content: 1 to 5 percent  
Reaction: pH 7.4 to 9.0

### 957E—Abor-Cabbart-Delpoint complex, 8 to 25 percent slopes

#### Setting

*Landform:*

- Abor—Hills
- Cabbart—Hills
- Delpoint—Hills

*Position on landform:*

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

*Slope:*

- Abor—8 to 25 percent
- Cabbart—8 to 25 percent
- Delpoint—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Abor and similar soils: 55 percent  
Cabbart and similar soils: 15 percent  
Delpoint and similar soils: 15 percent

##### Minor Components

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

#### Major Component Description

##### Abor

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

##### Cabbart

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

##### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

### 958D—Abor-Delpoint-Kobase complex, 4 to 15 percent slopes

#### Setting

*Landform:*

- Abor—Sedimentary plains
- Delpoint—Sedimentary plains
- Kobase—Sedimentary plains

*Position on landform:*

- Abor—Backslopes and shoulders
- Delpoint—Backslopes and footslopes
- Kobase—Backslopes

*Slope:*

- Abor—4 to 15 percent
- Delpoint—4 to 15 percent
- Kobase—4 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Abor and similar soils: 50 percent  
 Delpoint and similar soils: 20 percent  
 Kobase and similar soils: 15 percent

### Minor Components

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

### Major Component Description

#### Abor

*Surface layer texture:* Silty clay  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.8 inches

#### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.2 inches

#### Kobase

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### 43F—Abor-Lilsheep complex, 8 to 45 percent slopes

#### Setting

##### *Landform:*

- Abor—Hills
- Lilsheep—Relict stream terraces

##### *Position on landform:*

- Abor—Backslopes and shoulders
- Lilsheep—Summits

##### *Slope:*

- Abor—15 to 45 percent
- Lilsheep—8 to 45 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Abor and similar soils: 50 percent  
 Lilsheep and similar soils: 25 percent

### Minor Components

Neldore and similar soils: 0 to 5 percent  
 Areas of rock outcrop: 0 to 5 percent  
 Saline soils: 0 to 5 percent  
 Weingart and similar soils: 0 to 5 percent  
 Davidell and similar soils: 0 to 5 percent

### Major Component Description

#### Abor

*Surface layer texture:* Silty clay  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.5 inches

#### Lilsheep

*Surface layer texture:* Very gravelly loam  
*Depth class:* Deep (40 to 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.3 inches

### 959D—Abor-Weingart-Neldore complex, 2 to 15 percent slopes

#### Setting

##### *Landform:*

- Abor—Sedimentary plains
- Weingart—Sedimentary plains
- Neldore—Sedimentary plains

##### *Position on landform:*

- Abor—Foothslopes
- Weingart—Foothslopes and toe slopes
- Neldore—Shoulders and summits

*Slope:*

- Abor—2 to 8 percent
- Weingart—2 to 8 percent
- Neldore—2 to 15 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Abor and similar soils: 35 percent  
 Weingart and similar soils: 30 percent  
 Neldore and similar soils: 25 percent

**Minor Components**

Delpoint and similar soils: 0 to 4 percent  
 Gerdrum and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 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 4.1 inches**Weingart***Surface layer texture:* Clay loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Interbedded shale and siltstone residuum*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 4.0 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 2.2 inches**Absher Series***Depth class:* Very deep*Drainage class:* Moderately well drained*Permeability:* Very slow*Landform:* Sedimentary plains*Parent material:* Alluvium*Slope range:* 0 to 8 percent*Elevation range:* 2,240 to 2,900 feet*Annual precipitation:* 11 to 14 inches*Annual air temperature:* 43 to 45 degrees F*Frost-free period:* 110 to 135 days**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs**Typical Pedon**

Absher silty clay loam, 0 to 8 percent slopes, in an area of rangeland; 2,200 feet west and 2,300 feet south of northeast corner of sec. 3, T. 2 N., R. 46 E.

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

Btn—2 to 9 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; strong medium columnar structure parting to strong coarse subangular blocky structure; very hard, very firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common faint clay films on faces of peds and in pores; moderately alkaline; clear wavy boundary.

Btknyz—9 to 15 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; common very fine roots; few faint clay films on faces of peds and in pores; common fine rounded masses of gypsum and other salts; few medium masses of lime; slightly effervescent; strongly alkaline; clear wavy boundary.

Bknyz—15 to 52 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; common very fine roots; common fine and very fine pores; few fine rounded masses of gypsum and other salts; common medium masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bk<sub>yz</sub>—52 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few fine roots; few very fine pores; few fine rounded masses of gypsum and other salts; few fine masses of lime; strongly alkaline; slightly effervescent.

### Range in Characteristics

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

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

#### *E horizon*

Hue: 2.5Y, 10YR, or 7.5YR  
 Value: 6 or 7 dry; 3 to 5 moist  
 Texture: Loam (where mixed with the Bt horizon, textures are clay loam, clay, or silty clay loam)  
 Clay content: 20 to 27 percent  
 Electrical conductivity: 4 to 8 mmhos/cm  
 Reaction: pH 6.6 to 8.4

#### *B<sub>tn</sub> horizon*

Hue: 2.5Y, 10YR, or 7.5YR  
 Value: 4 to 6 dry; 3 to 5 moist  
 Chroma: 1 to 3  
 Texture: Silty clay, clay, or clay loam  
 Clay content: 35 to 60 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: 18 to 70  
 Reaction: pH 6.6 to 8.4

#### *B<sub>tknyz</sub> horizon*

Hue: 2.5Y, 10YR, or 7.5YR  
 Value: 4 to 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Silty clay, clay, or clay loam  
 Clay content: 35 to 50 percent  
 Electrical conductivity: 16 to 30 mmhos/cm  
 Sodium absorption ratio: 18 to 70  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 9.0

#### *B<sub>knyz</sub> and B<sub>kzyz</sub> horizons*

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 2 to 4  
 Texture: Clay loam, silty clay, or clay  
 Clay content: 35 to 50 percent  
 Electrical conductivity: 16 to 30 mmhos/cm  
 Sodium absorption ratio: 18 to 70  
 Calcium carbonate equivalent: 5 to 15 percent  
 Gypsum content: 1 to 5 percent  
 Reaction: pH 8.4 to 9.0

## 112C—Absher silty clay loam, 0 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Absher and similar soils: 85 percent

#### Minor Components

Gerdrum and similar soils: 0 to 3 percent

Creed and similar soils: 0 to 3 percent

Davidell and similar soils: 0 to 3 percent

Sonnett and similar soils: 0 to 3 percent

Weingart 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:* 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 4.1 inches

### Alona Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed, frigid Aridic Ustochrepts

#### Typical Pedon

Alona silt loam, 0 to 4 percent slopes, in an area of rangeland; 1,500 feet north and 1,400 feet west of the southeast corner of sec. 12, T. 12 N., R. 47 E.

A—0 to 4 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 10 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; common fine and very fine pores; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk—10 to 19 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many fine roots; common fine and very fine pores; common masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

Bz1—19 to 43 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine pores; few fine masses of salt; strongly effervescent; very strongly alkaline; clear smooth boundary.

Bz2—43 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine pores; few medium irregular masses of salt; strongly effervescent; very strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Bk horizon:* 6 to 18 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

#### Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 25 to 35 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.8 to 8.4

#### Bk horizon

Hue: 10YR to 5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Electrical conductivity: 2 to 16 mmhos/cm

Sodium absorption ratio: 13 to 40

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 8.5 to 9.6

#### Bz horizons

Value: 6 or 7 dry; 4 to 6 moist

Texture: Loam, silt loam, or silty clay loam

Clay content: 25 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 45

Reaction: pH 8.5 to 9.6

## 14B—Alona silt loam, 0 to 4 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Alona and similar soils: 85 percent

#### Minor Components

Lonna and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent: 0 to 5 percent

Soils that have silty clay loam surfaces: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam

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

*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.9 inches

## Antwerp Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed (calcareous), frigid Aridic Ustorthents

### Typical Pedon

Antwerp silty clay loam in an area of Davidell-Antwerp silty clay loams, 0 to 4 percent slopes, in an area of rangeland; 2,530 feet south and 250 west of the northeast corner of sec. 33, T. 8 N., R. 45 E.

Ap—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine platy structure; soft, firm, sticky and plastic; common fine and very fine roots; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bw—3 to 9 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; violently effervescent; strongly alkaline; clear smooth boundary.

Bz1—9 to 18 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium angular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common fine masses of salts; violently effervescent; strongly alkaline; clear smooth boundary.

Bz2—18 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist;

moderate coarse prismatic structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; few medium masses of salts; violently effervescent; strongly alkaline; clear smooth boundary.

Bz3—30 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam, brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; few fine masses of salts; violently effervescent; strongly alkaline; clear smooth boundary.

BC—40 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; soft, friable, slightly sticky and slightly plastic; violently effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

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

#### A horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 33 percent

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 9.0

#### Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 33 percent

Electrical conductivity: 2 to 8 mmhos/cm

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 9.0

#### Bz horizons

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 27 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 15 to 40

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

#### BC horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 22 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 15 to 40

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

## 910B—Antwerp silty clay loam, 0 to 4 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Antwerp and similar soils: 85 percent

#### Minor Components

Davidell and similar soils: 0 to 15 percent

#### Major Component Description

*Surface layer texture:* Silty clay loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 6.4 inches

### Archin Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Slow or moderately slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 2 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 130 days

**Taxonomic Class:** Fine-loamy, mixed Borollic Natrargids

#### Typical Pedon

Archin loam, in an area of Archin-Gerdrum loams, 2 to 8 percent slopes, in an area of rangeland; 1,900 feet east and 400 feet south of the northwest corner of sec. 17, T. 2 N., R. 46 E.

A—0 to 3 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine granular structure;

loose, slightly sticky and nonplastic; many fine and very fine roots; many fine and very fine pores; neutral; abrupt smooth boundary.

Btn1—3 to 8 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; strong coarse and very coarse prismatic structure; very hard, firm, slightly sticky and nonplastic; many very fine and fine roots; many fine and very fine tubular pores; many faint clay films in root channels and pores; slightly alkaline; clear wavy boundary.

Btn2—8 to 12 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; moderate coarse angular blocky structure parting to moderate medium subangular blocky structure; very hard, firm, sticky and nonplastic; many fine and very fine roots between peds; many fine and very fine tubular pores; few faint clay films in root channels and pores; slightly alkaline; abrupt smooth boundary.

Bkny1—12 to 21 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 structure; very hard, firm, sticky and nonplastic; many fine and very fine roots; many fine and very fine tubular pores; common fine and very fine threads of lime; few fine masses of gypsum; strongly effervescent; strongly alkaline; clear wavy boundary.

Bkny2—21 to 31 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist, weak medium subangular blocky structure; very hard, firm, sticky and nonplastic; many fine and very fine roots; common fine and very fine pores; common fine masses of lime; few fine masses of gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

C—31 to 60 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; very hard, firm, very sticky and nonplastic; common fine and very fine roots; few fine and very fine pores; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 1 to 4

Clay content: 15 to 25 percent  
 Electrical conductivity: 0 to 4 mmhos/cm  
 Reaction: pH 6.1 to 7.3

*Btn horizons*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 or 4 moist  
 Chroma: 2 to 4  
 Texture: Loam, clay loam, or sandy clay loam  
 Clay content: 25 to 34 percent  
 Sodium absorption ratio: 13 to 20  
 Electrical conductivity: 0 to 4 mmhos/cm  
 Reaction: pH 6.6 to 8.4

*Bkny horizon*

Hue: 10YR, 2.5Y, or 7.5YR  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 2 or 3  
 Texture: Loam or clay loam  
 Clay content: 15 to 30 percent  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 13 to 20  
 Calcium carbonate equivalent: 5 to 15 percent  
 Gypsum content: 1 to 5 percent  
 Reaction: pH 7.4 to 9.0

*C horizon*

Hue: 10YR, 2.5Y, or 7.5YR  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 1 to 4  
 Clay content: 15 to 30 percent  
 Texture: Loam, fine sandy loam, clay loam, or sandy clay loam  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 13 to 20  
 Calcium carbonate equivalent: 5 to 15 percent  
 Gypsum content: 1 to 5 percent  
 Reaction: pH 7.4 to 9.0

*Other features:* The Archin soil is a taxadjunct to the series. It classifies as a fine-loamy, mixed Typic Natriboralf. Use and management is similar.

## 19C—Archin loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Archin and similar soils: 85 percent

### Minor Components

Busby and similar soils: 0 to 3 percent  
 Foreleft and similar soils: 0 to 3 percent  
 Gerdrum and similar soils: 0 to 3 percent  
 Bullock and similar soils: 0 to 3 percent  
 Sonnett 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  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 7.3 inches

## 192C—Archin-Davidell-Bullock complex, 2 to 8 percent slopes

### Setting

*Landform:*

- Archin—Sedimentary plains
- Davidell—Sedimentary plains
- Bullock—Sedimentary plains

*Slope:*

- Archin—2 to 8 percent
- Davidell—2 to 8 percent
- Bullock—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Archin and similar soils: 35 percent  
 Davidell and similar soils: 30 percent  
 Bullock and similar soils: 20 percent

### Minor Components

Ivanell and similar soils: 0 to 3 percent  
 Cabbart and similar soils: 0 to 3 percent  
 Busby and similar soils: 0 to 3 percent

Soils that have slopes less than 2 percent: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 0 to 3 percent

### Major Component Description

#### Archin

*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 7.3 inches

#### Davidell

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.5 inches

#### Bullock

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.0 inches

### 191C—Archin-Gerdrum loams, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Archin—Sedimentary plains
- Gerdrum—Sedimentary plains

##### *Slope:*

- Archin—2 to 8 percent
- Gerdrum—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Archin and similar soils: 50 percent  
 Gerdrum and similar soils: 35 percent

#### Minor Components

Sonnett and similar soils: 0 to 3 percent  
 Creed and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Foreleft and similar soils: 0 to 3 percent  
 Soils that have slopes less than 2 percent: 0 to 3 percent

### Major Component Description

#### Archin

*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 7.3 inches

#### Gerdrum

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.1 inches

### Armells Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Hills  
*Parent material:* Material weathered from baked sandstone and shale  
*Slope range:* 25 to 70 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F  
*Frost free period:* 110 to 135 days

**Taxonomic Class:** Loamy-skeletal, mixed (calcareous), frigid Aridic Ustorthents

### Typical Pedon

Armells channery loam in an area of Armells-Cabbart-Kirby complex, 25 to 70 percent slopes, in an area of rangeland; 1,100 feet south and 2,200 feet west of the northeast corner of sec. 3, T. 7 N., R. 54 E.

A—0 to 6 inches; reddish brown (5YR 5/3) channery loam, dark reddish brown (5YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine and very fine pores; 30 percent channers; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk—6 to 14 inches; pink (5YR 6/3) very channery loam, reddish brown (5YR 5/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; 60 percent channers; common medium irregular masses of lime around channers; violently effervescent; moderately alkaline; gradual wavy boundary.

C1—14 to 31 inches; pink (5YR 6/4) very channery loam, reddish brown (5YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; 60 percent channers; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—31 to 60 inches; yellowish brown (10YR 5/6) extremely channery loam, dark yellowish brown (10YR 4/6) moist; massive; soft, very friable, slightly sticky and slightly plastic; 70 percent channers; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Bk horizon:* 3 to 7 inches

#### A horizon

Hue: 2.5YR to 10YR

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 10 to 22 percent

Content of rock fragments: 15 to 30 percent channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

#### Bk horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Loam or fine sandy loam

Clay content: 15 to 27 percent

Content of rock fragments: 45 to 70 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

#### C horizons

Hue: 5YR, 7.5YR, or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 to 6

Texture: Loam or fine sandy loam

Clay content: 15 to 27 percent

Content of rock fragments: 60 to 75 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

## 911F—Armells-Cabbart complex, 25 to 70 percent slopes

### Setting

#### Landform:

- Armells—Hills
- Cabbart—Hills

#### Position on landform:

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

#### Slope:

- Armells—25 to 70 percent
- Cabbart—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Armells and similar soils: 50 percent

Cabbart and similar soils: 25 percent

#### Minor Components

Yamacall and similar soils: 0 to 25 percent

## Major Component Description

### Armells

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.5 inches

### Cabbart

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

## 151F—Armells-Cabbart-Kirby complex, 25 to 70 percent slopes

### Setting

#### *Landform:*

- Armells—Hills
- Cabbart—Hills
- Kirby—Hills

#### *Position on landform:*

- Armells—Backslopes and shoulders
- Cabbart—Shoulders and summits
- Kirby—Summits

#### *Slope:*

- Armells—25 to 70 percent
- Cabbart—25 to 70 percent
- Kirby—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Armells and similar soils: 35 percent  
 Cabbart and similar soils: 25 percent  
 Kirby and similar soils: 25 percent

#### Minor Components

Birney and similar soils: 0 to 4 percent  
 Delpoint and similar soils: 0 to 4 percent

Areas of rock outcrop: 0 to 4 percent  
 Soils that have slopes less than 25 percent: 0 to 3 percent

## Major Component Description

### Armells

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.6 inches

### Cabbart

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

### Kirby

*Surface layer texture:* Very channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 0.8 inches

## 650F—Armells-Delpoint-Cabbart complex, 25 to 70 percent slopes

### Setting

#### *Landform:*

- Armells—Hills
- Delpoint—Hills
- Cabbart—Hills

#### *Position on landform:*

- Armells—Backslopes and footslopes
- Delpoint—Backslopes
- Cabbart—Backslopes and shoulders

#### *Slope:*

- Armells—25 to 70 percent
- Delpoint—25 to 70 percent
- Cabbart—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Armells and similar soils: 40 percent  
 Delpoint and similar soils: 20 percent  
 Cabbart and similar soils: 20 percent

#### Minor Components

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

### Major Component Description

#### Armells

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.5 inches

#### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

#### Cabbart

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

### 912F—Armells-Kirby complex, 25 to 70 percent slopes

#### Setting

*Landform:*

- Armells—Hills

- Kirby—Hills

*Position on landform:*

- Armells—Backslopes and footslopes
- Kirby—Shoulders and summits

*Slope:*

- Armells—25 to 70 percent
- Kirby—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Armells and similar soils: 50 percent  
 Kirby and similar soils: 30 percent

#### Minor Components

Cabbart and similar soils: 0 to 10 percent  
 Yawdim and similar soils: 0 to 5 percent  
 Areas of rock outcrop: 0 to 5 percent

### Major Component Description

#### Armells

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.5 inches

#### Kirby

*Surface layer texture:* Very channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 1.1 inches

### 17F—Badland

#### Composition

#### Major Components

Badland: 90 percent

**Minor Components**

Cabbart and similar soils: 0 to 3 percent  
 Delpoint and similar soils: 0 to 3 percent  
 Havre and similar soils: 0 to 2 percent  
 Weingart and similar soils: 0 to 2 percent

**Major Component Description**

*Definition:* Steep or very steep barren land dissected by many intermittent drainage channels cut through soft geologic material. Geologic erosion is active and areas support little or no vegetation.

**Benz Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Benz loam, 0 to 8 percent slopes, in an area of rangeland; 3,100 feet east and 200 feet south of the northwest corner of sec. 4, T. 8 N., R. 48 E.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; slightly effervescent; strongly alkaline; clear wavy boundary.

C1—4 to 13 inches; grayish brown (10YR 5/2) loam, brown (10YR 4/3) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine and very fine pores; strongly effervescent; strongly alkaline; clear wavy boundary.

C2—13 to 20 inches; pale brown (10YR 6/3) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots; common medium rounded masses of lime; strongly effervescent; strongly alkaline; clear wavy boundary.

C3—20 to 60 inches; pale brown (10YR 6/3) stratified fine sandy loam and silt loam, dark grayish brown

(10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; strongly effervescent; strongly alkaline.

**Range in Characteristics**

*Soil temperature:* 41 to 47 degrees F

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

**A horizon**

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 to 5 moist  
 Chroma: 2 or 3  
 Clay content: 18 to 27 percent  
 Electrical conductivity: 4 to 8 mmhos/cm  
 Calcium carbonate equivalent: 1 to 5 percent  
 Reaction: pH 7.4 to 9.6

**C horizons**

Hue: 5Y, 2.5Y, or 10YR  
 Value: 5 to 8 dry; 4 to 6 moist  
 Chroma: 2 or 3  
 Texture: Loam, clay loam, silt loam, or fine sandy loam  
 Clay content: 18 to 35 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 30  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 8.5 to 9.6

**21C—Benz loam, 0 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Benz and similar soils: 85 percent

**Minor Components**

Yamacall and similar soils: 0 to 5 percent  
 Vanda and similar soils: 0 to 5 percent  
 Gerdrum and similar soils: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.8 inches

### Big Sandy Series

*Depth class:* Very deep  
*Drainage class:* Poorly  
*Permeability:* Moderately slow  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents

#### Typical Pedon

Big Sandy loam in an area of Havre-Big Sandy loams, 0 to 2 percent slopes, frequently flooded, in an area of rangeland; 2,000 feet north and 1,850 feet west of the southeast corner of sec. 22, T. 8 N., R. 52 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to strong fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine roots; common distinct patchy black (10YR 2/1) organic coats on faces of peds; slightly effervescent; slightly alkaline; clear smooth boundary.

C—3 to 14 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; slightly hard, friable, sticky and plastic; common medium and fine roots; many very fine and fine tubular pores; common medium faint yellowish brown (10YR 5/4) redox concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg1—14 to 30 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium distinct yellowish brown (10YR 5/4)

redox concentrations; weak coarse prismatic structure; hard, firm, sticky and plastic; common very fine and fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—30 to 60 inches; gray (5Y 5/1) loam consisting of strata of clay loam, loam and very fine sandy loam, dark gray (5Y 4/1) moist; massive; hard, firm, sticky and plastic; common very fine roots; 10 percent pebbles; common fine and medium irregular light brownish gray (2.5Y 6/2) masses of lime in cracks; common fine and medium distinct light yellowish brown (10YR 6/4) redox concentrations; common medium faint gray (5Y 5/1) redox depletions; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to seasonal high water table:* 12 to 24 inches during the period from December to June

#### A horizon

Hue: 2.5Y or 10YR  
 Value: 4 to 6 dry; 3 or 4 moist  
 Chroma: 1 or 2  
 Clay content: 15 to 27 percent  
 Reaction: pH 7.4 to 9.0.

#### C horizon

Hue: 2.5Y or 10YR  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 1 or 2  
 Texture: Loam or silty clay loam, consisting of strata of silt loam, clay loam, or fine sandy loam  
 Clay content: 18 to 35 percent  
 Reaction: pH 7.9 to 9.0

#### Cg horizons

Hue: 2.5Y or 5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 1 or 2  
 Texture: Loam, clay loam, or very fine sandy loam  
 Clay content: 15 to 35 percent  
 Reaction: pH 7.9 to 9.0

### Big Sheep Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Hills  
*Parent material:* Gravelly alluvium or colluvium

*Slope range:* 8 to 45 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 46 degrees F  
*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Bigsheep very gravelly loam, in an area of Cambert-Bigsheep-Golva complex, 8 to 45 percent slopes, in an area of rangeland, 2,300 feet south and 1,300 feet west of the northeast corner of sec. 32, T. 14 N., R. 47 E., (in Prairie County, MT).

A1—0 to 4 inches; brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; 55 percent pebbles; slightly alkaline; clear smooth boundary.

A2—4 to 9 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; 50 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—9 to 24 inches; very pale brown (10YR 7.3) very gravelly loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; 55 percent pebbles; many distinct lime coatings on pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

2C1—24 to 33 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strongly effervescent; strongly alkaline; gradual smooth boundary.

3C2—33 to 60 inches; pale yellow (2.5Y 7/4) very gravelly loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; 55 percent pebbles; common faint lime coatings on pebbles; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 9 inches  
*Depth to the Bk horizon:* 7 to 9 inches

### A horizons

Hue: 10YR or 2.5Y  
 Value: 4 or 5 dry  
 Chroma: 2 or 3  
 Clay content: 18 to 27 percent  
 Content of rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 35 to 60 percent pebbles  
 Reaction: pH 6.6 to 8.4.

### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2 to 6  
 Texture: Loam, sandy loam, or sandy clay loam  
 Clay content: 18 to 27 percent  
 Content of rock fragments: 35 to 60 percent—0 to 5 percent cobbles, 35 to 55 percent pebbles  
 Calcium carbonate equivalent: 15 to 30 percent  
 Reaction: pH 7.9 to 9.0

### 2C1 horizon

Hue: 10YR, 2.5Y, or 5Y  
 Value: 6 or 7 dry; 5 or 6 moist  
 Chroma: 2 to 4  
 Texture: Silt loam or loam  
 Clay content: 18 to 27 percent  
 Content of rock fragments: 0 to 5 percent pebbles  
 Calcium carbonate equivalent: 8 to 15 percent  
 Reaction: pH 7.9 to 9.0

### 3C2 horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2 to 6  
 Texture: Loam, sandy loam, or sandy clay loam  
 Clay content: 10 to 27 percent  
 Content of rock fragments: 35 to 75 percent—0 to 5 percent cobbles, 35 to 70 percent pebbles  
 Calcium carbonate equivalent: 8 to 15 percent  
 Reaction: pH 8.5 to 9.0

## Birney Series

*Depth class:* Very deep  
*Drainage class:* Well  
*Permeability:* Moderate  
*Landform:* Hills and sedimentary plains  
*Parent material:* Material derived from baked sandstone and shale  
*Slope range:* 2 to 70 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Loamy-skeletal, mixed, frigid  
Aridic Ustochrepts

### Typical Pedon

Birney channery loam in an area of Yamacall-Birney-Delpoint complex, 15 to 25 percent slopes, in an area of rangeland; 1,400 feet east and 1,900 feet north of southwest corner of sec. 4, T. 7 N., R. 54 E.

- A—0 to 5 inches; reddish gray (5YR 5/2) channery loam, dark reddish gray (5YR 5/2) channery loam, dark reddish gray (5YR 4/2) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; few medium roots and common fine and very fine roots; 20 percent channers; slightly alkaline; gradual wavy boundary.
- Bw—5 to 11 inches; pinkish gray (7.5YR 6/2) channery loam, brown (7.5YR 5/2) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; few medium roots and common fine and very fine roots; common fine and very fine pores; 30 percent channers; strongly effervescent; slightly alkaline; gradual wavy boundary.
- Bk1—11 to 25 inches; pinkish gray (5YR 6/2) very channery fine sandy loam, reddish gray (5YR 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few medium roots and common fine and very fine roots; common fine and very fine pores; 50 percent channers and 10 percent flagstones; many faint lime coats on undersides of coarse fragments; violently effervescent; moderately alkaline; gradual irregular boundary.
- Bk2—25 to 42 inches; light reddish brown (2.5YR 6/4) extremely channery fine sandy loam, reddish brown (2.5Y 5/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; common fine and very fine pores; 50 percent channers and 15 percent flagstones; many faint lime coats surrounding coarse fragments; violently effervescent; moderately alkaline; gradual irregular boundary.
- C—42 to 60 inches; light red (2.5YR 6/6) extremely channery fine sandy loam, red (2.5YR 5/6) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; 50 percent channers and 20 percent flagstones; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Bk horizon:* 10 to 15 inches

#### A horizon

Hue: 5YR, 7.5YR, or 10YR

Value: 5 to 6 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 15 to 35 percent channers

Reaction: pH 7.4 to 8.4.

#### Bw horizon

Hue: 5YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 6

Clay content: 10 to 25 percent

Content of rock fragments: 15 to 35 percent channers

Reaction: pH 7.4 to 8.4

#### Bk horizons

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

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 6

Texture: Loam, sandy loam, or fine sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 50 to 80 percent—0 to 20 percent flagstones, 50 to 60 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### C horizon

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

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 6

Texture: Loam, sandy loam, or fine sandy loam

Clay content: 15 to 25 percent

Content of rock fragments: 50 to 70 percent—0 to 20 percent flagstones, 50 to 70 percent channers

Reaction: pH 7.9 to 9.0

### 841F—Birney, moist-Armells-Cabbart complex, 25 to 70 percent slopes

#### Setting

*Landform:*

- Birney—Hills

- Armells—Hills
- Cabbart—Hills

*Position on landform:*

- Birney—Backslopes and footslopes
- Armells—Backslopes and footslopes
- Cabbart—Backslopes and shoulders

*Slope:*

- Birney—25 to 70 percent
- Armells—25 to 70 percent
- Cabbart—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Birney and similar soils: 50 percent  
 Armells and similar soils: 15 percent  
 Cabbart and similar soils: 15 percent

#### Minor Components

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

### Major Component Description

#### Birney

*Surface layer texture:* Channery loam

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

*Drainage class:* Well drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 4.1 inches

#### Armells

*Surface layer texture:* Channery loam

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

*Drainage class:* Well drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.5 inches

#### Cabbart

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.1 inches

### 913D—Birney-Cooers-Kirby complex, 2 to 15 percent slopes

#### Setting

*Landform:*

- Birney—Sedimentary plains
- Cooers—Sedimentary plains
- Kirby—Sedimentary plains

*Position on landform:*

- Birney—Backslopes
- Cooers—Footslopes
- Kirby—Summits

*Slope:*

- Birney—2 to 15 percent
- Cooers—2 to 8 percent
- Kirby—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Birney and similar soils: 35 percent  
 Cooers and similar soils: 30 percent  
 Kirby and similar soils: 20 percent

#### Minor Components

Yamacall and similar soils: 0 to 10 percent  
 Areas of rock outcrop: 0 to 5 percent

### Major Component Description

#### Birney

*Surface layer texture:* Channery loam

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

*Drainage class:* Well drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.1 inches

#### Cooers

*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 9.6 inches

### **Kirby**

*Surface layer texture:* Channery loam

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

*Drainage class:* Excessively drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.6 inches

### **Bitton Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Hills

*Parent material:* Material weathered from baked sandstone and shale

*Slope range:* 25 to 45 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

### **Typical Pedon**

Bitton channery loam in an area of Bitton-Cabba-Ringling complex, 25 to 70 percent slope, in an area of rangeland; 1,300 feet south and 800 feet west of northeast corner of sec. 1, T. 8 N., R. 50 E.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) channery loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; common medium roots and many fine and very fine roots; 15 percent channers; slightly alkaline; clear smooth boundary.

A2—4 to 10 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common medium roots and many fine and very fine roots; common fine and very fine vesicular and tubular pores; 20 percent channers; slightly alkaline; clear smooth boundary.

Bw—10 to 22 inches; light brownish gray (10YR 6/2) very channery loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to weak fine and medium

granular; slightly hard, friable, slightly sticky and slightly plastic; common medium roots and many fine and very fine roots; common fine and very fine continuous tubular pores; 35 percent channers; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bk1—22 to 26 inches; light gray (10YR 7/2) very channery loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine interstitial and tubular pores; 45 percent channers; many faint lime coats on underside of coarse fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—26 to 60 inches; light gray (2.5Y 7/2) extremely channery loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; 5 percent flagstones, 65 percent channers; many fine lime coats surrounding coarse fragments; strongly effervescent; moderately alkaline.

### **Range in Characteristics**

*Soil temperature:* 40 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Depth to Bk horizon:* 11 to 28 inches

#### *A horizons*

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 30 percent channers

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 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 20 to 40 percent channers

Reaction: pH 7.4 to 8.4

#### *Bk horizons*

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Clay content: 10 to 27 percent

Content of rock fragments: 35 to 75 percent—0 to 40 percent flagstones, 35 to 60 percent channers

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

### 631F—Bitton-Cabba-Ringling complex, 25 to 70 percent slopes

#### Setting

##### Landform:

- Bitton—Hills
- Cabba—Hills
- Ringling—Hills

##### Position on landform:

- Bitton—Backslopes
- Cabba—Backslopes and shoulders
- Ringling—Shoulders and summits

##### Slope:

- Bitton—25 to 45 percent
- Cabba—35 to 70 percent
- Ringling—25 to 45 percent

Elevation: 2,900 to 3,760 feet

Mean annual precipitation: 15 to 17 inches

Frost-free period: 110 to 135 days

#### Composition

##### Major Components

Bitton and similar soils: 35 percent  
Cabba and similar soils: 25 percent  
Ringling and similar soils: 25 percent

##### Minor Components

Doney and similar soils: 0 to 3 percent  
Macar and similar soils: 0 to 3 percent  
Shambo and similar soils: 0 to 3 percent  
Areas of rock outcrop: 0 to 3 percent  
Soils that have slopes less than 25 percent: 0 to 3 percent

#### Major Component Description

##### Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from baked sandstone and shale

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, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

##### Ringling

Surface layer texture: Very channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

#### Blacksheep Series

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Hills and sedimentary plains

Parent material: Semiconsolidated sandy sedimentary beds

Slope range: 8 to 50 percent

Elevation range: 2,240 to 2,900 feet

Annual precipitation: 11 to 14 inches

Annual air temperature: 43 to 45 degrees F

Frost-free period: 110 to 135 days

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

##### Typical Pedon

Blacksheep fine sandy loam in an area of Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes, in an area of rangeland; 1,500 feet north and 1,200 feet west of the southeast corner of sec. 32, T. 2 N., R 46 E.

A—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common very fine tubular pores; slightly alkaline; clear smooth boundary.

Bk—6 to 16 inches; light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine tubular pores; few medium masses of lime; violently

effervescent; moderately alkaline; clear smooth boundary.

Cr—16 to 60 inches; light gray (10YR 7/2) semiconsolidated sandstone.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between 8 inches and the paralithic contact; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Fine sandy loam or very fine sandy loam

Clay content: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Fine sandy loam or very fine sandy loam

Clay content: 5 to 15 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 8.4

## 846F—Blacksheep-Delpoint-Rock outcrop complex, 15 to 50 percent slopes

### Setting

#### Landform:

- Blacksheep—Hills
- Delpoint—Hills

#### Position on landform:

- Blacksheep—Backslopes and shoulders
- Delpoint—Footslopes

#### Slope:

- Blacksheep—15 to 50 percent
- Delpoint—15 to 50 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Blacksheep and similar soils: 30 percent  
Delpoint and similar soils: 30 percent

Rock outcrop: 30 percent

#### Minor Components

Twilight and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

### Major Component Description

#### Blacksheep

*Surface layer texture:* Very fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, sandy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.7 inches

#### Delpoint

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 3.9 inches

#### Rock outcrop

*Definition:* Areas of exposed sandstone and siltstone bedrock.

### Bonfri Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Sedimentary plains and hills

*Parent material:* Interbedded sandstone and shale residuum

*Slope range:* 2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Typic Eutroboralfs

#### Typical Pedon

Bonfri loam, 2 to 8 percent slopes, in an area of rangeland, 750 feet south and 750 feet east of the northwest corner of section 9, T. 8 N., R 55 E., (in Fallon County, MT).

A—0 to 4 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure parting to moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral; clear smooth boundary.

Bt—4 to 18 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; many faint clay films on faces of peds and in pores; slightly alkaline; clear wavy boundary.

Bk1—18 to 26 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to strong medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; many very fine roots; many very fine pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—26 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; many medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—32 to 60 inches; light gray (10YR 7/1) interbedded sandstone and shale that crush to sandy loam, light brownish gray (10YR 6/2) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to the Bk horizon:* 18 to 30 inches

*Depth to the Cr horizon:* 20 to 40 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.3

#### Bt horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 20 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

## 602C—Bonfri loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Bonfri and similar soils: 85 percent

#### Minor Components

Twilight and similar soils: 0 to 4 percent

Yamacall and similar soils: 0 to 4 percent

Bullock and similar soils: 0 to 4 percent

Soils that have slopes more than 8 percent: 0 to 3 percent

### Major Component Description

*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 5.4 inches

### Broadus Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Hills

*Parent material:* Alluvium or colluvium

*Slope range:* 15 to 25 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Broadus loam from an area of Doney-Broadus-Cabba complex, 15 to 25 percent slopes, in a grazed forestland area; 2,600 feet north and 1,600 feet east of the southwest corner of sec. 21, T. 8 N., R. 53 E.

O—1 inch to 0; undecomposed forest litter.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine and medium platy structure parting to moderate fine and medium granular structure; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots; many very fine continuous tubular pores; slightly alkaline; clear smooth boundary.

Bw—4 to 10 inches; grayish brown (10YR 5/2) loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; many very fine continuous tubular pores; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—10 to 19 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and plastic; few fine and very fine roots; common fine continuous tubular pores and many very fine continuous tubular pores; common fine irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—19 to 40 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; common fine and very fine continuous tubular pores; common fine and medium irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—40 to 60 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common fine and very

fine continuous tubular pores; few fine irregular masses of lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

#### A horizon

Hue: 10YR or 5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

#### Bw horizon

Hue: 10YR or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Reaction: pH 7.4 to 7.8

#### Bk1 and Bk2 horizons

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 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### Bk3 horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Fine sandy loam or clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

### Brushton Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Aridic Argiborolls

**Typical Pedon**

Brushston silt loam, 0 to 4 percent slopes, in an area of rangeland; 800 feet north and 150 feet east of southwest corner of sec. 4, T. 6 N., R. 46 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium and coarse granular structure; soft, friable, sticky and slightly plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt1—6 to 12 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to strong fine and medium angular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots; common fine and very fine pores; very few faint clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bt2—12 to 18 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to strong medium angular blocky structure; very hard firm sticky and plastic; many fine and very fine roots; very few faint clay films on faces of peds; slightly alkaline; gradual wavy boundary.

Bk1—18 to 28 inches; pale brown (10 YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine roots; common fine and very fine pores; common fine and medium rounded masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—28 to 36 inches; pale brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) moist; moderate coarse prismatic structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common fine irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—36 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; soft, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches; dry

in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

*Mollic epipedon thickness:* 7 to 15 inches

*Depth to Bk horizon:* 10 to 24 inches

**A horizons**

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 6.6 to 7.8

**Bt horizons**

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

**Bk horizons**

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam or loam

Clay content: 15 to 27 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 8.4

**BC horizon**

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

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

Clay content: 15 to 25 percent

Reaction: pH 7.9 to 9.0

**93B—Brushston silt loam, 0 to 4 percent slopes****Setting**

*Landform:* Sedimentary plains

*Slope:* 0 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Brushston and similar soils: 85 percent

**Minor Components**

Kobase and similar soils: 0 to 4 percent

Cambeth and similar soils: 0 to 4 percent  
 Lonna and similar soils: 0 to 4 percent  
 Soils that have slopes more than 4 percent: 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 10.1 inches

### Bullock Series

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Interbedded sandstone and shale residuum  
*Slope range:* 2 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Borollic Natrargids

### Typical Pedon

Bullock loam in an area of Archin-Davidell-Bullock complex, 2 to 8 percent slopes, in an area of rangeland; 2,200 feet north and 1,000 feet east of southwest corner of sec. 16, T. 9 N., R. 46 E.

E—0 to 4 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and medium roots; common fine and very fine pores; slightly alkaline; clear smooth boundary.

Btn—4 to 10 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium columnar structure parting to strong medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; common fine and very fine pores; common distinct patchy clay films on faces of peds and in pores; strongly alkaline; gradual wavy boundary.

Bknz—10 to 17 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist;

moderate medium prismatic structure parting to moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine and very fine roots; common fine rounded masses of lime; common fine cylindrical gypsum threads; violently effervescent; strongly alkaline; gradual wavy boundary.

BC—17 to 34 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; common fine and very fine pores; common fine threads of gypsum; slightly effervescent; strongly alkaline; gradual smooth boundary.

Cr—34 to 60 inches; light gray (2.5Y 7/2) sandstone, dark grayish brown (2.5Y 4/2) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Depth to Cr horizon:* 20 to 40 inches  
*Soil phases:* Eroded

#### E horizon

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 3 or 4 moist  
 Chroma: 1 or 2  
 Texture: Loam or clay loam  
 Clay content: 10 to 32 percent  
 Reaction: pH 6.6 to 7.8

#### Btn horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Texture: Loam or clay loam  
 Clay content: 27 to 35 percent  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 13 to 20  
 Reaction: pH 7.4 to 9.0

#### Bknz horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 to 6 moist  
 Texture: Loam or clay loam  
 Clay content: 25 to 32 percent  
 Electrical conductivity: 4 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 25  
 Calcium carbonate equivalent: 5 to 15 percent  
 Gypsum content: 1 to 5 percent  
 Reaction: pH 7.4 to 9.0

*BC horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 2 or 3 moist  
 Texture: Loam or clay loam  
 Clay content: 25 to 32 percent  
 Electrical conductivity: 4 to 16 mmhos/cm  
 Reaction: pH 7.4 to 9.0

*Other features:* This soil is a taxadjunct to the series. It classifies as a fine-loamy, mixed Typic Natriboralfs. Use and management are similar.

## 914D—Bullock, eroded-Ralore clay loams, 2 to 15 percent slopes

### Setting

*Landform:*

- Bullock—Sedimentary plains
- Ralore—Sedimentary plains

*Slope:*

- Bullock—2 to 8 percent
- Ralore—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Bullock and similar soils: 55 percent  
 Ralore and similar soils: 25 percent

#### Minor Components

Areas of slickspots: 0 to 10 percent  
 Rominell and similar soils: 0 to 10 percent

### Major Component Description

#### Bullock

*Surface layer texture:* Clay 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  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 3.3 inches

#### Ralore

*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 2.6 inches

## Busby Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid

*Landform:* Hills and sedimentary plains

*Parent material:* Alluvium or eolian material

*Slope range:* 0 to 25 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Busby fine sandy loam in an area of Busby-Twilight fine sandy loams, 2 to 15 percent slopes, in an area of rangeland; 2,200 feet east and 1,200 feet north of the southwest corner of sec. 33, T. 8 N., R. 45 E.

A—0 to 3 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Bw—3 to 10 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium angular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; slightly alkaline; abrupt smooth boundary.

Bk1—10 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium angular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; common fine and medium irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—15 to 27 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; moderate

medium angular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—27 to 42 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—42 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Bk horizon:* 10 to 20 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loam

Clay content: 10 to 27 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 or 3

Texture: Fine sandy loam or loam

Clay content: 10 to 18 percent

Reaction: pH 7.4 to 8.4

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Clay content: 10 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### C horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loamy fine sand

Clay content: 3 to 18 percent

Reaction: pH 7.9 to 8.4

### 27A—Busby fine sandy loam, 0 to 2 percent slopes

#### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Busby and similar soils: 85 percent

##### Minor Components

Yamacall and similar soils: 0 to 4 percent

Chinook and similar soils: 0 to 4 percent

Soils that have slopes more than 2 percent: 0 to 4 percent

Twilight 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 or eolian material

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 8.2 inches

### 27C—Busby fine sandy loam, 2 to 8 percent slopes

#### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Busby and similar soils: 85 percent

#### Minor Components

Yamacall and similar soils: 0 to 4 percent  
 Yetull and similar soils: 0 to 4 percent  
 Soils that have slopes more than 8 percent: 0 to 4 percent  
 Twilight 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 or eolian material  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 8.2 inches

### 603D—Busby fine sandy loam, 8 to 15 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 8 to 15 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Busby and similar soils: 85 percent

#### Minor Components

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

#### Major Component Description

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

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 8.2 inches

### 960A—Busby loam, 0 to 2 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Busby and similar soils: 85 percent

#### Minor Components

Kremlin and similar soils: 0 to 5 percent  
 Busby fine sandy loam: 0 to 5 percent  
 Ryell and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or eolian material  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 8.6 inches

### 604E—Busby, gullied-Delpoint-Yawdim complex, 8 to 25 percent slopes

#### Setting

*Landform:*

- Busby—Sedimentary plains
- Delpoint—Hills
- Yawdim—Hills

*Position on landform:*

- Busby—Backslopes and footslopes
- Delpoint—Backslopes
- Yawdim—Shoulders and summits

*Slope:*

- Busby—8 to 15 percent
- Delpoint—8 to 25 percent
- Yawdim—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Busby and similar soils: 35 percent  
 Delpoint and similar soils: 30 percent  
 Yawdim and similar soils: 20 percent

#### Minor Components

Poorly drained soils: 0 to 3 percent  
 Soils that have slopes more than 15 percent: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Yamacall and similar soils: 0 to 3 percent  
 Cabbart and similar soils: 0 to 3 percent

### Major Component Description

#### Busby

*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 7.5 inches

#### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.7 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 2.5 inches

### 271E—Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes

### Setting

#### *Landform:*

- Busby—Sedimentary plains
- Blacksheep—Hills
- Twilight—Hills

#### *Position on landform:*

- Busby—Foothills
- Blacksheep—Shoulders and summits
- Twilight—Backslopes

#### *Slope:*

- Busby—8 to 15 percent
- Blacksheep—8 to 25 percent
- Twilight—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Busby and similar soils: 40 percent  
 Blacksheep and similar soils: 25 percent  
 Twilight and similar soils: 20 percent

#### Minor Components

Yamacall and similar soils: 0 to 4 percent  
 Areas of rock outcrop: 0 to 4 percent  
 Yetull and similar soils: 0 to 4 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

### Major Component Description

#### Busby

*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 8.2 inches

#### Blacksheep

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

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.3 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 4.2 inches

## **277D—Busby-Twilight fine sandy loams, 2 to 15 percent slopes**

### **Setting**

*Landform:*

- Busby—Sedimentary plains
- Twilight—Sedimentary plains

*Position on landform:*

- Busby—Foothills
- Twilight—Backslopes and shoulders

*Slope:*

- Busby—2 to 15 percent
- Twilight—2 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Busby and similar soils: 55 percent

Twilight and similar soils: 30 percent

#### **Minor Components**

Blacksheep and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

### **Major Component Description**

#### **Busby**

*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 8.2 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 4.2 inches

## **651C—Busby-Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes**

### **Setting**

*Landform:*

- Busby—Sedimentary plains
- Twilight—Sedimentary plains
- Blacksheep—Sedimentary plains

*Slope:*

- Busby—2 to 8 percent
- Twilight—2 to 8 percent
- Blacksheep—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Busby and similar soils: 35 percent

Twilight and similar soils: 30 percent

Blacksheep and similar soils: 25 percent

#### **Minor Components**

Yamacall and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 5 percent

### **Major Component Description**

#### **Busby**

*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 7.5 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 4.5 inches

**Blacksheep**

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

**916E—Busby-Twilight-Blacksheep fine sandy loams, 8 to 25 percent slopes****Setting***Landform:*

- Busby—Sedimentary plains
- Twilight—Hills
- Blacksheep—Hills

*Position on landform:*

- Busby—Backslopes and footslopes
- Twilight—Backslopes
- Blacksheep—Summits

*Slope:*

- Busby—8 to 15 percent
- Twilight—8 to 25 percent
- Blacksheep—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Busby and similar soils: 35 percent  
 Twilight and similar soils: 30 percent  
 Blacksheep and similar soils: 25 percent

**Minor Components**

Yamacall and similar soils: 0 to 5 percent  
 Yetull and similar soils: 0 to 5 percent

**Major Component Description****Busby**

*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 8.2 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 3.9 inches

**Blacksheep**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, sandy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.2 inches

**961C—Busby-Yetull complex, 0 to 8 percent slopes****Setting***Landform:*

- Busby—Sedimentary plains
- Yetull—Sedimentary plains

*Slope:*

- Busby—0 to 8 percent
- Yetull—0 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Busby and similar soils: 50 percent  
 Yetull and similar soils: 35 percent

**Minor Components**

Twilight and similar soils: 0 to 5 percent  
 Blacksheep and similar soils: 0 to 5 percent  
 Delpoint and similar soils: 0 to 3 percent  
 Areas of blowouts: 0 to 2 percent

**Major Component Description****Busby**

*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 7.5 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

**278E—Busby-Yetull complex, 2 to 15 percent slopes****Setting***Landform:*

- Busby—Sedimentary plains
- Yetull—Sedimentary plains

*Position on landform:*

- Busby—Foothslopes
- Yetull—Backslopes

*Slope:*

- Busby—2 to 15 percent
- Yetull—2 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Busby and similar soils: 45 percent  
 Yetull and similar soils: 35 percent

**Minor Components**

Yamacall and similar soils: 0 to 3 percent

Blacksheep and similar soils: 0 to 3 percent  
 Areas of blowouts: 0 to 3 percent  
 Soils that have slopes more than 15 percent: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent

**Major Component Description****Busby**

*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 8.2 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

**847E—Busby-Yetull-Rock outcrop complex, 8 to 25 percent slopes****Setting***Landform:*

- Busby—Hills
- Yetull—Sedimentary plains

*Position on landform:*

- Busby—Foothslopes and toe slopes
- Yetull—Foothslopes and toe slopes

*Slope:*

- Busby—8 to 25 percent
- Yetull—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Busby and similar soils: 40 percent  
 Yetull and similar soils: 30 percent  
 Rock outcrop: 15 percent

**Minor Components**

Blacksheep and similar soils: 0 to 5 percent

Chinook and similar soils: 0 to 5 percent  
Areas of blowouts: 0 to 5 percent

### Major Component Description

#### Busby

*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 7.5 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:* Areas of exposed sandstone and siltstone bedrock.

### Cabba Series

*Depth class:* Shallow  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Hills and sedimentary plains  
*Parent material:* Semiconsolidated loamy sedimentary beds  
*Slope range:* 8 to 70 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Cabba silt loam in an area of Cambert-Cherry-Cabba silt loams, 8 to 25 percent slopes, in an area of rangeland; 1,000 feet north and 800 feet east of southwest corner of sec. 18, T. 3 N., R. 45 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—3 to 8 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; few fine masses of lime; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk2—8 to 14 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine and very fine pores; common fine and medium irregular masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

Cr—14 to 60 inches; pale yellow (2.5Y 7/4) semiconsolidated sandstone and siltstone, olive yellow (2.5Y 6/6) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches or to the paralithic contact; frozen November through March; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees or higher  
*Depth to Cr horizon:* 10 to 20 inches

#### A horizon

Hue: 10YR or 2.5Y  
Value: 4 to 6 dry; 3 or 4 moist  
Chroma: 2 to 4  
Texture: Loam or silt loam  
Clay content: 10 to 27 percent  
Calcium carbonate equivalent: 5 to 10 percent  
Reaction: pH 7.4 to 9.0

#### Bk horizons

Hue: 10YR or 2.5Y  
Value: 5 to 7 dry; 4 to 6 moist  
Chroma: 2 to 4  
Texture: Silty clay loam or silt loam  
Clay content: 20 to 35 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.4 to 9.0

### Cabbart Series

*Depth class:* Shallow  
*Drainage class:* Well drained  
*Permeability:* Moderate

*Landform:* Hills and sedimentary plains  
*Parent material:* Semiconsolidated loamy sedimentary beds  
*Slope range:* 2 to 70 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Cabbart silt loam in an area of Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes, in an area of rangeland; 1,900 feet east and 10 feet south of the northwest corner of sec. 3, T. 12 N., R. 45 E.

A—0 to 4 inches; light olive brown (2.5Y 5/4) silt loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and slightly plastic; common fine and very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—4 to 15 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; common fine and medium irregular masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Cr1—15 to 33 inches; pale yellow (2.5Y 7/4) semiconsolidated siltstone, light olive brown (2.5Y 5/4) moist.

Cr2—33 to 60 inches; pale yellow (2.5Y 7/4) semiconsolidated shale, light yellowish brown (2.5Y 6/4) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches or to the paralithic contact; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F  
*Depth to Cr horizon:* 10 to 20 inches

#### A horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 to 5 moist  
 Chroma: 2 to 4  
 Texture: Loam or silt loam

Clay content: 18 to 27 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

#### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 to 5 moist  
 Chroma: 2 to 4  
 Texture: Loam or silt loam  
 Clay content: 18 to 27 percent  
 Calcium carbonate equivalent: 10 to 25 percent  
 Reaction: pH 7.4 to 9.0

## 994E—Cabbart-Bullock, eroded complex, 2 to 25 percent slopes

### Setting

#### Landform:

- Cabbart—Hills
- Bullock—Sedimentary plains

#### Position on landform:

- Cabbart—Backslopes and shoulders
- Bullock—Footslopes and toe slopes

#### Slope:

- Cabbart—2 to 25 percent
- Bullock—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cabbart and similar soils: 45 percent  
 Bullock and similar soils: 35 percent

#### Minor Components

Cambeth and similar soils: 0 to 10 percent  
 Havre and similar soils: 0 to 10 percent

### Major Component Description

#### Cabbart

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

**Bullock**

*Surface layer texture:* Clay 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  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.0 inches

**605D—Cabbart-Cambeth silt loams, 8 to 15 percent slopes****Setting***Landform:*

- Cabbart—Sedimentary plains
- Cambeth—Sedimentary plains

*Position on landform:*

- Cabbart—Shoulders and summits
- Cambeth—Backslopes

*Slope:*

- Cabbart—8 to 15 percent
- Cambeth—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Cabbart and similar soils: 50 percent  
 Cambeth and similar soils: 35 percent

**Minor Components**

Yamacall and similar soils: 0 to 4 percent  
 Yawdim and similar soils: 0 to 4 percent  
 Twilight and similar soils: 0 to 4 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

**Major Component Description****Cabbart**

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.2 inches

**Cambeth**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 6.6 inches

**18E—Cabbart-Havre complex, 0 to 35 percent slopes****Setting***Landform:*

- Cabbart—Sedimentary plains
- Havre—Flood plains

*Slope:*

- Cabbart—2 to 35 percent
- Havre—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Cabbart and similar soils: 50 percent  
 Havre and similar soils: 20 percent

**Minor Components**

Areas of rock outcrop: 0 to 3 percent  
 Bigsandy and similar soils: 0 to 2 percent  
 Glendive and similar soils: 0 to 2 percent  
 Glendive, saline and similar soils: 0 to 2 percent  
 Harlake and similar soils: 0 to 2 percent  
 Kobase and similar soils: 0 to 2 percent  
 Yamacall 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, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 inches

**Havre**

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* Frequent

*Available water capacity:* Mainly 9.8 inches

### **Rock outcrop**

*Definition:* Areas of exposed sandstone and siltstone bedrock.

## **386F—Cabbart-Rock outcrop-Delpoint complex, 15 to 50 percent slopes**

### **Setting**

*Landform:*

- Cabbart—Hills
- Delpoint—Hills

*Position on landform:*

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

*Slope:*

- Cabbart—15 to 50 percent
- Delpoint—15 to 35 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Cabbart and similar soils: 35 percent

Rock outcrop: 35 percent

Delpoint and similar soils: 20 percent

#### **Minor Components**

Yawdim and similar soils: 0 to 3 percent

Yamacall and similar soils: 0 to 3 percent

Twilight and similar soils: 0 to 2 percent

Soils that have slopes less than 15 percent: 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, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

### **Rock outcrop**

*Definition:* Areas of exposed sandstone and siltstone bedrock.

### **Delpoint**

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.2 inches

## **3F—Cabbart-Rock outcrop-Yawdim complex, 15 to 70 percent slopes**

### **Setting**

*Landform:*

- Cabbart—Hills
- Yawdim—Hills

*Position on landform:*

- Cabbart—Backslopes and shoulders
- Yawdim—Backslopes and shoulders

*Slope:*

- Cabbart—15 to 70 percent
- Yawdim—15 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Cabbart and similar soils: 35 percent

Rock outcrop: 30 percent

Yawdim and similar soils: 20 percent

#### **Minor Components**

Delpoint and similar soils: 0 to 5 percent

Soils that have slopes less than 15 percent: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

### **Major Component Description**

#### **Cabbart**

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

### Rock outcrop

*Definition:* Areas of exposed shale and siltstone bedrock.

### 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 3.1 inches

## 842F—Cabbart-Yawdim-Rock outcrop complex, 15 to 70 percent slopes

### Setting

*Landform:*

- Cabbart—Hills
- Yawdim—Hills

*Position on landform:*

- Cabbart—Backslopes and shoulders
- Yawdim—Backslopes

*Slope:*

- Cabbart—15 to 70 percent
- Yawdim—15 to 70 percent
- Rock outcrop—15 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cabbart and similar soils: 30 percent

Yawdim and similar soils: 30 percent

Rock outcrop: 30 percent

#### Minor Components

Delpoint and similar soils: 0 to 2 percent

Cambeth and similar soils: 0 to 2 percent

Lonna and similar soils: 0 to 2 percent

Kobase and similar soils: 0 to 2 percent

Yamacall and similar soils: 0 to 2 percent

### Major Component Description

#### Cabbart

*Surface layer texture:* Silt loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.8 inches

### Yawdim

*Surface layer texture:* Silty clay loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated shale residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.2 inches

### Rock outcrop

*Definition:* Areas of exposed shale and siltstone bedrock.

### Cambert Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Hills and sedimentary plains

*Parent material:* Semiconsolidated silty sedimentary beds

*Slope range:* 2 to 45 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Cambert silt loam in an area of Cherry-Cambert-Cabba silt loams, 8 to 15 percent slopes, in an area of rangeland; 1,300 feet west and 1,200 feet north of southeast corner sec. 36, T. 2 N., R. 46 E.

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

Bw—3 to 11 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly

plastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—11 to 18 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—18 to 26 inches; pale yellow (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; hard, firm, slightly sticky and plastic; few fine and very fine roots; common fine and very fine pores; many medium and coarse threads and masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—26 to 60 inches; light brownish gray (2.5Y 6/2) siltstone, grayish brown (2.5Y 5/2) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to the Cr horizon:* 20 to 40 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3 or 4

Clay content: 18 to 25 percent

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: 3 or 4

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

#### Bk horizons

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 10 to 30 percent

Reaction: pH 7.4 to 9.0

## 962F—Cambert-Bigsheep-Golva complex, 8 to 45 percent slopes

### Setting

#### Landform:

- Cambert—Hills
- Bigsheep—Hills
- Golva—Sedimentary plains

#### Position on landform:

- Cambert—Shoulders and summits
- Bigsheep—Shoulders
- Golva—Backslopes

#### Slope:

- Cambert—8 to 25 percent
- Bigsheep—8 to 45 percent
- Golva—8 to 15 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cambert and similar soils: 30 percent

Bigsheep and similar soils: 25 percent

Golva and similar soils: 20 percent

#### Minor Components

Dast and similar soils: 0 to 15 percent

Lisk and similar soils: 0 to 10 percent

### Major Component Description

#### Cambert

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, silty sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.6 inches

#### Bigsheep

*Surface layer texture:* Very gravelly loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.4 inches

**Golva**

*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 10.9 inches

### **731E—Cambert-Cabba-Ringling complex, 8 to 45 percent slopes**

#### **Setting**

*Landform:*

- Cambert—Hills
- Cabba—Hills
- Ringling—Hills

*Position on landform:*

- Cambert—Backslopes and footslopes
- Cabba—Backslopes and shoulders
- Ringling—Shoulders and summits

*Slope:*

- Cambert—8 to 25 percent
- Cabba—25 to 45 percent
- Ringling—25 to 45 percent

*Elevation:* 2,900 to 3,760 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

Cambert and similar soils: 40 percent  
 Cabba and similar soils: 25 percent  
 Ringling and similar soils: 20 percent

#### **Minor Components**

Bitton and similar soils: 0 to 3 percent  
 Cherry and similar soils: 0 to 3 percent  
 Sagedale and similar soils: 0 to 3 percent  
 Lisk and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent

#### **Major Component Description**

#### **Cambert**

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

*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.7 inches**Cabba**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

**Ringling**

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 inches

### **733E—Cambert-Cabba-Widen complex, 15 to 25 percent slopes**

#### **Setting**

*Landform:*

- Cambert—Hills
- Cabba—Hills
- Widen—Hills

*Position on landform:*

- Cambert—Backslopes
- Cabba—Shoulders and summits
- Widen—Backslopes and shoulders

*Slope:*

- Cambert—15 to 25 percent
- Cabba—15 to 25 percent
- Widen—15 to 25 percent

*Elevation:* 2,900 to 3,760 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

Cambert and similar soils: 35 percent  
 Cabba and similar soils: 25 percent  
 Widen and similar soils: 25 percent

**Minor Components**

Wayden and similar soils: 0 to 4 percent  
 Cherry and similar soils: 0 to 4 percent  
 Dast and similar soils: 0 to 4 percent  
 Areas of rock outcrop: 0 to 3 percent

**Major Component Description****Cambert**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.7 inches

**Cabba**

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

**Widen**

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

**734E—Cambert-Cherry-Cabba silt loams,  
12 to 25 percent slopes****Setting***Landform:*

- Cambert—Hills
- Cherry—Sedimentary plains
- Cabba—Hills

*Position on landform:*

- Cambert—Backslopes
- Cherry—Backslopes and footslopes
- Cabba—Shoulders and summits

*Slope:*

- Cambert—12 to 25 percent
- Cherry—12 to 15 percent
- Cabba—12 to 25 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Cambert and similar soils: 35 percent  
 Cherry and similar soils: 30 percent  
 Cabba and similar soils: 20 percent

**Minor Components**

Dast and similar soils: 0 to 3 percent  
 Wayden and similar soils: 0 to 3 percent  
 Widen and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Soils that have slopes less than 12 percent: 0 to 3 percent

**Major Component Description****Cambert**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.7 inches

**Cherry**

*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 10.6 inches

**Cabba**

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

### 732C—Cambert-Widen complex, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Cambert—Sedimentary plains
- Widen—Sedimentary plains

##### *Slope:*

- Cambert—2 to 8 percent
- Widen—2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Cambert and similar soils: 45 percent  
Widen and similar soils: 40 percent

##### Minor Components

Sagedale and similar soils: 0 to 3 percent  
Dast and similar soils: 0 to 3 percent  
Cabba and similar soils: 0 to 3 percent  
Wayden and similar soils: 0 to 3 percent  
Soils that have slopes more than 8 percent: 0 to 3 percent

#### Major Component Description

##### Cambert

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, silty sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.7 inches

##### Widen

*Surface layer texture:* Silty clay loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Interbedded shale and siltstone residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.9 inches

### 732D—Cambert-Widen complex, 8 to 15 percent slopes

#### Setting

##### *Landform:*

- Cambert—Sedimentary plains
- Widen—Sedimentary plains

##### *Position on landform:*

- Cambert—Backslopes and shoulders
- Widen—Backslopes and footslopes

##### *Slope:*

- Cambert—8 to 15 percent
- Widen—8 to 15 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Cambert and similar soils: 45 percent  
Widen and similar soils: 40 percent

##### Minor Components

Sagedale and similar soils: 0 to 3 percent  
Cabba and similar soils: 0 to 3 percent  
Dast and similar soils: 0 to 3 percent  
Wayden and similar soils: 0 to 3 percent  
Soils that have slopes less than 8 percent: 0 to 3 percent

#### Major Component Description

##### Cambert

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, silty sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.7 inches

##### Widen

*Surface layer texture:* Silty clay loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Interbedded shale and siltstone residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.9 inches

## Cambeth Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Hills and sedimentary plains

*Parent material:* Semiconsolidated silty sedimentary beds

*Slope range:* 2 to 45 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed, frigid Aridic Ustochrepts

### Typical Pedon

Cambeth silt loam in an area of Cambeth-Cabbart-Rock outcrop complex, 8 to 45 percent slopes, in an area of rangeland; 1,100 feet south and 200 feet east of northwest corner of sec. 9, T. 7 N., R. 45 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, friable, nonsticky and slightly plastic; common medium and fine roots; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—3 to 11 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate medium angular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—11 to 20 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate medium and coarse angular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; few fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—20 to 32 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak fine and medium angular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; common medium masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated siltstone, light olive brown (2.5Y 5/4) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to Bk horizon:* 10 to 15 inches

*Depth to Cr horizon:* 20 to 40 inches

*Soil phases:* Gullied and noncalcareous

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

#### Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 7.4 to 8.4

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 10 to 25 percent

Reaction: pH 7.9 to 9.0

## 963E—Cambeth, calcareous-Cabbart-Lonna silt loams, 15 to 35 percent slopes

### Setting

#### Landform:

- Cambeth—Hills
- Cabbart—Hills
- Lonna—Hills

#### Position on landform:

- Cambeth—Shoulders
- Cabbart—Summits
- Lonna—Backslopes

#### Slope:

- Cambeth—15 to 25 percent
- Cabbart—15 to 35 percent
- Lonna—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cambeth and similar soils: 30 percent  
 Cabbart and similar soils: 25 percent  
 Lonna and similar soils: 20 percent

#### Minor Components

Busby and similar soils: 0 to 15 percent  
 Yawdim and similar soils: 0 to 10 percent

### Major Component Description

#### Cambeth

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.5 inches

#### Cabbart

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

#### Lonna

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.8 inches

### 297E—Cambeth, calcareous-Cabbart-Yawdim complex, 15 to 25 percent slopes

### Setting

*Landform:*

- Cambeth—Hills
- Cabbart—Hills

- Yawdim—Hills

*Position on landform:*

- Cambeth—Backslopes and footslopes
- Cabbart—Shoulders and summits
- Yawdim—Backslopes and shoulders

*Slope:*

- Cambeth—15 to 25 percent
- Cabbart—15 to 25 percent
- Yawdim—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cambeth and similar soils: 35 percent  
 Cabbart and similar soils: 25 percent  
 Yawdim and similar soils: 25 percent

#### Minor Components

Megonot and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Lonna and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Twilight and similar soils: 0 to 3 percent

### Major Component Description

#### Cambeth

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

#### Cabbart

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 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 3.1 inches

### **964E—Cambeth, calcareous-Cabbart-Yawdim complex, 4 to 25 percent slopes**

#### **Setting**

*Landform:*

- Cambeth—Sedimentary plains
- Cabbart—Hills
- Yawdim—Sedimentary plains

*Position on landform:*

- Cambeth—Backslopes and footslopes
- Cabbart—Backslopes and shoulders
- Yawdim—Backslopes and shoulders

*Slope:*

- Cambeth—4 to 15 percent
- Cabbart—4 to 25 percent
- Yawdim—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

Cambeth and similar soils: 40 percent  
 Cabbart and similar soils: 25 percent  
 Yawdim and similar soils: 20 percent

#### **Minor Components**

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

#### **Major Component Description**

##### **Cambeth**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.0 inches

##### **Cabbart**

*Surface layer texture:* Silt loam

*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.0 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 2.4 inches

### **228F—Cambeth, noncalcareous-Lilsheep-Lonna complex, 15 to 45 percent slopes**

#### **Setting**

*Landform:*

- Cambeth—Hills
- Lilsheep—Relict stream terraces
- Lonna—Hills

*Position on landform:*

- Cambeth—Backslopes and shoulders
- Lilsheep—Shoulders and summits
- Lonna—Backslopes

*Slope:*

- Cambeth—15 to 45 percent
- Lilsheep—15 to 45 percent
- Lonna—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

Cambeth and similar soils: 40 percent  
 Lilsheep and similar soils: 25 percent  
 Lonna and similar soils: 20 percent

#### **Minor Components**

Floweree and similar soils: 0 to 5 percent  
 Cabbart and similar soils: 0 to 5 percent  
 Soils that have slopes less than 15 percent: 0 to 5 percent

### Major Component Description

#### Cambeth

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

#### Lilsheep

*Surface layer texture:* Gravelly loam  
*Depth class:* Deep (40 to 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.6 inches

#### Lonna

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.3 inches

### 297C—Cambeth, noncalcareous-Megonot complex, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Cambeth—Sedimentary plains
- Megonot—Sedimentary plains

##### *Slope:*

- Cambeth—2 to 8 percent
- Megonot—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Cambeth and similar soils: 45 percent  
 Megonot and similar soils: 40 percent

#### Minor Components

Lonna and similar soils: 0 to 3 percent

Cabbart and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Cambeth soils that are calcareous: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 0 to 3 percent

### Major Component Description

#### Cambeth

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

#### Megonot

*Surface layer texture:* Silty clay loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.1 inches

### 297D—Cambeth, noncalcareous-Megonot complex, 8 to 15 percent slopes

#### Setting

##### *Landform:*

- Cambeth—Sedimentary plains
- Megonot—Sedimentary plains

##### *Position on landform:*

- Cambeth—Shoulders and summits
- Megonot—Backslopes and shoulders

##### *Slope:*

- Cambeth—8 to 15 percent
- Megonot—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Cambeth and similar soils: 45 percent  
 Megonot and similar soils: 40 percent

#### Minor Components

Yawdim and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 3 percent  
 Cabbart and similar soils: 0 to 3 percent  
 Lonna and similar soils: 0 to 3 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

### Major Component Description

#### Cambeth

*Surface layer texture: Silt loam*  
*Depth class: Moderately deep (20 to 40 inches)*  
*Drainage class: Well drained*  
*Dominant parent material: Semiconsolidated, silty sedimentary beds*  
*Native plant cover type: Rangeland*  
*Flooding: None*  
*Available water capacity: Mainly 5.6 inches*

#### Megonot

*Surface layer texture: Silty clay loam*  
*Depth class: Moderately deep (20 to 40 inches)*  
*Drainage class: Well drained*  
*Dominant parent material: Semiconsolidated shale residuum*  
*Native plant cover type: Rangeland*  
*Flooding: None*  
*Available water capacity: Mainly 3.1 inches*

### 918E—Cambeth-Cabbart complex, dissected, 8 to 25 percent slopes

#### Setting

##### Landform:

- Cambeth—Sedimentary plains
- Cabbart—Hills

##### Position on landform:

- Cambeth—Backslopes
- Cabbart—Shoulders and summits

##### Slope:

- Cambeth—8 to 15 percent
- Cabbart—8 to 25 percent

*Elevation: 2,240 to 2,900 feet*

*Mean annual precipitation: 11 to 14 inches*

*Frost-free period: 110 to 135 days*

#### Composition

#### Major Components

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

#### Minor Components

Yawdim and similar soils: 0 to 5 percent

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

### Major Component Description

#### Cambeth

*Surface layer texture: Silt loam*  
*Depth class: Moderately deep (20 to 40 inches)*  
*Drainage class: Well drained*  
*Dominant parent material: Semiconsolidated, loamy sedimentary beds*  
*Native plant cover type: Rangeland*  
*Flooding: None*  
*Available water capacity: Mainly 5.6 inches*

#### Cabbart

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

### 607C—Cambeth-Cabbart silt loams, 2 to 8 percent slopes

#### Setting

##### Landform:

- Cambeth—Sedimentary plains
- Cabbart—Sedimentary plains

##### Position on landform:

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

##### Slope:

- Cambeth—2 to 8 percent
- Cabbart—2 to 8 percent

*Elevation: 2,240 to 2,900 feet*

*Mean annual precipitation: 11 to 14 inches*

*Frost-free period: 110 to 135 days*

#### Composition

#### Major Components

Cambeth and similar soils: 60 percent  
 Cabbart and similar soils: 25 percent

#### Minor Components

Lonna and similar soils: 0 to 5 percent  
 Alona and similar soils: 0 to 5 percent  
 Soils that have slopes more than 8 percent: 0 to 5 percent

### Major Component Description

#### Cambeth

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 6.6 inches

#### Cabbart

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.2 inches

### 917D—Cambeth-Cabbart silt loams, 4 to 15 percent slopes

#### Setting

##### *Landform:*

- Cambeth—Sedimentary plains
- Cabbart—Sedimentary plains

##### *Slope:*

- Cambeth—4 to 15 percent
- Cabbart—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Cambeth and similar soils: 55 percent  
 Cabbart and similar soils: 30 percent

#### Minor Components

Lonna and similar soils: 0 to 5 percent  
 Kobase and similar soils: 0 to 5 percent  
 Yawdim and similar soils: 0 to 5 percent

### Major Component Description

#### Cambeth

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.4 inches

#### Cabbart

*Surface layer texture:* Silt loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, silty sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.2 inches

### 293E—Cambeth-Cabbart-Kirby complex, 8 to 45 percent slopes

#### Setting

##### *Landform:*

- Cambeth—Hills
- Cabbart—Hills
- Kirby—Hills

##### *Position on landform:*

- Cambeth—Backslopes and footslopes
- Cabbart—Backslopes and shoulders
- Kirby—Shoulders and summits

##### *Slope:*

- Cambeth—8 to 25 percent
- Cabbart—8 to 45 percent
- Kirby—8 to 45 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Cambeth and similar soils: 40 percent  
 Cabbart and similar soils: 25 percent  
 Kirby and similar soils: 20 percent

#### Minor Components

Floweree and similar soils: 0 to 5 percent  
 Lonna and similar soils: 0 to 5 percent  
 Mego not and similar soils: 0 to 3 percent  
 Yawdim and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 2 percent  
 Twilight and similar soils: 0 to 2 percent

## Major Component Description

### Cambeth

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, silty sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.6 inches

### Cabbart

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

### Kirby

*Surface layer texture:* Channery loam

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

*Drainage class:* Excessively drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.3 inches

## 296F—Cambeth-Cabbart-Rock outcrop complex, 8 to 45 percent slopes

### Setting

*Landform:*

- Cambeth—Sedimentary plains
- Cabbart—Hills

*Position on landform:*

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

*Slope:*

- Cambeth—8 to 15 percent
- Cabbart—8 to 45 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cambeth and similar soils: 35 percent

Cabbart and similar soils: 30 percent

Rock outcrop: 20 percent

#### Minor Components

Twilight and similar soils: 0 to 5 percent

Yawdim and similar soils: 0 to 5 percent

Lonna and similar soils: 0 to 5 percent

## Major Component Description

### Cambeth

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, silty sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.6 inches

### Cabbart

*Surface layer texture:* Silt loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

### Rock outcrop

*Definition:* Areas of exposed siltstone bedrock.

## Chanta Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Stream terraces

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Chanta loam, 0 to 2 percent slopes, in an area of rangeland; 2,500 feet east and 200 feet north of southwest corner of sec. 25, T. 9 N., R. 47 E.

A—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular

blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

**Bw**—6 to 18 inches; pale brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

**C1**—18 to 27 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

**2C2**—27 to 60 inches; grayish brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose, loose, nonsticky and nonplastic; 50 percent pebbles; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 15 inches

#### A horizon

Value: 4 or 5 dry

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 15 to 25 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 to 4

Texture: Loam or silt loam

Clay content: 15 to 27 percent

Reaction: pH 6.6 to 8.4

#### C1 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 15 to 27 percent

Reaction: pH 7.9 to 9.0

#### 2C2 horizon

Hue: 10YR or 2.5Y

Clay content: 0 to 5 percent

Content of rock fragments: 15 to 60 percent—0

to 5 percent cobbles, 15 to 55 percent pebbles

Reaction: pH 7.9 to 9.0

## 33A—Chanta loam, 0 to 2 percent slopes

### Setting

*Landform:* Stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Chanta and similar soils: 85 percent

#### Minor Components

Chinook and similar soils: 0 to 5 percent

Tinsley and similar soils: 0 to 5 percent

Soils that have slopes more than 2 percent: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.6 inches

## Cherry Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 15 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Cherry silt loam in an area of Cambert-Cherry-Cabba silt loams, 8 to 25 percent slopes, in an area of rangeland; 2,100 feet east and 1,300 feet south of northwest corner of sec. 24, T. 1 N., R. 46 E.

**A**—0 to 4 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine and

medium subangular blocky structure parting to moderate fine granular structure; soft, very friable, slightly sticky and plastic; common fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—4 to 16 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine and very fine roots; common fine and very fine pores; common fine and medium irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—16 to 33 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to strong fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; common fine and very fine pores; common medium irregular masses of lime; common fine gypsum threads; violently effervescent; moderately alkaline; gradual wavy boundary.

By—33 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; common fine gypsum threads; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Moisture control section:* Between 4 and 12 inches

#### A horizon

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 3 or 4 moist  
Chroma: 2 or 3  
Clay content: 18 to 27 percent  
Reaction: pH 6.6 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y  
Value: 5 to 7 dry; 4 or 5 moist  
Chroma: 3 or 4  
Texture: Silt loam or silty clay loam  
Clay content: 18 to 35 percent  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.9 to 9.0

#### Bky horizon

Hue: 10YR or 2.5Y  
Value: 6 or 7 dry; 4 to 6 moist  
Chroma: 3 or 4  
Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent  
Calcium carbonate equivalent: 5 to 15 percent  
Gypsum content: 1 to 3 percent  
Reaction: pH 7.9 to 9.0

#### By horizon

Hue: 10YR or 2.5Y  
Value: 6 or 7 dry; 4 to 6 moist  
Chroma: 3 or 4  
Texture: Silt loam or silty clay loam  
Clay content: 18 to 35 percent  
Gypsum content: 1 to 3 percent  
Reaction: pH 7.9 to 9.0

### 56A—Cherry silt loam, 0 to 2 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Cherry and similar soils: 85 percent

#### Minor Components

Cambert and similar soils: 0 to 4 percent  
Sagedale and similar soils: 0 to 4 percent  
Farnuf and similar soils: 0 to 4 percent  
Soils that have slopes more than 2 percent: 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 10.6 inches

### 56C—Cherry silt loam, 2 to 8 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cherry and similar soils: 85 percent

#### Minor Components

Cambert and similar soils: 0 to 3 percent  
 Doney and similar soils: 0 to 3 percent  
 Sagedale and similar soils: 0 to 3 percent  
 Farnuf and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 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 10.6 inches

### 561C—Cherry-Cambert silt loams, 2 to 8 percent slopes

#### Setting

*Landform:*

- Cherry—Sedimentary plains
- Cambert—Sedimentary plains

*Position on landform:*

- Cherry—Foothills
- Cambert—Backslopes and shoulders

*Slope:*

- Cherry—2 to 8 percent
- Cambert—2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cherry and similar soils: 50 percent  
 Cambert and similar soils: 35 percent

#### Minor Components

Dast and similar soils: 0 to 3 percent  
 Lisk and similar soils: 0 to 3 percent

Cabba and similar soils: 0 to 3 percent  
 Sagedale and similar soils: 0 to 3 percent  
 Saline soils: 0 to 3 percent

### Major Component Description

#### Cherry

*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 10.6 inches

#### Cambert

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.7 inches

### 562D—Cherry-Cambert-Cabba silt loams, 8 to 15 percent slopes

#### Setting

*Landform:*

- Cherry—Sedimentary plains
- Cambert—Sedimentary plains
- Cabba—Sedimentary plains

*Position on landform:*

- Cherry—Backslopes and foothills
- Cambert—Backslopes and shoulders
- Cabba—Shoulders and summits

*Slope:*

- Cherry—8 to 15 percent
- Cambert—8 to 15 percent
- Cabba—8 to 15 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Cherry and similar soils: 40 percent  
 Cambert and similar soils: 30 percent  
 Cabba and similar soils: 15 percent

### Minor Components

Sagedale and similar soils: 0 to 3 percent  
 Dast and similar soils: 0 to 3 percent  
 Shambo and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

### Major Component Description

#### Cherry

*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 10.6 inches

#### Cambert

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.7 inches

#### Cabba

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

### Chinook Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium or eolian material  
*Slope range:* 2 to 15 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Chinook fine sandy loam in an area of Chinook-Twilight fine sandy loams, 2 to 12 percent slopes, in an area of rangeland; 1,500 feet north and 1,800 feet west of southeast corner sec. 23, T. 8 N., R. 53 E.

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky parting to moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; slightly alkaline; clear wavy boundary.

Bw—4 to 13 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk1—13 to 26 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; common fine and very fine pores; common fine masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—26 to 38 inches; light brownish gray (2.5Y 6/2) fine sandy loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; common fine rounded masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—38 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 8 and 24 inches  
*Mollic epipedon thickness:* 7 to 15 inches thick  
*Soil phases:* Alkaline substratum

#### A horizon

Hue: 10YR or 2.5Y  
 Value: 2 or 3 moist  
 Chroma: 2 or 3

Texture: Fine sandy loam or sandy loam  
Clay content: 5 to 18 percent  
Reaction: pH 6.6 to 8.4

*Bw horizon*

Hue: 10YR or 2.5Y  
Value: 4 or 5 dry; 3 or 4 moist  
Chroma: 2 or 3  
Texture: Fine sandy loam or sandy loam  
Clay content: 5 to 18 percent  
Reaction: pH 6.6 to 8.4

*Bk horizons*

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 to 4  
Texture: Fine sandy loam or sandy loam  
Clay content: 5 to 18 percent  
Calcium carbonate equivalent: 3 to 15 percent  
Reaction: pH 6.6 to 9.6

*C horizon*

Hue: 10YR or 2.5Y  
Value: 5 to 7 dry; 4 to 6 moist  
Chroma: 2 to 4  
Texture: Fine sandy loam or loamy fine sand  
Clay content: 5 to 15 percent  
Reaction: pH 6.6 to 9.0

*C horizon (alkali substratum phase)*

Electrical conductivity: 4 to 8 mmhos/cm  
Sodium absorption ratio: 25 to 40  
Reaction: pH 7.9 to 9.6

**35C—Chinook fine sandy loam, 2 to 8 percent slopes**

**Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition**

**Major Components**

Chinook and similar soils: 85 percent

**Minor Components**

Twilight and similar soils: 0 to 4 percent  
Kremlin and similar soils: 0 to 4 percent  
Delpoint and similar soils: 0 to 4 percent

Soils that have slopes more than 8 percent: 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 or eolian material  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 7.7 inches

**652C—Chinook fine sandy loam, alkali substratum, 2 to 8 percent slopes**

**Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition**

**Major Components**

Chinook and similar soils: 85 percent

**Minor Components**

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

**Major Component Description**

*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 7.9 inches

**608C—Chinook sandy loam, 2 to 8 percent slopes**

**Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Chinook and similar soils: 85 percent

### Minor Components

Twilight and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 5 percent

### Major Component Description

*Surface layer texture:* 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 8.1 inches

## 353C—Chinook-Kremlin complex, 2 to 6 percent slopes

### Setting

*Landform:*

- Chinook—Sedimentary plains
- Kremlin—Sedimentary plains

*Slope:*

- Chinook—2 to 6 percent
- Kremlin—2 to 6 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Chinook and similar soils: 50 percent

Kremlin and similar soils: 40 percent

#### Minor Components

Delpoint and similar soils: 0 to 4 percent

Twilight and similar soils: 0 to 3 percent

Soils that have slopes more than 6 percent: 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 7.7 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 10.8 inches

## 357D—Chinook-Lihen-Twilight complex, 8 to 15 percent slopes

### Setting

*Landform:*

- Chinook—Sedimentary plains
- Lihen—Sedimentary plains
- Twilight—Sedimentary plains

*Position on landform:*

- Chinook—Backslopes and footslopes
- Lihen—Backslopes and shoulders
- Twilight—Shoulders and summits

*Slope:*

- Chinook—8 to 15 percent
- Lihen—8 to 15 percent
- Twilight—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Chinook and similar soils: 35 percent

Lihen and similar soils: 30 percent

Twilight and similar soils: 20 percent

#### Minor Components

Blacksheep and similar soils: 0 to 3 percent

Delpoint and similar soils: 0 to 3 percent

Yamacall and similar soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Soils that have slopes less than 8 percent: 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 7.7 inches

#### Lihen

*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 5.2 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 4.2 inches

### 352D—Chinook-Twilight fine sandy loams, 2 to 12 percent slopes

#### Setting

##### *Landform:*

- Chinook—Sedimentary plains
- Twilight—Sedimentary plains

##### *Position on landform:*

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

##### *Slope:*

- Chinook—2 to 12 percent
- Twilight—2 to 12 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Chinook and similar soils: 50 percent  
 Twilight and similar soils: 40 percent

### Minor Components

Blacksheep and similar soils: 0 to 3 percent  
 Kremlin and similar soils: 0 to 3 percent  
 Delpoint and similar soils: 0 to 2 percent  
 Soils that have slopes more than 12 percent: 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 7.7 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 4.2 inches

### 965C—Chinook-Twilight fine sandy loams, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Chinook—Sedimentary plains
- Twilight—Sedimentary plains

##### *Slope:*

- Chinook—2 to 8 percent
- Twilight—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Chinook and similar soils: 50 percent  
 Twilight and similar soils: 40 percent

#### Minor Components

Kremlin and similar soils: 0 to 5 percent  
 Blacksheep and similar soils: 0 to 5 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 8.2 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 4.0 inches

**966D—Chinook-Twilight-Blacksheep fine sandy loams, 8 to 15 percent slopes****Setting***Landform:*

- Chinook—Sedimentary plains
- Twilight—Sedimentary plains
- Blacksheep—Sedimentary plains

*Slope:*

- Chinook—8 to 15 percent
- Twilight—8 to 15 percent
- Blacksheep—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Chinook and similar soils: 40 percent  
 Twilight and similar soils: 25 percent  
 Blacksheep and similar soils: 20 percent

**Minor Components**

Kremlin and similar soils: 0 to 5 percent  
 Cabbart and similar soils: 0 to 5 percent  
 Areas of rock outcrop: 0 to 5 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 7.8 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 4.3 inches

**Blacksheep**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, sandy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.0 inches

**355C—Chinook-Twilight-Eapa complex, 2 to 8 percent slopes****Setting***Landform:*

- Chinook—Sedimentary plains
- Twilight—Sedimentary plains
- Eapa—Sedimentary plains

*Position on landform:*

- Chinook—Backslopes
- Twilight—Shoulders and summits
- Eapa—Footslopes

*Slope:*

- Chinook—2 to 8 percent
- Twilight—2 to 8 percent
- Eapa—2 to 6 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Chinook and similar soils: 35 percent  
 Twilight and similar soils: 30 percent  
 Eapa and similar soils: 20 percent

### Minor Components

Delpoint and similar soils: 0 to 4 percent  
 Ethridge and similar soils: 0 to 4 percent  
 Blacksheep and similar soils: 0 to 4 percent  
 Soils that have slopes more than 8 percent: 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 7.7 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 4.2 inches

#### Eapa

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 11.1 inches

### Cohagen Series

*Depth class:* Shallow  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid  
*Landform:* Hills  
*Parent material:* Semiconsolidated sandy sedimentary beds

*Slope range:* 15 to 25 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Cohagen fine sandy loam in an area of Lisk-Cohagen-Dast fine sandy loams, 8 to 25 percent slopes, in an area of rangeland; 1,300 feet east and 600 feet north of the southwest corner of sec. 4, T. 1 N., R. 45 E.

A—0 to 4 inches; light olive brown (2.5Y 5/4) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common coarse, medium, fine, and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—4 to 13 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common coarse, medium, fine, and very fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr1—13 to 30 inches; olive yellow (2.5Y 6/6) sandstone, light olive brown (2.5Y 5/4) moist.

Cr2—30 to 60 inches; pale yellow (2.5Y 7/4) sandstone, light olive brown (2.5Y 5/4) moist.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Depth to Cr horizon:* 10 to 20 inches

#### A horizon

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

#### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Clay content: 10 to 18 percent

Calcium carbonate equivalent: 1 to 10 percent  
Reaction: pH 7.9 to 8.4

## Cooers Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 2 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Cooers loam, in an area of rangeland, 2,100 feet north and 2,500 feet east of the southwest corner of sec. 23, T. 3 S., R. 44 E., (in Rosebud County, MT).

A—0 to 4 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; moderate medium platy structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

Bw—4 to 15 inches; reddish brown (5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; weak medium prismatic structure parting to weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; 5 percent channers; slightly alkaline; clear smooth boundary.

Bk1—15 to 19 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine pores; 5 percent channers; disseminated lime; many faint coats of lime on channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—19 to 38 inches; light brown (7.5YR 6/4) loam, reddish brown (5YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine pores; 10 percent channers; disseminated lime; continuous faint coats of lime on channers;

strongly effervescent; strongly alkaline; gradual smooth boundary.

BC—38 to 60 inches; light brown (7.5YR 6/4) channery loam, reddish brown (5YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine and very fine root; 20 percent channers; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

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

*Depth to Bk horizon:* 10 to 21 inches

#### A horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 3 or 4 moist

Chroma: 3 or 4

Clay content: 18 to 25 percent

Content of rock fragments: 0 to 5 percent channers

Reaction: pH 6.6 to 8.4

#### Bw horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 3 or 4 moist

Chroma: 4 to 6

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent channers

Reaction: pH 7.4 to 8.4

#### Bk horizons

Hue: 2.5Y, 5YR, or 7.5YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3 to 6

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 20 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### BC horizon

Hue: 2.5Y, 5YR, or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3 to 6

Texture: Loam, sandy loam, or fine sandy loam

Clay content: 10 to 27 percent

Content of rock fragments: 0 to 25 percent channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

## Creed Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 15 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs

### Typical Pedon

Creed loam in an area of Creed-Absher complex, 2 to 8 percent slopes, in an area of rangeland; 400 feet west and 1,200 feet north of southeast corner of sec. 31, T. 10 N., R. 48 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly alkaline; abrupt smooth boundary.

E—3 to 7 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse platy structure parting to weak medium and coarse granular structure; slightly hard, friable, very sticky and very plastic; common very fine roots; common fine and very fine pores; moderately alkaline; abrupt smooth boundary.

Btn—7 to 15 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parting to strong medium angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; common very fine discontinuous tubular pores; continuous very dark gray (10YR 3/1) clay films on faces of peds and in pores and skeletons on tops of columns; strongly alkaline; clear smooth boundary.

Bky—15 to 28 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure parting to strong coarse angular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common very fine discontinuous tubular pores;

common medium irregular masses of lime between peds; common fine threads of gypsum; strongly effervescent; strongly alkaline; gradual smooth boundary.

By—28 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; common fine and medium threads of gypsum; slightly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to secondary lime:* 10 to 20 inches

*Soil phases:* Gullied

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 7.4 to 8.4

#### E horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 to 7 moist

Clay content: 20 to 27 percent

Reaction: pH 7.4 to 8.4

#### Btn horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 8 to 20

Reaction: pH 7.8 to 9.0

#### Bky horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silty clay loam, clay loam, or clay

Clay content: 27 to 45 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 13 to 20

Calcium carbonate equivalent: 5 to 15 percent  
 Gypsum content: 1 to 2 percent  
 Reaction: pH 8.5 to 9.0

*By 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: 25 to 35 percent  
 Electrical conductivity: 4 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 25  
 Gypsum content: 1 to 5 percent  
 Calcium carbonate equivalent: 5 to 10 percent  
 Reaction: pH 8.5 to 9.0

**81A—Creed loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Creed and similar soils: 85 percent

**Minor Components**

Pinehill and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Areas of slickspots: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent  
 Poorly drained 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  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.6 inches

**81C—Creed loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Creed and similar soils: 85 percent

**Minor Components**

Sonnett and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Areas of slickspots: 0 to 3 percent  
 Pinehill and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 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  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.6 inches

**813C—Creed-Absher complex, 2 to 8 percent slopes****Setting**

*Landform:*

- Creed—Sedimentary plains
- Absher—Sedimentary plains

*Position on landform:*

- Creed—Microhighs
- Absher—Microlows

*Slope:*

- Creed—2 to 8 percent
- Absher—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Creed and similar soils: 50 percent  
Absher and similar soils: 35 percent

### Minor Components

Sonnett and similar soils: 0 to 3 percent  
Gerdrum and similar soils: 0 to 3 percent  
Archin and similar soils: 0 to 3 percent  
Weingart and similar soils: 0 to 3 percent  
Kobase and similar soils: 0 to 3 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

#### Absher

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.1 inches

### 811C—Creed-Pinehill loams, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Creed—Sedimentary plains
- Pinehill—Sedimentary plains

##### *Slope:*

- Creed—2 to 8 percent
- Pinehill—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Creed and similar soils: 50 percent  
Pinehill and similar soils: 35 percent

### Minor Components

Sonnett and similar soils: 0 to 3 percent  
Gerdrum and similar soils: 0 to 3 percent  
Archin and similar soils: 0 to 3 percent  
Moderately deep soils: 0 to 3 percent  
Kobase and similar soils: 0 to 3 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

#### Pinehill

*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

### Dast Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid

*Landform:* Hills and sedimentary plains

*Parent material:* Semiconsolidated sandy sedimentary beds

*Slope range:* 8 to 25 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Dast fine sandy loam in an area of Shambo-Lisk-Dast Complex, 8 to 25 percent slopes, in a grazed forestland area; 2,100 feet west and 1,700 feet north of the southeast corner of sec. 34, T. 9 N., R. 52 E.

Oi—1 to 0 inches; undecomposed forest litter.

A1—0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; slightly alkaline; clear wavy boundary.

Bw1—6 to 12 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; slightly alkaline; gradual wavy boundary.

Bw2—12 to 22 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure parting to weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few medium and common very fine roots; common fine and very fine pores; slightly alkaline; gradual wavy boundary.

Bk—22 to 36 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; common fine and very fine pores; common medium irregular masses of lime between ped; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—36 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated sandstone, grayish brown (2.5Y 5/2) moist.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Depth to Bk horizon:* 12 to 24 inches

*Depth to bedrock:* 20 to 40 inches

**A horizons**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 2 to 18 percent

Reaction: pH 6.6 to 7.8

**Bw horizons**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Fine sandy loam or sandy loam

Clay content: 2 to 18 percent

Reaction: pH 6.6 to 8.4

**Bk horizon**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

**Davidell Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Typic Eutroboralfs

**Typical Pedon**

Davidell silty clay loam, 0 to 4 percent slopes, in an area of rangeland; 200 feet west and 1,200 feet north of southeast corner of sec. 14, T. 10 N., R. 45 E.

E1—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; slightly alkaline; clear smooth boundary.

E2—2 to 5 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure parting to

weak fine platy structure; soft, very friable, slightly sticky and plastic; common very fine roots; common fine and very fine pores; slightly alkaline; clear smooth boundary.

**Bt**—5 to 9 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 medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common distinct continuous clay films on faces of peds and in pores; moderately alkaline; gradual wavy boundary.

**Bk**—9 to 29 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common medium irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

**Byz**—29 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; few fine masses of gypsum and other salts; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

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

*Depth to the Bk horizon:* 6 to 14 inches

#### *E horizons*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or silty clay loam

Clay content: 15 to 35 percent

Reaction: pH 6.6 to 7.8

#### *Bt horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 8.4

#### *Bk horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 32 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 8 to 15

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### *Byz horizon*

Value: 4 or 5 moist; 5 or 6 dry

Texture: Silty clay loam, clay loam, or loam

Clay content: 24 to 30 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 15 to 30

Gypsum: 1 to 5 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

## 653B—Davidell loam, 2 to 4 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Davidell and similar soils: 85 percent

#### Minor Components

Lonna and similar soils: 0 to 5 percent

Ivanell and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 6.7 inches

## 24B—Davidell silty clay loam, 0 to 4 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Davidell and similar soils: 85 percent

#### Minor Components

Ivanell and similar soils: 0 to 4 percent

Gerdrum and similar soils: 0 to 4 percent

Sonnett and similar soils: 0 to 4 percent

Soils that have slopes more than 4 percent: 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

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 6.5 inches

## 241B—Davidell-Antwerp silty clay loams, 0 to 4 percent slopes

### Setting

*Landform:*

- Davidell—Sedimentary plains

- Antwerp—Sedimentary plains

*Position on landform:*

- Davidell—Microhighs

- Antwerp—Microlows

*Slope:*

- Davidell—0 to 4 percent

- Antwerp—0 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Davidell and similar soils: 65 percent

Antwerp and similar soils: 20 percent

#### Minor Components

Kobase and similar soils: 0 to 3 percent

Ivanell and similar soils: 0 to 3 percent

Cambeth and similar soils: 0 to 3 percent

Archin and similar soils: 0 to 3 percent

Sonnett and similar soils: 0 to 3 percent

### Major Component Description

#### Davidell

*Surface layer texture:* Silty clay loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 6.5 inches

#### Antwerp

*Surface layer texture:* Silty clay loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 7.0 inches

## 242C—Davidell-Ivanell complex, 2 to 8 percent slopes

### Setting

*Landform:*

- Davidell—Sedimentary plains

- Ivanell—Sedimentary plains

*Slope:*

- Davidell—2 to 8 percent
- Ivanell—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Davidell and similar soils: 40 percent  
Ivanell and similar soils: 40 percent

**Minor Components**

Cambeth and similar soils: 0 to 3 percent  
Antwerp and similar soils: 0 to 3 percent  
Kobase and similar soils: 0 to 3 percent  
Migonot and similar soils: 0 to 3 percent  
Sonnott and similar soils: 0 to 3 percent

**Major Component Description****Davidell***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 6.5 inches**Ivanell***Surface layer texture:* Silt loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated shale residuum*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 5.1 inches**Degrad Series***Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate over rapid*Landform:* Relict stream terraces*Parent material:* alluvium*Slope range:* 0 to 8 percent*Elevation range:* 2,240 to 2,900 feet*Annual precipitation:* 11 to 14 inches*Annual air temperature:* 43 to 45 degrees F*Frost-free period:* 110 to 135 days**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls**Typical Pedon**

Degrad loam, 0 to 4 percent slopes, in an area of rangeland; 300 feet east and 400 feet north of southwest corner of sec. 14, T. 9 N., R. 48 E.

A—0 to 7 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; common medium and fine roots; slightly alkaline; clear smooth boundary.

Bt—7 to 16 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common medium and fine roots; common medium and coarse tubular pores; few distinct very dark grayish brown (10YR 3/2), moist, clay films on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Bk1—16 to 25 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure parting to moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common medium and coarse tubular pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—25 to 31 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common medium to very fine tubular pores; common medium irregular masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

2C—31 to 60 inches; pale brown (10YR 6/3) sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; slightly effervescent; moderately alkaline.

**Range in Characteristics**

*Mollic epipedon thickness:* 7 to 16 inches

*A horizon*

Value: 4 or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 10 to 27 percent  
 Reaction: pH 6.6 to 7.8

*Bt horizon*

Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Clay loam or sandy clay loam  
 Clay content: 20 to 35 percent  
 Reaction: pH 6.6 to 8.4

*Bk horizons*

Value: 6 or 7 dry; 4 to 6 moist  
 Chroma: 2 or 3  
 Texture: Clay loam, loam, or sandy loam  
 Clay content: 15 to 30 percent  
 Calcium carbonate equivalent: 15 to 40 percent  
 Reaction: pH 7.4 to 9.0

*2C horizon*

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 0 to 5 percent  
 Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 8 to 15 percent  
 Reaction: pH 7.4 to 8.4

**37B—Degrand loam, 0 to 4 percent slopes****Setting**

*Landform:* Relict stream terraces  
*Slope:* 0 to 4 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Degrad and similar soils: 85 percent

**Minor Components**

Bigsheep and similar soils: 0 to 4 percent  
 Chinook and similar soils: 0 to 4 percent  
 Tinsley and similar soils: 0 to 4 percent  
 Soils that have clay loam surfaces: 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 5.8 inches

**Delpoint Series**

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains and hills  
*Parent material:* Semiconsolidated loamy sedimentary beds  
*Slope range:* 2 to 45 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Delpoint loam in an area of Delpoint-Yamacall-Cabbart loams, 15 to 25 percent slopes, in an area of rangeland; 1,400 feet south and 200 feet west of northeast corner of sec. 3, T. 4 N., R. 51 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

Bw—3 to 11 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bk—11 to 32 inches; light gray (2.5Y 7/2) loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; many medium irregular masses of lime; violently

effervescent; moderately alkaline; gradual wavy boundary.

Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated sandstone, dark grayish brown (2.5Y 4/2) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to Bk horizon:* 10 to 20 inches

*Depth to bedrock:* 20 to 40 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 8.4

#### Bw 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 35 percent

Reaction: pH 6.6 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

## 843E—Delpoint, moist-Delpoint-Cabbart loams, 15 to 25 percent slopes

### Setting

#### Landform:

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

#### Position on landform:

- Cabbart—Shoulders and summits

#### Slope:

- Delpoint—15 to 25 percent
- Delpoint—15 to 25 percent
- Cabbart—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Delpoint and similar soils: 35 percent

Delpoint and similar soils: 25 percent

Cabbart and similar soils: 25 percent

### Minor Components

Kirby and similar soils: 0 to 3 percent

Birney and similar soils: 0 to 3 percent

Twilight and similar soils: 0 to 3 percent

Yawdim and similar soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

### Major Component Description

#### Delpoint

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 4.4 inches

#### Delpoint

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.8 inches

#### Cabbart

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.1 inches

## 381F—Delpoint-Armells complex, 25 to 70 percent slopes

### Setting

#### Landform:

- Delpoint—Hills
- Armells—Hills

*Position on landform:*

- Delpoint—Backslopes
- Armells—Shoulders and summits

*Slope:*

- Delpoint—25 to 45 percent
- Armells—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Delpoint and similar soils: 60 percent

Armells and similar soils: 30 percent

**Minor Components**

Cabbart and similar soils: 0 to 2 percent

Kirby and similar soils: 0 to 2 percent

Yamacall and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Soils that have slopes less than 25 percent: 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, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**Armells***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Material weathered from baked sandstone and shale*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.6 inches**387D—Delpoint-Busby-Blacksheep complex, 4 to 15 percent slopes****Setting***Landform:*

- Delpoint—Sedimentary plains
- Busby—Sedimentary plains

- Blacksheep—Sedimentary plains

*Position on landform:*

- Delpoint—Backslopes
- Busby—Foothills
- Blacksheep—Shoulders and summits

*Slope:*

- Delpoint—4 to 15 percent

- Busby—4 to 15 percent

- Blacksheep—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Delpoint and similar soils: 45 percent

Busby and similar soils: 30 percent

Blacksheep and similar soils: 20 percent

**Minor Components**

Yetull and similar soils: 0 to 2 percent

Kremlin and similar soils: 0 to 1 percent

Yamacall and similar soils: 0 to 1 percent

Twilight 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, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**Busby***Surface layer texture:* Fine sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or colluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 8.2 inches**Blacksheep***Surface layer texture:* Fine sandy loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, sandy sedimentary beds*Native plant cover type:* Rangeland

*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

### 919F—Delpoint-Cabbart loams, 25 to 70 percent slopes

#### Setting

*Landform:*

- Delpoint—Hills
- Cabbart—Hills

*Position on landform:*

- Delpoint—Backslopes
- Cabbart—Shoulders and summits

*Slope:*

- Delpoint—25 to 70 percent
- Cabbart—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Delpoint and similar soils: 50 percent  
 Cabbart and similar soils: 30 percent

##### Minor Components

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

#### Major Component Description

##### Delpoint

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.4 inches

##### Cabbart

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.1 inches

### 940E—Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes

#### Setting

*Landform:*

- Delpoint—Hills
- Yamacall—Sedimentary plains
- Cabbart—Hills

*Position on landform:*

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

*Slope:*

- Delpoint—15 to 25 percent
- Yamacall—8 to 15 percent
- Cabbart—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Delpoint and similar soils: 35 percent  
 Yamacall and similar soils: 30 percent  
 Cabbart and similar soils: 20 percent

##### Minor Components

Busby and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Sonnett and similar soils: 0 to 3 percent  
 Megonot and similar soils: 0 to 2 percent  
 Twilight and similar soils: 0 to 2 percent  
 Yawdim 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, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.7 inches

##### Yamacall

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### **Cabbart**

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

## **383F—Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes**

### **Setting**

#### *Landform:*

- Delpoint—Hills
- Cabbart—Hills
- Yawdim—Hills

#### *Position on landform:*

- Delpoint—Backslopes
- Cabbart—Shoulders and summits
- Yawdim—Backslopes and shoulders

#### *Slope:*

- Delpoint—25 to 45 percent
- Cabbart—25 to 70 percent
- Yawdim—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Delpoint and similar soils: 35 percent  
 Cabbart and similar soils: 30 percent  
 Yawdim and similar soils: 20 percent

#### **Minor Components**

Twilight and similar soils: 0 to 3 percent  
 Busby and similar soils: 0 to 3 percent  
 Magonot and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Soils that have slopes less than 25 percent: 0 to 3 percent

### **Major Component Description**

#### **Delpoint**

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

### **Cabbart**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 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 3.1 inches

## **967E—Delpoint-Cabbart-Yawdim complex, 4 to 25 percent slopes**

### **Setting**

#### *Landform:*

- Delpoint—Hills
- Cabbart—Hills
- Yawdim—Hills

#### *Position on landform:*

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

#### *Slope:*

- Delpoint—4 to 25 percent
- Cabbart—4 to 25 percent
- Yawdim—4 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Delpoint and similar soils: 45 percent

Cabbart and similar soils: 25 percent  
 Yawdim and similar soils: 15 percent

### Minor Components

Busby and similar soils: 0 to 5 percent  
 Kobase and similar soils: 0 to 5 percent  
 Gerdrum and similar soils: 0 to 5 percent

## Major Component Description

### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.4 inches

### Cabbart

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.0 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

## 388D—Delpoint-Kobase-Yawdim complex, 4 to 15 percent slopes

### Setting

#### *Landform:*

- Delpoint—Sedimentary plains
- Kobase—Sedimentary plains
- Yawdim—Sedimentary plains

#### *Position on landform:*

- Delpoint—Backslopes
- Kobase—Footslopes
- Yawdim—Shoulders and summits

#### *Slope:*

- Delpoint—4 to 15 percent
- Kobase—4 to 8 percent
- Yawdim—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Delpoint and similar soils: 45 percent  
 Kobase and similar soils: 25 percent  
 Yawdim and similar soils: 15 percent

### Minor Components

Twilight and similar soils: 0 to 4 percent  
 Birney and similar soils: 0 to 4 percent  
 Cabbart and similar soils: 0 to 4 percent  
 Megonot and similar soils: 0 to 3 percent

## Major Component Description

### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

### Kobase

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.8 inches

### Yawdim

*Surface layer texture:* Silty clay loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.1 inches

**554E—Delpoint-Weingart complex, 4 to 25 percent slopes****Setting***Landform:*

- Delpoint—Hills
- Weingart—Sedimentary plains

*Position on landform:*

- Delpoint—Backslopes and shoulders
- Weingart—Backslopes and footslopes

*Slope:*

- Delpoint—4 to 25 percent
- Weingart—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Delpoint and similar soils: 60 percent  
Weingart and similar soils: 25 percent

**Minor Components**

Archin and similar soils: 0 to 3 percent  
Cabbart and similar soils: 0 to 3 percent  
Neldore and similar soils: 0 to 3 percent  
Kobase and similar soils: 0 to 3 percent  
Areas of slickspots: 0 to 3 percent

**Major Component Description****Delpoint***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**Weingart***Surface layer texture:* Clay loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Interbedded shale and siltstone residuum*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 3.4 inches**385E—Delpoint-Yamacall-Cabbart loams, 15 to 25 percent slopes****Setting***Landform:*

- Delpoint—Hills
- Yamacall—Hills
- Cabbart—Hills

*Position on landform:*

- Delpoint—Backslopes and shoulders
- Yamacall—Backslopes
- Cabbart—Shoulders and summits

*Slope:*

- Delpoint—15 to 25 percent
- Yamacall—15 to 25 percent
- Cabbart—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Delpoint and similar soils: 35 percent  
Yamacall and similar soils: 30 percent  
Cabbart and similar soils: 20 percent

**Minor Components**

Megonot and similar soils: 0 to 3 percent  
Areas of rock outcrop: 0 to 3 percent  
Yawdim and similar soils: 0 to 3 percent  
Twilight and similar soils: 0 to 3 percent  
Soils that have slopes less than 15 percent: 0 to 3 percent

**Major Component Description****Delpoint***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**Yamacall***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland

*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### **Cabbart**

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

## **968E—Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes**

### **Setting**

*Landform:*

- Delpoint—Hills
- Yamacall—Sedimentary plains
- Cabbart—Hills

*Position on landform:*

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

*Slope:*

- Delpoint—8 to 25 percent
- Yamacall—8 to 15 percent
- Cabbart—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Delpoint and similar soils: 35 percent  
 Yamacall and similar soils: 30 percent  
 Cabbart and similar soils: 20 percent

#### **Minor Components**

Busby and similar soils: 0 to 5 percent  
 Gerdrum and similar soils: 0 to 5 percent  
 Kobase and similar soils: 0 to 3 percent  
 Yawdim 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, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 3.9 inches

### **Yamacall**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### **Cabbart**

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

## **DA—Denied access**

### **Composition**

#### **Major Components**

Denied access: 100 percent

#### **Major Component Description**

*Definition:* Soil survey mapping areas denied by landowner.

## **Doney Series**

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains and hills  
*Parent material:* Semiconsolidated loamy sedimentary beds  
*Slope range:* 2 to 45 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Doney loam in an area of Doney-Broadus-Cabba loams, 15 to 25 percent slopes, in a forestland area; 500 feet north and 2,400 feet west of the southeast corner of sec. 35, T. 1 N., R. 45 E.

Oi—1 inch to 0; slightly decomposed forest litter.

A—0 to 4 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak very fine granular structure; slightly hard, very friable, nonsticky and slightly plastic; many medium and fine roots; slightly alkaline; clear smooth boundary.

Bw—4 to 10 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; common fine and very fine pores; slightly alkaline; gradual wavy boundary.

Bk1—10 to 12 inches; light gray (10YR 7/2) loam, yellowish brown (10YR 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and medium roots; common fine and very fine pores; common fine and medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—12 to 24 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; moderate medium and coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common medium and coarse irregular masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—24 to 60 inches; light gray (2.5Y 7/2) semiconsolidated sandstone and siltstone.

**Range in Characteristics**

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to bedrock:* 20 to 40 inches

**A 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

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 or 3

Clay content: 18 to 27 percent

Reaction: pH 7.4 to 8.4

**Bk horizons**

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

**361E—Doney-Broadus-Cabba complex,  
15 to 25 percent slopes****Setting****Landform:**

- Doney—Hills
- Broadus—Hills
- Cabba—Hills

**Position on landform:**

- Doney—Backslopes
- Broadus—Footslopes
- Cabba—Shoulders

**Slope:**

- Doney—15 to 25 percent
- Broadus—15 to 25 percent
- Cabba—15 to 25 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Doney and similar soils: 40 percent

Broadus and similar soils: 30 percent

Cabba and similar soils: 20 percent

**Minor Components**

Lisk and similar soils: 0 to 2 percent

Wayden and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Soils that have slopes less than 15 percent: 0 to 2 percent

Soils that have slopes more than 25 percent: 0 to 2 percent

**Major Component Description****Doney**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 3.9 inches

**Broadus**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 9.8 inches

**Cabba**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

**831F—Doney-Cabba-Wayden complex,  
25 to 70 percent slopes****Setting***Landform:*

- Doney—Hills
- Cabba—Hills
- Wayden—Hills

*Position on landform:*

- Doney—Backslopes
- Cabba—Shoulders and summits
- Wayden—Backslopes and shoulders

*Slope:*

- Doney—25 to 45 percent
- Cabba—35 to 70 percent
- Wayden—35 to 70 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Doney and similar soils: 35 percent  
 Cabba and similar soils: 30 percent  
 Wayden and similar soils: 20 percent

**Minor Components**

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

**Major Component Description****Doney**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.9 inches

**Cabba**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

**Wayden**

*Surface layer texture:* Silty clay loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 inches

**862F—Doney-Lamedeer-Cabba complex,  
25 to 70 percent slopes****Setting***Landform:*

- Doney—Hills
- Lamedeer—Hills
- Cabba—Hills

*Position on landform:*

- Doney—Backslopes
- Lamedeer—Backslopes and shoulders
- Cabba—Shoulders and summits

*Slope:*

- Doney—25 to 45 percent
- Lamedeer—25 to 70 percent
- Cabba—35 to 70 percent

*Elevation:* 2,900 to 3,760 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Doney and similar soils: 35 percent  
 Lamedeer and similar soils: 30 percent  
 Cabba and similar soils: 20 percent

**Minor Components**

Dast and similar soils: 0 to 3 percent  
 Macar and similar soils: 0 to 3 percent  
 Ringling and similar soils: 0 to 3 percent  
 Wayden and similar soils: 0 to 3 percent  
 Widen and similar soils: 0 to 3 percent

**Major Component Description****Doney***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 3.9 inches**Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Material weathered from baked sandstone and shale*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.7 inches**Cabba***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.3 inches**862E—Doney-Lamedeer-Cabba complex,  
8 to 25 percent slopes****Setting***Landform:*

- Doney—Hills
- Lamedeer—Hills
- Cabba—Hills

*Position on landform:*

- Doney—Backslopes and footslopes
- Lamedeer—Backslopes and shoulders
- Cabba—Shoulders and summits

*Slope:*

- Doney—8 to 25 percent
- Lamedeer—8 to 25 percent
- Cabba—8 to 25 percent

*Elevation:* 2,900 to 3,760 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Doney and similar soils: 35 percent  
 Lamedeer and similar soils: 30 percent  
 Cabba and similar soils: 20 percent

**Minor Components**

Dast and similar soils: 0 to 3 percent  
 Ringling and similar soils: 0 to 3 percent  
 Widen and similar soils: 0 to 3 percent  
 Macar and similar soils: 0 to 3 percent  
 Wayden and similar soils: 0 to 3 percent

**Major Component Description****Doney***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 3.9 inches

**Lamedeer**

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 4.7 inches

**Cabba**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

**832E—Doney-Macar-Cabba loams, 15 to 25 percent slopes****Setting***Landform:*

- Doney—Hills
- Macar—Hills
- Cabba—Hills

*Position on landform:*

- Doney—Backslopes and shoulders
- Macar—Backslopes
- Cabba—Shoulders and summits

*Slope:*

- Doney—15 to 25 percent
- Macar—15 to 25 percent
- Cabba—15 to 25 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Doney and similar soils: 35 percent  
 Macar and similar soils: 30 percent  
 Cabba and similar soils: 20 percent

**Minor Components**

Widen and similar soils: 0 to 3 percent  
 Dast and similar soils: 0 to 3 percent  
 Wayden and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent

Soils that have slopes less than 15 percent: 0 to 3 percent

**Major Component Description****Doney**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.9 inches

**Macar**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

**Cabba**

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

**Eapa Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Eapa loam, in and area of Chinook-Twilight-Eapa complex, 2 to 8 percent slopes, in an area of rangeland; 2,500 feet south and 1,100 feet east of the northwest corner of sec. 36, T. 6 N., R. 45 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse and very coarse platy structure parting to moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few medium roots and many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt1—6 to 9 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; strong fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium roots and many fine and very fine roots; common fine and very fine pores; common distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bt2—9 to 13 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium roots and many fine and very fine roots; common fine and very fine pores; few faint clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bk1—13 to 23 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to moderate coarse angular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; many fine threads of lime and common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—23 to 27 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; many fine threads of lime and common fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—27 to 60 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine masses of lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 16 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 7.8

#### Bt horizons

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 24 to 34 percent

Reaction: pH 6.6 to 7.8

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Loam or clay loam

Clay content: 20 to 33 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

## 41A—Eapa loam, 0 to 2 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Eapa and similar soils: 85 percent

#### Minor Components

Degrad and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 4 percent

Soils that have calcareous surfaces: 0 to 3 percent

Poorly drained soils: 0 to 2 percent

Soils that have slopes more than 2 percent: 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  
*Available water capacity:* Mainly 11.1 inches

### 654B—Eapa loam, 0 to 4 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 0 to 4 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Eapa and similar soils: 85 percent

#### Minor Components

Soils that have slopes more than 4 percent: 0 to 13 percent  
 Pondered 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  
*Available water capacity:* Mainly 11.1 inches

### 41C—Eapa loam, 2 to 6 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 6 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Eapa and similar soils: 85 percent

#### Minor Components

Ethridge and similar soils: 0 to 4 percent  
 Degrand and similar soils: 0 to 4 percent  
 Soils that have calcareous surfaces: 0 to 4 percent  
 Soils that have slopes more than 6 percent: 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 11.1 inches

### 969C—Eapa-Delpoint loams, 2 to 8 percent slopes

#### Setting

*Landform:*

- Eapa—Sedimentary plains
- Delpoint—Sedimentary plains

*Slope:*

- Eapa—2 to 8 percent
- Delpoint—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Eapa and similar soils: 50 percent  
 Delpoint and similar soils: 35 percent

#### Minor Components

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

#### Major Component Description

#### Eapa

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly .10.2 inches

### **Delpoint**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.2 inches

### **Ethridge Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Aridic Argiborolls

### **Typical Pedon**

Ethridge silty clay loam, 2 to 8 percent slopes, in an area of rangeland; 2,400 feet south and 1,000 feet east of northwest corner of sec. 30, T. 9 N., R. 53 E.

Ap1—0 to 2 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine platy structure; soft, friable, slightly sticky and plastic; common medium roots and many fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Ap2—2 to 4 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium and coarse platy structure; slightly hard, friable, sticky and plastic; common medium roots and many fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Bt—4 to 11 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; hard, firm, very sticky and very plastic; common medium

roots and many fine and very fine roots; common fine and very fine pores; many distinct patchy very dark grayish brown (10YR 3/2) moist clay films on faces of peds and in pores; slightly alkaline; clear smooth boundary.

Btk—11 to 16 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist, moderate fine and medium prismatic structure parting to strong fine angular blocky structure; hard, firm, very sticky and very plastic; common fine and very fine roots; common fine and very fine pores; many distinct continuous very dark grayish brown (10YR 3/2), moist clay films on faces of peds and in pores; common fine and medium irregular masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk—16 to 20 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bky—20 to 36 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; common fine and very fine pores; common fine masses of lime; common fine gypsum threads; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—36 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; massive; slightly hard, firm, sticky and plastic; common very fine roots; strongly effervescent; moderately alkaline.

### **Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 7 to 14 inches  
*Depth to Bk horizon:* 10 to 20 inches

### *A horizons*

Value: 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 35 percent  
 Reaction: pH 6.6 to 7.8

*Bt horizon*

Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Silty clay loam, clay loam, or clay  
 Clay content: 35 to 45 percent  
 Reaction: pH 7.4 to 8.4

*Btk horizon*

Value: 5 or 6 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Silty clay loam, clay loam, or clay  
 Clay content: 30 to 45 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

*Bk horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Texture: Silty clay loam or clay loam  
 Clay content: 30 to 45 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

*Bky horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Clay content: 25 to 40 percent  
 Gypsum content: 1 to 3 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

*C horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Clay content: 25 to 40 percent  
 Gypsum content: 1 to 3 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

**39A—Ethridge silty clay loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Ethridge and similar soils: 85 percent

**Minor Components**

Eapa and similar soils: 0 to 3 percent  
 Soils that have calcareous surfaces: 0 to 3 percent  
 Creed and similar soils: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.8 inches

**39C—Ethridge silty clay loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Ethridge and similar soils: 85 percent

**Minor Components**

Eapa and similar soils: 0 to 4 percent  
 Soils that have calcareous surfaces: 0 to 4 percent  
 Creed and similar soils: 0 to 4 percent  
 Soils that have slopes less than 2 percent: 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 9.8 inches

## Farland Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 2 to 8 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Typic Argiborolls

### Typical Pedon

Farland silt loam, 2 to 8 percent slopes, in an area of rangeland; 850 feet north and 1,100 feet east of the southwest corner of sec. 23, T. 1 N., R. 46 E.

A—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; soft, very friable, slightly sticky and plastic; few fine roots and many very fine roots; slightly alkaline; clear smooth boundary.

Bt—6 to 13 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to strong fine and medium angular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; common fine and very fine pores; continuous distinct dark brown (10YR 3/3) dry clay films on faces of peds; slightly alkaline; clear wavy boundary.

Btk—13 to 18 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; strong fine and medium angular blocky structure; hard, firm, sticky and plastic; common very fine roots; common faint dark yellowish brown (10YR 4/4) dry clay films on faces of peds; common very fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—18 to 45 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common fine irregular

masses of lime; violently effervescent; moderately alkaline; diffuse wavy boundary.

C—45 to 60 inches; pale yellow (2.5Y 7/3) silty clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine roots; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 16 inches

#### A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 6.6 to 7.8

#### Bt horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

#### Btk horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### Bk horizon

Value: 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam, loam, or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### C horizon

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.9 to 9.0

## 59C—Farland silt loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Farland and similar soils: 85 percent

#### Minor Components

Doney and similar soils: 0 to 5 percent  
 Sagedale and similar soils: 0 to 5 percent  
 Soils that have slopes less than 2 percent: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.8 inches

#### Farnuf Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 6 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Typic Argiborolls

#### Typical Pedon

Farnuf loam, 2 to 6 percent slopes, in an area of rangeland; 1,800 feet north and 2,500 feet west of the southeast corner of sec. 21, T. 3 N., R. 50 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure parting to weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common medium and fine roots; neutral; abrupt smooth boundary.

Bt1—5 to 14 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate medium and coarse prismatic structure parting to moderate

medium and coarse subangular blocky structure; hard, firm, slightly sticky and plastic; common medium and fine roots and many very fine roots; common fine and very fine pores; common distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; neutral; clear smooth boundary.

Bt2—14 to 25 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong medium and coarse angular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; many distinct continuous clay films on faces of peds; slightly alkaline; clear smooth boundary.

Bk—25 to 36 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium and coarse angular blocky structure; hard, friable, sticky and plastic; common very fine roots; common fine and very fine pores; common fine and medium irregular masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

BC—36 to 48 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine and very fine pores; moderately alkaline; gradual wavy boundary.

C—48 to 60 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; slightly effervescent; moderately alkaline.

#### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 7 to 15 inches  
*Depth to secondary lime horizon:* 10 to 25 inches

#### A horizon

Hue: 10YR or 2.5Y  
 Value: 3 or 4 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 15 to 27 percent  
 Reaction: pH 6.6 to 7.8

#### Bt horizons

Hue: 10YR or 2.5Y  
 Value: 4 or 5 dry; 3 or 4 moist

Chroma: 3 or 4  
 Texture: Loam or clay loam  
 Clay content: 25 to 35 percent  
 Reaction: pH 6.6 to 7.8

**Bk horizon**

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loam or clay loam  
 Clay content: 20 to 30 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

**BC horizon**

Hue: 2.5Y or 10YR  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Silt loam, loam, or clay loam  
 Clay content: 20 to 30 percent  
 Reaction: pH 7.4 to 8.4

**C horizon**

Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loam or clay loam  
 Clay content: 20 to 30 percent  
 Reaction: pH 7.4 to 8.4

**44A—Farnuf loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Farnuf and similar soils: 85 percent

**Minor Components**

Shambo and similar soils: 0 to 4 percent  
 Tally and similar soils: 0 to 4 percent  
 Savage and similar soils: 0 to 4 percent  
 Soils that have slopes more than 2 percent: 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 9.7 inches

**44C—Farnuf loam, 2 to 6 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 6 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Farnuf and similar soils: 85 percent

**Minor Components**

Shambo and similar soils: 0 to 4 percent  
 Tally and similar soils: 0 to 4 percent  
 Savage and similar soils: 0 to 4 percent  
 Soils that have slopes more than 6 percent: 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 9.7 inches

**Floweree Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Aridic Haploborolls

**Typical Pedon**

Floweree silt loam, 2 to 6 percent slopes, in an area of

rangeland; 2,200 feet south and 100 feet east of northwest corner of sec. 29, T. 12 N., R. 45 E.

Ap1—0 to 4 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular structure; soft, very friable, sticky and plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

Ap2—4 to 7 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky structure; soft, very friable, sticky and plastic; common fine and very fine roots; slightly alkaline; clear wavy boundary.

Bw—7 to 12 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky structure; soft, very friable, sticky and plastic; common very fine roots; common fine and very fine pores; slightly alkaline; clear wavy boundary.

Bk1—12 to 16 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine roots; common fine and very fine pores; common fine and medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—16 to 38 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate medium prismatic structure; hard, very firm, sticky and plastic; common very fine roots; common fine and very fine pores; few fine masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

BC—38 to 60 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Depth to Bk horizon:* 11 to 25 inches

#### Ap horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

#### Bw horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.4 to 8.4

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 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 9.0

#### BC horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.9 to 9.0

## 88A—Floweree silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Floweree and similar soils: 85 percent

#### Minor Components

Lonna and similar soils: 0 to 5 percent

Soils that have slopes more than 2 percent: 0 to 5 percent

Cambeth soils that are calcareous: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silt loam

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

*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.5 inches

### **88C—Floweree silt loam, 2 to 6 percent slopes**

#### **Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 6 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Floweree and similar soils: 85 percent

##### **Minor Components**

Lonna and similar soils: 0 to 4 percent  
 Cambeth soils that are calcareous: 0 to 4 percent  
 Lilsheep and similar soils: 0 to 4 percent  
 Soils that have slopes more than 6 percent: 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 10.5 inches

### **222D—Floweree-Cambeth, noncalcareous-Lilsheep complex, 4 to 15 percent slopes**

#### **Setting**

*Landform:*

- Floweree—Sedimentary plains
- Cambeth—Sedimentary plains
- Lilsheep—Relict stream terraces

*Position on landform:*

- Floweree—Foothslopes
- Cambeth—Backslopes and shoulders

- Lilsheep—Shoulders and summits

*Slope:*

- Floweree—4 to 8 percent
- Cambeth—4 to 15 percent
- Lilsheep—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Floweree and similar soils: 35 percent  
 Cambeth and similar soils: 30 percent  
 Lilsheep and similar soils: 20 percent

##### **Minor Components**

Cabbart and similar soils: 0 to 5 percent  
 Lonna and similar soils: 0 to 5 percent  
 Soils that have slopes more than 15 percent: 0 to 5 percent

#### **Major Component Description**

##### **Floweree**

*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 10.5 inches

##### **Cambeth**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

##### **Lilsheep**

*Surface layer texture:* Gravelly loam  
*Depth class:* Deep (40 to 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.6 inches

## Foreleft Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 2 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Typic Eutroboralfs

### Typical Pedon

Foreleft loam, 2 to 8 percent slopes, in an area of rangeland; 2,500 feet east and 500 feet north of southwest corner of sec. 28, T. 2 N., R. 45 E.

- A—0 to 4 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.
- Bt1—4 to 7 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong medium angular blocky structure; hard, friable, slightly sticky and plastic; common fine and very fine roots; common fine and very fine pores; few faint patchy clay films on faces of peds; slightly alkaline; clear smooth boundary.
- Bt2—7 to 16 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common fine and very fine roots; common fine and very fine pores; common distinct continuous clay films on faces of peds and in pores; moderately alkaline; gradual smooth boundary.
- Btk—16 to 21 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common distinct clay films on faces of

peds and in pores; few fine masses of lime; slightly effervescent; moderately alkaline; gradual wavy boundary.

- Bk1—21 to 51 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots; common fine and very fine pores; common medium masses of lime; violently effervescent; moderately alkaline; diffuse wavy boundary.
- Bk2—51 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure; hard, friable, slightly sticky and plastic; common fine and very fine pores; common fine and medium soft masses of lime; violently effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

*Depth to Btk or Bk horizon:* 11 to 22 inches

#### A horizon

Hue: 2.5Y or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Reaction: pH 6.6 to 7.8

#### Bt horizons

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 8.4

#### Btk and Bk horizons

Hue: 2.5Y or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.9 to 9.0

## 85C—Foreleft loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Foreleft and similar soils: 85 percent

#### Minor Components

Delpoint and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent  
 Archin and similar soils: 0 to 4 percent  
 Soils that have slopes less than 2 percent: 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

### Gerdrum Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 15 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs

#### Typical Pedon

Gerdrum silty clay loam in an area of Gerdrum-Creed complex, 2 to 8 percent slopes, in an area of rangeland; 400 feet east and 300 feet north of southwest corner of sec. 8, T. 8 N., R. 46 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; slightly alkaline; abrupt smooth boundary.

Btn—3 to 9 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse columnar structure parting to strong medium prismatic structure; hard, firm, sticky and plastic; common very fine roots between peds; common fine and very fine pores; continuous distinct clay films on faces of peds and in pores; strongly alkaline; clear smooth boundary.

Btkn—9 to 16 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong fine and medium angular blocky structure; very hard, very firm, sticky and plastic; common very fine roots between peds; common fine and very fine pores; continuous distinct clay films on faces of peds and in pores; few irregular masses of lime; slightly effervescent; strongly alkaline; clear wavy boundary.

Bknyz—16 to 25 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure parting to strong fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; common fine and very fine pores; common medium irregular masses of lime; common irregular masses of gypsum; strongly effervescent; strongly alkaline.

Bz—25 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, very sticky and very plastic; common very fine roots; common irregular masses of gypsum; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above  
*Depth to gypsum:* 10 to 28 inches  
*Soil phases:* Gullied

#### E horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loam, clay loam, or silty clay loam  
 Clay content: 20 to 40 percent  
 Reaction: pH 6.6 to 7.8

*Btn horizon*

Hue: 10YR or 2.5Y  
 Value: 4 or 5 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Clay, silty clay, or silty clay loam  
 Clay content: 35 to 55 percent  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Reaction: pH 7.4 to 9.0

*Btkn horizon*

Hue: 10YR to 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Silty clay or silty clay loam  
 Clay content: 35 to 55 percent  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 13 to 20  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

*Bknyz horizon*

Hue: 10YR to 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Clay, clay loam, silty clay loam, or silty clay  
 Clay content: 30 to 50 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 20  
 Calcium carbonate equivalent: 5 to 15 percent  
 Gypsum: 1 to 5 percent  
 Reaction: pH 7.9 to 9.0

*Bz horizon*

Hue: 10YR to 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Clay, clay loam, or silty clay loam  
 Clay content: 30 to 50 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Reaction: pH 7.9 to 9.0

### 656A—Gerdrum clay loam, 0 to 2 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Gerdrum and similar soils: 85 percent

#### Minor Components

Creed and similar soils: 0 to 5 percent  
 Absher and similar soils: 0 to 5 percent  
 Pinehill and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

### 657C—Gerdrum clay loam, 2 to 8 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Gerdrum and similar soils: 85 percent

#### Minor Components

Creed and similar soils: 0 to 5 percent  
 Absher and similar soils: 0 to 5 percent  
 Pinehill and similar soils: 0 to 5 percent

#### Major Component Description

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

*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.3 inches

### **421A—Gerdrum-Creed complex, 0 to 2 percent slopes**

#### **Setting**

*Landform:*

- Gerdrum—Sedimentary plains
- Creed—Sedimentary plains

*Position on landform:*

- Gerdrum—Microlows
- Creed—Microhighs

*Slope:*

- Gerdrum—0 to 2 percent
- Creed—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

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

#### **Minor Components**

Sonnett and similar soils: 0 to 3 percent  
 Archin and similar soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent  
 Areas of slickspots: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent

#### **Major Component Description**

##### **Gerdrum**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.9 inches

##### **Creed**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.6 inches

### **421C—Gerdrum-Creed complex, 2 to 8 percent slopes**

#### **Setting**

*Landform:*

- Gerdrum—Sedimentary plains
- Creed—Sedimentary plains

*Position on landform:*

- Gerdrum—Microlows
- Creed—Microhighs

*Slope:*

- Gerdrum—2 to 8 percent
- Creed—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

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

#### **Minor Components**

Sonnett and similar soils: 0 to 4 percent  
 Archin and similar soils: 0 to 4 percent  
 Davidell and similar soils: 0 to 4 percent  
 Areas of slickspots: 0 to 3 percent

#### **Major Component Description**

##### **Gerdrum**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.9 inches

##### **Creed**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.6 inches

### **421D—Gerdrum-Creed complex, 4 to 15 percent slopes, gullied**

#### **Setting**

*Landform:*

- Gerdrum—Sedimentary plains
- Creed—Sedimentary plains

*Position on landform:*

- Gerdrum—Microlows
- Creed—Microhighs

*Slope:*

- Gerdrum—4 to 15 percent
- Creed—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

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

##### **Minor Components**

Sonnett and similar soils: 0 to 3 percent  
 Davidell and similar soils: 0 to 3 percent  
 Archin and similar soils: 0 to 3 percent  
 Areas of slickspots: 0 to 3 percent  
 Weingart and similar soils: 0 to 3 percent

#### **Major Component Description**

##### **Gerdrum**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.9 inches

##### **Creed**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.6 inches

### **941C—Gerdrum-Kobase silty clay loams, 2 to 8 percent slopes**

#### **Setting**

*Landform:*

- Gerdrum—Sedimentary plains
- Kobase—Sedimentary plains

*Slope:*

- Gerdrum—2 to 8 percent
- Kobase—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Gerdrum and similar soils: 40 percent  
 Kobase and similar soils: 40 percent

##### **Minor Components**

Lonna and similar soils: 0 to 10 percent  
 Areas of slickspots: 0 to 10 percent

#### **Major Component Description**

##### **Gerdrum**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

##### **Kobase**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

## 658C—Gerdrum-Marvan silty clays, 2 to 8 percent slopes

### Setting

*Landform:*

- Gerdrum—Sedimentary plains
- Marvan—Sedimentary plains

*Slope:*

- Gerdrum—2 to 8 percent
- Marvan—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Gerdrum and similar soils: 50 percent  
 Marvan and similar soils: 40 percent

#### Minor Components

Creed and similar soils: 0 to 10 percent

### Major Component Description

#### Gerdrum

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.3 inches

#### Marvan

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

*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.7 inches

### Glendive Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid  
*Landform:* Flood plains and stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Elevation range:* 2,240 to 2,700 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Glendive fine sandy loam in an area of Glendive-Havre complex, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 2,300 feet south and 2,600 feet east of the northwest corner of sec. 12, T. 8 N., R. 45 E.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium angular blocky structure parting to moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

C1—4 to 23 inches; brown (10YR 5/3) stratified fine sandy loam and loamy fine sand, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium angular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; slightly alkaline; clear wavy boundary.

C2—23 to 34 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—34 to 60 inches; grayish brown (10YR 5/2) stratified loam and fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common

very fine roots; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Soil phases:* Frequently flooded, rarely flooded, nonflooded, or channeled

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 or 3

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

Clay content: 5 to 35 percent

Reaction: pH 7.4 to 9.0

#### C1 horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Reaction: pH 7.4 to 9.0

#### C2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Reaction: pH 7.4 to 9.0

#### C3 horizon

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Sandy loam, or fine sandy loam consisting of stratified loam, sandy loam, and loamy fine sand

Clay content: 5 to 18 percent

Reaction: pH 7.9 to 9.0

### 451A—Glendive fine sandy loam, 0 to 2 percent slopes, occasionally flooded

#### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Glendive and similar soils: 85 percent

#### Minor Components

Havre and similar soils: 0 to 3 percent

Harlake and similar soils: 0 to 3 percent

Hanly and similar soils: 0 to 3 percent

Frequently flooded soils: 0 to 3 percent

Poorly drained 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:* Forest land

*Flooding:* Occasional

*Available water capacity:* Mainly 10.0 inches

### 45A—Glendive fine sandy loam, 0 to 2 percent slopes, rarely flooded

#### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Glendive and similar soils: 85 percent

#### Minor Components

Havre and similar soils: 0 to 3 percent

Hanly and similar soils: 0 to 3 percent

Ryell and similar soils: 0 to 3 percent

Harlake and similar soils: 0 to 3 percent

Poorly drained 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:* Rare  
*Available water capacity:* Mainly 9.8 inches

### **659A—Glendive loam, 0 to 2 percent slopes, occasionally flooded**

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Glendive and similar soils: 85 percent

##### **Minor Components**

Havre and similar soils: 0 to 10 percent  
 Hanly and similar soils: 0 to 5 percent

#### **Major Component Description**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Forest land  
*Flooding:* Occasional  
*Available water capacity:* Mainly 8.0 inches

### **452A—Glendive loam, 0 to 2 percent slopes, rarely flooded**

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Glendive and similar soils: 85 percent

##### **Minor Components**

Havre and similar soils: 0 to 3 percent  
 Harlake and similar soils: 0 to 3 percent  
 Hanly and similar soils: 0 to 3 percent  
 Ryell and similar soils: 0 to 3 percent  
 Poorly drained 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 10.0 inches

### **486A—Glendive-Havre complex, 0 to 2 percent slopes, nonflooded**

#### **Setting**

*Landform:*

- Glendive—Stream terraces
- Havre—Stream terraces

*Slope:*

- Glendive—0 to 2 percent
- Havre—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Glendive and similar soils: 50 percent  
 Havre and similar soils: 40 percent

##### **Minor Components**

Harlake and similar soils: 0 to 5 percent  
 Hanly and similar soils: 0 to 5 percent

#### **Major Component Description**

##### **Glendive**

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

*Flooding:* None

*Available water capacity:* Mainly 9.8 inches

#### **Havre**

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 9.8 inches

### **453A—Glendive-Havre complex, 0 to 2 percent slopes, occasionally flooded**

#### **Setting**

*Landform:*

- Glendive—Flood plains
- Havre—Flood plains

*Slope:*

- Glendive—0 to 2 percent
- Havre—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

Glendive and similar soils: 50 percent

Havre and similar soils: 40 percent

#### **Minor Components**

Hanly and similar soils: 0 to 2 percent

Harlake and similar soils: 0 to 2 percent

Ryell and similar soils: 0 to 2 percent

Frequently flooded soils: 0 to 2 percent

Poorly drained soils: 0 to 2 percent

#### **Major Component Description**

#### **Glendive**

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Forest land

*Flooding:* Occasional

*Available water capacity:* Mainly 10.0 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

### **4861A—Glendive-Havre silty clay loams, 0 to 2 percent slopes, nonflooded**

#### **Setting**

*Landform:*

- Glendive—Stream terraces
- Havre—Stream terraces

*Slope:*

- Glendive—0 to 2 percent
- Havre—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

#### **Major Components**

Glendive and similar soils: 50 percent

Havre and similar soils: 40 percent

#### **Minor Components**

Havre loam: 0 to 3 percent

Glendive loam: 0 to 3 percent

Harlake and similar soils: 0 to 2 percent

Poorly drained soils: 0 to 2 percent

#### **Major Component Description**

#### **Glendive**

*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 10.0 inches

#### **Havre**

*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 9.6 inches

## Golva Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 15 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Typic Haploborolls

### Typical Pedon

Golva silt loam, 2 to 8 percent slopes, in an area of rangeland; 1,300 feet south and 400 feet west of the northeast corner of sec. 7, T. 7 N., R. 53 E.

- A—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and plastic; many fine and very fine roots; many very fine tubular pores; neutral; clear smooth boundary.
- Bw1—5 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium angular blocky structure; slightly hard, very friable, slightly sticky and plastic; common very fine and fine roots; many very fine tubular pores; neutral; clear wavy boundary.
- Bw2—9 to 14 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium angular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; many very fine pores; slightly effervescent; slightly alkaline; gradual wavy boundary.
- Bk1—14 to 28 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; strong fine and medium angular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; common fine irregular masses of lime; violently

effervescent; moderately alkaline; gradual wavy boundary.

- Bk2—28 to 60 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; common fine irregular masses of lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 7 to 16 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  
 Reaction: pH 6.6 to 7.8

#### Bw horizons

Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Silt loam or silty clay loam  
 Clay content: 18 to 35 percent  
 Reaction: pH 6.6 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 5 or 6 moist  
 Chroma: 2 or 3  
 Texture: Loam, silt loam, or silty clay loam  
 Clay content: 18 to 35 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 8.4

## 60A—Golva silt loam, 0 to 2 percent slopes

### Setting

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Golva and similar soils: 85 percent

**Minor Components**

Cherry and similar soils: 0 to 5 percent  
 Soils that have calcareous surfaces: 0 to 5 percent  
 Soils that have slopes more than 2 percent: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Silt loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 11.0 inches

**60C—Golva silt loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Golva and similar soils: 85 percent

**Minor Components**

Doney and similar soils: 0 to 4 percent  
 Cherry and similar soils: 0 to 4 percent  
 Soils that have calcareous surfaces: 0 to 4 percent  
 Soils that have slopes more than 8 percent: 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 11.0 inches

**Hanly Series**

*Depth class:* Very deep  
*Drainage class:* Somewhat excessively drained

*Permeability:* Rapid

*Landform:* Flood plains and stream terraces

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Elevation range:* 2,240 to 2,700 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Sandy, mixed, frigid Aridic Ustifluvents

**Typical Pedon**

Hanly loamy fine sand in an area of Hanly-Glendive complex, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 800 feet east and 80 feet south of the northwest corner of sec. 19, T. 6 N., R. 52 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; common fine and medium roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C1—5 to 17 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; slightly effervescent; moderately alkaline; diffuse smooth boundary.

C2—17 to 60 inches; pale brown (10YR 6/3) fine sand with thin strata of fine sandy loam, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; slightly effervescent; slightly alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* 12 to 35 inches

*Soil phases:* Nonflooded, rarely flooded, or occasionally flooded

**A horizon**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loamy fine sand or loam

Clay content: 8 to 20 percent

Reaction: pH 6.6 to 8.4

**C1 horizon**

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loamy fine sand or fine sand

Clay content: 5 to 10 percent  
Reaction: pH 6.6 to 8.4

**C2 horizon**

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Loamy fine sand or fine sand with thin strata of loam and sandy loam  
Clay content: 5 to 10 percent  
Reaction: pH 6.6 to 8.4

**461A—Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded****Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Hanly and similar soils: 85 percent

**Minor Components**

Glendive and similar soils: 0 to 3 percent  
Havre and similar soils: 0 to 3 percent  
Ryell and similar soils: 0 to 3 percent  
Frequently flooded soils: 0 to 3 percent  
Poorly drained soils: 0 to 3 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  
*Native plant cover type:* Forest land  
*Flooding:* Occasional  
*Available water capacity:* Mainly 5.7 inches

**46A—Hanly loamy fine sand, 0 to 2 percent slopes, rarely flooded****Setting**

*Landform:* Flood plains

*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Hanly and similar soils: 85 percent

**Minor Components**

Glendive and similar soils: 0 to 4 percent  
Havre and similar soils: 0 to 4 percent  
Ryell and similar soils: 0 to 4 percent  
Rivra and similar soils: 0 to 3 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  
*Native plant cover type:* Rangeland  
*Flooding:* Rare  
*Available water capacity:* Mainly 5.7 inches

**462A—Hanly-Glendive complex, 0 to 2 percent slopes, nonflooded****Setting**

*Landform:*

- Hanly—Stream terraces
- Glendive—Stream terraces

*Slope:*

- Hanly—0 to 2 percent
- Glendive—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Hanly and similar soils: 50 percent  
Glendive and similar soils: 40 percent

**Minor Components**

Havre and similar soils: 0 to 3 percent  
Harlake and similar soils: 0 to 3 percent  
Ryell and similar soils: 0 to 3 percent  
Poorly drained soils: 0 to 1 percent

### Major Component Description

#### Hanly

*Surface layer texture:* Loamy fine sand  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.7 inches

#### Glendive

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.8 inches

### 4621A—Hanly-Glendive complex, 0 to 2 percent slopes, occasionally flooded

#### Setting

##### *Landform:*

- Hanly—Flood plains
- Glendive—Flood plains

##### *Slope:*

- Hanly—0 to 2 percent
- Glendive—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Hanly and similar soils: 50 percent  
 Glendive and similar soils: 40 percent

#### Minor Components

Havre and similar soils: 0 to 2 percent  
 Ryell and similar soils: 0 to 2 percent  
 Harlake and similar soils: 0 to 2 percent  
 Poorly drained soils: 0 to 2 percent  
 Frequently flooded soils: 0 to 2 percent

#### Major Component Description

#### Hanly

*Surface layer texture:* Loamy fine sand

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Forest land  
*Flooding:* Occasional  
*Available water capacity:* Mainly 5.7 inches

#### Glendive

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Forest land  
*Flooding:* Occasional  
*Available water capacity:* Mainly 10.0 inches

### 660A—Hanly-Glendive loams, 0 to 2 percent slopes, occasionally flooded

#### Setting

##### *Landform:*

- Hanly—Flood plains
- Glendive—Flood plains

##### *Slope:*

- Hanly—0 to 2 percent
- Glendive—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Hanly and similar soils: 50 percent  
 Glendive and similar soils: 40 percent

#### Minor Components

Havre and similar soils: 0 to 5 percent  
 Rivra and similar soils: 0 to 5 percent

#### Major Component Description

#### Hanly

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Forest land  
*Flooding:* Occasional  
*Available water capacity:* Mainly 4.1 inches

**Glendive***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 7.6 inches**Harlake Series***Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Slow*Landform:* Flood plains and stream terraces*Parent material:* Alluvium*Slope range:* 0 to 2 percent*Elevation range:* 2,240 to 2,700 feet*Annual precipitation:* 11 to 14 inches*Annual air temperature:* 43 to 45 degrees F*Frost-free period:* 110 to 135 days**Taxonomic Class:** Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents**Typical Pedon**

Harlake silty clay, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 1,700 feet east and 400 feet south of the northwest corner of sec. 13, T. 4 N., R. 47 E.

A—0 to 8 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; hard, firm, sticky and very plastic; many fine roots and common coarse roots; many very fine discontinuous tubular pores; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C1—8 to 21 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium prismatic structure; hard, firm, sticky and plastic; many fine and medium roots; many medium discontinuous tubular pores; strongly effervescent; moderately alkaline; diffuse wavy boundary.

C2—21 to 41 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; many fine roots and common medium roots; many very fine discontinuous tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—41 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and plastic; common coarse roots; many very fine discontinuous tubular pores; strongly effervescent; moderately alkaline.

**Range in Characteristics***Soil temperature:* 42 to 47 degrees F*Moisture control section:* Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher*Soil phases:* Nonflooded, rarely flooded, channeled, or occasionally flooded*A horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 27 to 55 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: Silty clay, silty clay loam, or clay loam consisting of stratified layers of silty clay, silty clay loam, clay loam, and fine sandy loam

Clay content: 35 to 60 percent

Reaction: pH 7.4 to 9.0

**942A—Harlake silty clay loam, 0 to 2 percent slopes, occasionally flooded****Setting***Landform:* Flood plains*Slope:* 0 to 2 percent*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Harlake and similar soils: 85 percent

**Minor Components**

Havre and similar soils: 0 to 15 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:* Occasional  
*Available water capacity:* Mainly 9.6 inches

### 471A—Harlake silty clay, 0 to 2 percent slopes, occasionally flooded

#### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Harlake and similar soils: 85 percent

#### Minor Components

Havre and similar soils: 0 to 3 percent  
 Glendive and similar soils: 0 to 3 percent  
 Saline soils: 0 to 3 percent  
 Frequently flooded soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent

#### Major Component Description

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Available water capacity:* Mainly 9.6 inches

### 47A—Harlake silty clay, 0 to 2 percent slopes, rarely flooded

#### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Harlake and similar soils: 85 percent

#### Minor Components

Havre and similar soils: 0 to 3 percent  
 Saline soils: 0 to 3 percent  
 Sodic soils: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent

#### Major Component Description

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Rare  
*Available water capacity:* Mainly 9.0 inches

### Havre Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Flood plains and stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Elevation range:* 2,240 to 2,700 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Havre loam, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 2,400 feet south and 1,500 feet west of the northeast corner of sec. 4, T. 7 N., R. 47 E.

A—0 to 9 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; slightly

effervescent; slightly alkaline; clear wavy boundary.

C1—9 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—18 to 60 inches; pale brown (10YR 6/3) loam consisting of thin strata of very fine sandy loam; brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 40 to 47 degrees F

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

*Soil phases:* Frequently flooded, rarely flooded, occasionally flooded, nonflooded, or channeled

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silty clay loam, or silty clay

Clay content: 10 to 55 percent

Reaction: pH 6.1 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 consisting of thin strata of very fine sandy loam

Clay content: 18 to 35 percent

Reaction: pH 7.4 to 9.0

### 456A—Havre and Glendive soils, channeled, 0 to 2 percent slopes, frequently flooded

#### Setting

##### Landform:

- Havre—Flood plains
- Glendive—Flood plains

##### Slope:

- Havre—0 to 2 percent
- Glendive—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Havre and similar soils: 45 percent

Glendive and similar soils: 45 percent

#### Minor Components

Harlake and similar soils: 0 to 2 percent

Hanly and similar soils: 0 to 2 percent

Nonflooded soils: 0 to 2 percent

Occasionally flooded soils: 0 to 2 percent

Poorly drained 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:* Frequent

*Available water capacity:* Mainly 9.8 inches

#### Glendive

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* Frequent

*Available water capacity:* Mainly 10.0 inches

### 481A—Havre loam, 0 to 2 percent slopes, occasionally flooded

#### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Havre and similar soils: 85 percent

### Minor Components

Harlake and similar soils: 0 to 4 percent  
Glendive and similar soils: 0 to 4 percent  
Frequently flooded soils: 0 to 4 percent  
Poorly drained 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:* Forest land  
*Flooding:* Occasional  
*Available water capacity:* Mainly 9.8 inches

## 4881A—Havre loam, 0 to 2 percent slopes, rarely flooded

### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Havre and similar soils: 85 percent

#### Minor Components

Glendive and similar soils: 0 to 3 percent  
Harlake and similar soils: 0 to 3 percent  
Saline soils: 0 to 3 percent  
Soils that have slopes more than 2 percent: 0 to 3 percent  
Poorly drained 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

## 488A—Havre silty clay loam, 0 to 2 percent slopes, occasionally flooded

### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Havre and similar soils: 85 percent

#### Minor Components

Glendive and similar soils: 0 to 3 percent  
Havre loam: 0 to 3 percent  
Saline soils: 0 to 3 percent  
Frequently flooded soils: 0 to 3 percent  
Poorly drained soils: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Available water capacity:* Mainly 9.6 inches

## 661A—Havre silty clay loam, saline, 0 to 2 percent slopes, frequently flooded

### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Havre and similar soils: 85 percent

**Minor Components**

Glendive and similar soils: 0 to 5 percent  
 Harlake and similar soils: 0 to 5 percent  
 Strongly saline soils: 0 to 5 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:* Frequent  
*Water table:* Apparent  
*Ponding:* Long  
*Salt affected:* Saline within 30 inches  
*Available water capacity:* Mainly 6.6 inches

**483A—Havre silty clay, 0 to 2 percent slopes, occasionally flooded****Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Havre and similar soils: 85 percent

**Minor Components**

Harlake and similar soils: 0 to 3 percent  
 Havre soils that have loam textures: 0 to 3 percent  
 Saline soils: 0 to 3 percent  
 Frequently flooded soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Available water capacity:* Mainly 9.4 inches

**844A—Havre, Harlake, and Glendive soils, channeled, 0 to 2 percent slopes****Setting***Landform:*

- Havre—Flood plains
- Harlake—Flood plains
- Glendive—Flood plains

*Slope:*

- Havre—0 to 2 percent
- Harlake—0 to 2 percent
- Glendive—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Havre and similar soils: 35 percent  
 Harlake and similar soils: 30 percent  
 Glendive and similar soils: 25 percent

**Minor Components**

Moderately saline soils: 0 to 4 percent  
 Rarely flooded soils: 0 to 2 percent  
 Extremely gravelly sandy soils: 0 to 2 percent  
 Somewhat poorly drained 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:* Forest land  
*Flooding:* Frequent  
*Available water capacity:* Mainly 9.7 inches

**Harlake**

*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:* Frequent  
*Available water capacity:* Mainly 9.6 inches

**Glendive**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Frequent  
*Available water capacity:* Mainly 9.9 inches

### **77A—Havre-Bigsandy loams, 0 to 2 percent slopes, frequently flooded**

#### **Setting**

*Landform:*

- Havre—Flood plains
- Bigsandy—Flood plains

*Slope:*

- Havre—0 to 2 percent
- Bigsandy—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Havre and similar soils: 50 percent  
 Bigsandy and similar soils: 40 percent

##### **Minor Components**

Glendive and similar soils: 0 to 2 percent  
 Ismay and similar soils: 0 to 2 percent  
 Harlake and similar soils: 0 to 2 percent  
 Ryell and similar soils: 0 to 2 percent  
 Nonflooded 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:* Frequent  
*Available water capacity:* Mainly 9.8 inches

##### **Bigsandy**

*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:* Frequent  
*Water table:* Apparent  
*Available water capacity:* Mainly 8.5 inches

### **487A—Havre-Harlake complex, 0 to 2 percent slopes, nonflooded**

#### **Setting**

*Landform:*

- Havre—Stream terraces
- Harlake—Stream terraces

*Slope:*

- Havre—0 to 2 percent
- Harlake—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

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

##### **Minor Components**

Glendive and similar soils: 0 to 4 percent  
 Saline soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 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:* None  
*Available water capacity:* Mainly 9.8 inches

##### **Harlake**

*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 9.6 inches

## 4871A—Havre-Harlake complex, 0 to 2 percent slopes, occasionally flooded

### Setting

#### Landform:

- Havre—Flood plains
- Harlake—Flood plains

#### Slope:

- Havre—0 to 2 percent
- Harlake—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

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

#### Minor Components

Glendive and similar soils: 0 to 3 percent  
Saline soils: 0 to 3 percent  
Frequently flooded soils: 0 to 2 percent  
Poorly drained 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:* Forest land

*Flooding:* Occasional

*Available water capacity:* Mainly 9.8 inches

#### Harlake

*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:* Occasional

*Available water capacity:* Mainly 9.6 inches

#### Ismay Series

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderately slow

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Elevation range:* 2,240 to 2,700 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Ismay silty clay loam, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 1,700 feet south and 2,300 feet west of the northeast corner of sec. 22, T. 12 N., R. 48 E.

A—0 to 4 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; slightly hard, very friable, sticky and plastic; many very fine roots and common medium roots; common very fine pores; common fine masses of salt; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—4 to 30 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; common very fine and fine pores; few fine masses of salt; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—30 to 45 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; few fine and medium faint gray (5Y 6/1) moist redox depletions, few fine and medium faint gray (10YR 6/1) moist redox depletions; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—45 to 60 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few fine and medium faint gray (5Y 6/1) moist redox depletions, few fine and medium faint brownish yellow (10YR 6/6) moist redox concentrations; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths

of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

*Depth to water table:* 42 to 60 inches

#### *A horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 27 to 40 percent

Electrical conductivity: 2 to 8

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

#### *C1 horizon*

Value: 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam, silty clay loam, or loam

Clay content: 18 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 20

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

#### *C2 horizon*

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

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

Clay content: 18 to 35 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium absorption ratio: 10 to 35

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

#### *C3 horizon*

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, silty clay loam, or clay loam

Clay content: 18 to 35 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium absorption ratio: 5 to 35

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

### **491A—Ismay silty clay loam, 0 to 2 percent slopes, occasionally flooded**

#### **Setting**

*Landform:* Flood plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Ismay and similar soils: 85 percent

##### **Minor Components**

Havre and similar soils: 0 to 3 percent

Glendive and similar soils: 0 to 3 percent

Frequently flooded soils: 0 to 3 percent

Soils that have slopes more than 2 percent: 0 to 3 percent

Poorly drained soils: 0 to 3 percent

#### **Major Component Description**

*Surface layer texture:* Silty clay loam

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

*Drainage class:* Moderately well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* Occasional

*Water table:* Apparent

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 7.6 inches

#### **Ivanell Series**

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Sedimentary plains

*Parent material:* Semiconsolidated shale residuum

*Slope range:* 2 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Typic Eutroboralfs

#### **Typical Pedon**

Ivanell silt loam in an area of Davidell-Ivanell complex, 2 to 8 percent slopes, in an area of rangeland; 2,000 feet north and 1,500 feet east of the southwest corner of sec. 25, T. 10 N., R. 47 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; soft,

very friable, slightly sticky and slightly plastic; common medium roots and many very fine and fine roots; slightly alkaline; clear smooth boundary.

Bt1—3 to 9 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; common medium roots and many very fine and fine roots; common fine and very fine pores; common distinct very dark grayish brown (10YR 3/2) moist, clay films on faces of ped; slightly alkaline; clear smooth boundary.

Bt2—9 to 12 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common medium, fine, and very fine roots; common fine and very fine pores; many distinct very dark grayish brown (10YR 3/2) moist clay films on faces of ped and in pores; slightly alkaline; clear smooth boundary.

Bk1—12 to 17 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine and fine roots; common medium irregular masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bk2—17 to 21 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine roots; common medium and coarse irregular masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bk3—21 to 33 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common medium and coarse irregular masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

Cr—33 to 60 inches; pale yellow (2.5Y 7/4) semiconsolidated siltstone, light olive brown (2.5Y 5/6) moist.

## Range in Characteristics

### *E horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

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

Clay content: 18 to 30 percent

Reaction: pH 6.6 to 7.8

### *Bt horizons*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 to 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 8.4

### *Bk1 and Bk2 horizons*

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

### *Bk3 horizon*

Hue: 2.5Y or 10YR

Value: 4 or 5 moist

Chroma: 2 to 4

Texture: Loam or silty clay loam

Clay content: 20 to 35 percent

Electrical conductivity (mmhos/cm): 8 to 16

Sodium absorption ratio: 10 to 15

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

## 581C—Ivanell-Cabbart silt loams, 2 to 8 percent slopes

### Setting

#### *Landform:*

- Ivanell—Sedimentary plains
- Cabbart—Sedimentary plains

#### *Position on landform:*

- Ivanell—Foothills and toe slopes
- Cabbart—Shoulders and summits

#### *Slope:*

- Ivanell—2 to 8 percent
- Cabbart—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Ivanell and similar soils: 50 percent  
 Cabbart and similar soils: 35 percent

#### Minor Components

Cambeth and similar soils: 0 to 4 percent  
 Lonna and similar soils: 0 to 4 percent  
 Very shallow soils: 0 to 4 percent  
 Areas of rock outcrop: 0 to 3 percent

### Major Component Description

#### Ivanell

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.1 inches

#### Cabbart

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

### 845C—Ivanell-Davidell complex, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Ivanell—Sedimentary plains
- Davidell—Sedimentary plains

##### *Position on landform:*

- Ivanell—Backslopes
- Davidell—Footslopes

#### *Slope:*

- Ivanell—2 to 8 percent
- Davidell—2 to 4 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Ivanell and similar soils: 40 percent  
 Davidell and similar soils: 40 percent

#### Minor Components

Cambeth and similar soils: 0 to 4 percent  
 Delpoint and similar soils: 0 to 4 percent  
 Gerdrum and similar soils: 0 to 4 percent  
 Antwerp and similar soils: 0 to 4 percent  
 Shallow soils: 0 to 4 percent

### Major Component Description

#### Ivanell

*Surface layer texture:* Silty clay loam  
*Depth class:* 25  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 4.4 inches

#### Davidell

*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

### Kirby Series

*Depth class:* Very deep  
*Drainage class:* Excessively  
*Permeability:* Rapid  
*Landform:* Sedimentary plains and hills  
*Parent material:* Material weathered from baked sandstone and shale

*Slope range:* 8 to 70 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Loamy-skeletal over fragmental, mixed (calcareous), frigid Aridic Ustorthents

### Typical Pedon

Kirby channery loam in an area of Cambeth-Cabbart-Kirby complex, 8 to 45 percent slopes, in an area of rangeland; 400 feet east and 2,300 feet south of the northwest corner of sec. 31, T. 6 N., R. 50 E.

A—0 to 6 inches; reddish brown (5YR 5/3) channery loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 35 percent channers; slightly alkaline; clear wavy boundary.

Bk—6 to 12 inches; reddish brown (5YR 5/4) extremely channery loam, yellowish red (5YR 4/6) moist; massive structure; soft, very friable, slightly sticky and slightly plastic, many fine and very fine roots; common fine and very fine pores; 80 percent channers and flagstones; common distinct lime coats on coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—12 to 60 inches; reddish brown (5YR 5/4) hard fractured baked shale, yellowish red (5YR 4/6) moist few fine roots in cracks.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 8 and 24 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

*Depth to fragmental material:* 11 to 20 inches

#### A horizon

Hue: 5YR or 7.5YR  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 3 or 4  
 Clay content: 10 to 22 percent  
 Content of rock fragments: 15 to 60 percent channers  
 Calcium carbonate equivalent: 1 to 5 percent  
 Reaction: pH 7.4 to 8.4

#### Bk horizon

Hue: 5YR or 7.5YR  
 Value: 5 to 7 dry; 4 to 6 moist

Chroma: 4 to 6  
 Texture: Loam or sandy loam  
 Clay content: 8 to 22 percent  
 Content of rock fragments: 60 to 80 percent channers and flagstones  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 8.4

#### 2C horizon

Hue: 2.5YR or 5YR  
 Content of rock fragments: 95 to 100 percent flagstones and channers  
 Reaction: pH 7.9 to 8.4

## 612F—Kirby-Blacksheep-Rock outcrop complex, 25 to 60 percent slopes

### Setting

#### Landform:

- Kirby—Hills
- Blacksheep—Hills

#### Position on landform:

- Kirby—Shoulders and summits
- Blacksheep—Backslopes and shoulders

#### Slope:

- Kirby—25 to 60 percent
- Blacksheep—25 to 50 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Kirby and similar soils: 40 percent  
 Blacksheep and similar soils: 35 percent  
 Rock outcrop: 15 percent

#### Minor Components

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

### Major Component Description

#### Kirby

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 1.4 inches

**Blacksheep**

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, sandy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.7 inches

**Rock outcrop**

*Definition:* Areas of exposed baked shale and sandstone bedrock.

## 943F—Kirby-Cabbart-Rock outcrop complex, 25 to 70 percent slopes

### Setting

*Landform:*

- Kirby—Hills
- Cabbart—Hills

*Position on landform:*

- Kirby—Summits
- Cabbart—Backslopes

*Slope:*

- Kirby—25 to 70 percent
- Cabbart—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Kirby and similar soils: 40 percent

Cabbart and similar soils: 25 percent

Rock outcrop: 20 percent

#### Minor Components

Armells and similar soils: 0 to 5 percent

Yawdim and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

### Major Component Description

#### Kirby

*Surface layer texture:* Very channery loam

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

*Drainage class:* Excessively drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 0.9 inches

#### Cabbart

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.9 inches

#### Rock outcrop

*Definition:* Areas of exposed baked shale and siltstone bedrock.

### Kobase Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Sedimentary plains and hills

*Parent material:* Alluvium

*Slope range:* 0 to 25 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Aridic Ustochrepts

#### Typical Pedon

Kobase silty clay loam, 2 to 8 percent slopes, in an area of rangeland; 3,100 feet north and 1,400 feet east of the southwest corner of sec. 5, T. 3 N., R 50 E.

A—0 to 8 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to moderate fine and medium granular structure; hard, firm, sticky and plastic; many medium and fine roots; very slightly effervescent; slightly alkaline; clear wavy boundary.

Bw—8 to 18 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—18 to 26 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist;

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

C1—26 to 36 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—36 to 60 inches; brown (10YR 4/3) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Soil phases:* Gullied

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Reaction: pH 6.6 to 8.4

#### Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

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

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### C horizons

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

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

### 53A—Kobase silty clay loam, 0 to 2 percent slopes

#### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Kobase and similar soils: 85 percent

##### Minor Components

Yamacall and similar soils: 0 to 4 percent

Marvan and similar soils: 0 to 4 percent

Poorly drained soils: 0 to 4 percent

Pinehill 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 9.8 inches

### 531D—Kobase silty clay loam, 2 to 15 percent slopes, gullied

#### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Kobase and similar soils: 85 percent

### Minor Components

Yamacall and similar soils: 0 to 3 percent

Busby and similar soils: 0 to 3 percent

Megonot and similar soils: 0 to 3 percent

Delpoint and similar soils: 0 to 3 percent

Gerdrum 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 9.8 inches

## 53C—Kobase silty clay loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Kobase and similar soils: 85 percent

#### Minor Components

Yamacall and similar soils: 0 to 3 percent

Delpoint and similar soils: 0 to 3 percent

Megonot and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 3 percent

Sonnett 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 9.8 inches

## 53D—Kobase silty clay loam, 8 to 15 percent slopes

### Setting

*Landform:* Sedimentary plains

*Position on landform:* Foothills

*Slope:* 8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Kobase and similar soils: 85 percent

#### Minor Components

Megonot and similar soils: 0 to 3 percent

Yamacall and similar soils: 0 to 3 percent

Delpoint and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 3 percent

Soils that have slopes less than 8 percent: 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 9.8 inches

## 944E—Kobase-Cabbart-Yawdim complex, 8 to 25 percent slopes

### Setting

*Landform:*

- Kobase—Sedimentary plains
- Cabbart—Hills
- Yawdim—Hills

*Position on landform:*

- Kobase—Backslopes
- Cabbart—Shoulders and summits
- Yawdim—Shoulders and summits

*Slope:*

- Kobase—8 to 15 percent
- Cabbart—8 to 25 percent
- Yawdim—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Kobase and similar soils: 45 percent

Cabbart and similar soils: 20 percent

Yawdim and similar soils: 15 percent

**Minor Components**

Cambeth and similar soils: 0 to 10 percent

Areas of rock outcrop: 0 to 10 percent

**Major Component Description****Kobase***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.7 inches**Cabbart***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.8 inches**Yawdim***Surface layer texture:* Silty clay loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated shale residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.0 inches**532C—Kobase-Gerdrum silty clay loams,  
2 to 8 percent slopes****Setting***Landform:*

- Kobase—Sedimentary plains
- Gerdrum—Sedimentary plains

*Slope:*

- Kobase—2 to 8 percent
- Gerdrum—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Kobase and similar soils: 60 percent

Gerdrum and similar soils: 30 percent

**Minor Components**

Sonnett and similar soils: 0 to 3 percent

Archin and similar soils: 0 to 3 percent

Migonot and similar soils: 0 to 2 percent

Davidell and similar soils: 0 to 2 percent

**Major Component Description****Kobase***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.8 inches**Gerdrum***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland

*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.9 inches

## Kremlin Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 2 to 15 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Haploborolls

### Typical Pedon

Kremlin loam, 2 to 8 percent slopes, in an area of rangeland; 2,900 feet west and 10 feet north of the southeast corner of sec. 11, T. 2 N., R. 53 E.

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

A2—3 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine roots; common fine and very fine pores; slightly alkaline; clear smooth boundary.

Bw—8 to 15 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium and coarse angular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common coarse and medium roots; common fine and very fine pores; slightly alkaline; abrupt smooth boundary.

Bk1—15 to 27 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak coarse angular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common medium and fine roots; common fine and very fine pores; common coarse and medium irregular masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk2—27 to 46 inches; pale brown (10YR 6/3) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium and coarse angular blocky structure; hard, firm, sticky and plastic; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk3—46 to 62 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium angular blocky structure; hard, firm, sticky and plastic; common medium irregular masses of lime; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Bk horizon:* 10 to 24 inches

*Mollic epipedon thickness:* 7 to 15 inches

#### A horizons

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.1 to 7.8

#### 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

Reaction: pH 6.6 to 8.4

*Bk horizons*

Hue: 10YR, 2.5Y, or 5Y  
 Value: 6 to 8 dry; 4 to 6 moist  
 Chroma: 2 to 4  
 Texture: Loam, silt loam, clay loam, or sandy loam  
 Clay content: 18 to 30 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

**50C—Kremlin loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Kremlin and similar soils: 85 percent

**Minor Components**

Delpoint and similar soils: 0 to 5 percent  
 Chinook and similar soils: 0 to 5 percent  
 Soils that have slopes more than 8 percent: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.8 inches

**613C—Kremlin-Cabbart complex, 2 to 8 percent slopes****Setting**

*Landform:*

- Kremlin—Sedimentary plains
- Cabbart—Sedimentary plains

*Position on landform:*

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

*Slope:*

- Kremlin—2 to 8 percent
- Cabbart—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Kremlin and similar soils: 50 percent  
 Cabbart and similar soils: 35 percent

**Minor Components**

Delpoint and similar soils: 0 to 5 percent  
 Kobase and similar soils: 0 to 5 percent  
 Soils that have slopes more than 8 percent: 0 to 5 percent

**Major Component Description****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 10.8 inches

**Cabbart**

*Surface layer texture:* Silt loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.2 inches

**501C—Kremlin-Delpoint loams, 2 to 8 percent slopes****Setting**

*Landform:*

- Kremlin—Sedimentary plains
- Delpoint—Sedimentary plains

*Position on landform:*

- Kremlin—Foothslopes
- Delpoint—Backslopes and foothslopes

*Slope:*

- Kremlin—2 to 8 percent
- Delpoint—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Kremlin and similar soils: 50 percent  
Delpoint and similar soils: 35 percent

**Minor Components**

Lonna and similar soils: 0 to 4 percent  
Busby and similar soils: 0 to 4 percent  
Cabbart and similar soils: 0 to 4 percent  
Twilight and similar soils: 0 to 3 percent

**Major Component Description****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 10.8 inches**Delpoint***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**121D—Kremlin-Tinsley-Degrad complex,  
4 to 15 percent slopes****Setting***Landform:*

- Kremlin—Sedimentary plains
- Tinsley—Relict stream terraces
- Degrand—Relict stream terraces

*Position on landform:*

- Kremlin—Foothslopes
- Tinsley—Backslopes and shoulders
- Degrand—Summits

*Slope:*

- Kremlin—4 to 15 percent
- Tinsley—4 to 15 percent
- Degrand—4 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Kremlin and similar soils: 30 percent  
Tinsley and similar soils: 30 percent  
Degrand and similar soils: 25 percent

**Minor Components**

Delpoint and similar soils: 0 to 3 percent  
Chinook and similar soils: 0 to 3 percent  
Lihen and similar soils: 0 to 3 percent  
Soils that have slopes less than 4 percent: 0 to 3 percent  
Soils that have slopes more than 15 percent: 0 to 3 percent

**Major Component Description****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 10.8 inches**Tinsley***Surface layer texture:* Very gravelly sandy 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 1.3 inches**Degrad***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 5.8 inches

## Lallie Series

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Slow

*Landform:* Oxbows

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Elevation range:* 2,240 to 2,700 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic (calcareous), frigid Vertic Fluvaquents

### Typical Pedon

Lallie silty clay, 0 to 2 percent slopes, in an area of rangeland; 2,400 feet north and 1,200 feet east of the southwest corner of sec. 4, T. 7 N., R. 47 E.

A1—0 to 6 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; very hard, firm, sticky and plastic; common fine and very fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A2—6 to 9 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg1—9 to 37 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common medium and coarse prominent light olive brown (2.5Y 5/6) moist redox concentrations; massive; very hard, firm, sticky and plastic; common very fine roots; common very fine pores; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg2—37 to 53 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common medium and coarse distinct light olive brown (2.5Y 5/6) moist redox concentrations; massive; very hard, firm, sticky and plastic; common very fine roots; common very fine pores; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg3—53 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common coarse distinct light olive brown (2.5Y 5/6) moist redox concentrations, common faint olive (5Y 4/3) moist redox concentrations; massive; very hard, firm, sticky and plastic; common very fine roots; slightly effervescent; slightly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Depth to water table:* 6 to 12 inches

#### A horizons

Hue: 10YR or 5Y

Value: 3 to 6 dry; 2 or 4 moist

Chroma: 1 or 2

Clay content: 40 to 60 percent

Reaction: pH 6.6 to 7.8

#### Cg horizons

Hue: 2.5Y or 10YR

Value: 4 or 8 dry; 3 to 6 moist

Chroma: 1 or 2

Texture: Silty clay loam or silty clay

Clay content: 35 to 60 percent

Reaction: pH 7.4 to 9.0

## 473A—Lallie silty clay, 0 to 2 percent slopes

### Setting

*Landform:* Oxbows /

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Lallie and similar soils: 85 percent

#### Minor Components

Havre and similar soils: 0 to 4 percent

Harlake and similar soils: 0 to 4 percent

Nonflooded soils: 0 to 4 percent

Saline soils: 0 to 3 percent

### Major Component Description

*Surface layer texture:* Silty clay

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

*Drainage class:* Poorly drained

*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Frequent  
*Water table:* Apparent  
*Salt affected:* Saline within 30 inches  
*Available water capacity:* Mainly 10.7 inches

## Lamedeer Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Hills and sedimentary plains  
*Parent material:* Material weathered from baked sandstone and shale  
*Slope range:* 8 to 70 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

### Typical Pedon

Lamedeer channery loam in an area of Lamedeer-Cabba-Ringling complex, 25 to 70 percent slopes, in a grazed forestland area; 1,000 feet south and 2,500 feet east of the northwest corner of sec. 22, T. 7 N., R. 50 E.

Oi—2 to 0 inches; undecomposed and partially decomposed forest litter.

A—0 to 4 inches; brown (7.5YR 5/2) channery loam, brown (7.5YR 4/2) moist; weak medium and coarse granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; 30 percent channers; slightly alkaline; clear wavy boundary.

Bw—4 to 19 inches; brown (7.5YR 5/4) very channery loam, brown (7.5YR 4/4) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; common fine and very fine pores; 60 percent channers; slightly alkaline; clear wavy boundary.

Bk1—19 to 26 inches; light brown (7.5YR 6/4) extremely channery loam, brown (7.5YR 5/4) moist; moderate fine and very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common coarse to fine roots; common fine and very fine pores; common coarse irregular masses of lime; strongly effervescent; 25

percent flagstones, 45 percent channers; moderately alkaline; clear wavy boundary.

Bk2—26 to 60 inches; pink (5YR 7/4) extremely channery loam, reddish brown (5YR 5/4) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; common medium, fine, and very fine roots; common medium and coarse irregular masses of lime; violently effervescent; 70 percent channers and flagstones; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

*Moisture control section:* Between the depths of 4 and 12 inches

#### A horizon

Hue: 5YR or 7.5YR  
 Value: 4 to 6 dry; 3 to 5 moist  
 Chroma: 2 or 3  
 Clay content: 12 to 23 percent  
 Content of rock fragments: 15 to 35 percent channers  
 Reaction: pH 6.6 to 7.8

#### Bw horizon

Hue: 5YR or 7.5YR  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 3 or 4  
 Clay content: 15 to 25 percent  
 Content of rock fragments: 30 to 60 percent channers and flagstones  
 Reaction: pH 6.6 to 7.8

#### Bk horizons

Hue: 5YR or 7.5YR  
 Value: 5 to 7 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Texture: Loam or sandy loam  
 Clay content: 8 to 20 percent  
 Content of rock fragments: 50 to 70 percent channers and flagstones  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

## 701E—Lamedeer-Broadus-Ringling complex, 15 to 25 percent slopes

### Setting

#### Landform:

- Lamedeer—Hills
- Broadus—Hills
- Ringling—Hills

*Position on landform:*

- Lamedeer—Backslopes and shoulders
- Broadus—Backslopes
- Ringling—Shoulders and summits

*Slope:*

- Lamedeer—15 to 25 percent
- Broadus—15 to 25 percent
- Ringling—15 to 25 percent

*Elevation:* 2,900 to 3,760 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Lamedeer and similar soils: 35 percent

Broadus and similar soils: 30 percent

Ringling and similar soils: 20 percent

**Minor Components**

Cabba and similar soils: 0 to 3 percent

Doney and similar soils: 0 to 3 percent

Macar and similar soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Cohagen and similar soils: 0 to 3 percent

**Major Component Description****Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Material weathered from baked sandstone and shale*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.7 inches**Broadus***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium or colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 9.8 inches**Ringling***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained*Dominant parent material:* Material weathered from baked sandstone and shale*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 2.6 inches**702F—Lamedeer-Cabba-Ringling complex, 25 to 70 percent slopes****Setting***Landform:*

- Lamedeer—Hills
- Cabba—Hills
- Ringling—Hills

*Position on landform:*

- Lamedeer—Backslopes
- Cabba—Backslopes and shoulders
- Ringling—Shoulders and summits

*Slope:*

- Lamedeer—25 to 70 percent
- Cabba—25 to 70 percent
- Ringling—25 to 70 percent

*Elevation:* 2,900 to 3,760 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Lamedeer and similar soils: 35 percent

Cabba and similar soils: 30 percent

Ringling and similar soils: 20 percent

**Minor Components**

Bitton and similar soils: 0 to 3 percent

Doney and similar soils: 0 to 3 percent

Macar and similar soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Soils that have slopes less than 25 percent: 0 to 3 percent

**Major Component Description****Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.7 inches**Cabba***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)

*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

### Ringling

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Forest land  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 inches

### Lihen Series

*Depth class:* Very deep  
*Drainage class:* Somewhat excessively  
*Permeability:* Rapid  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium or eolian material  
*Slope range:* 4 to 35 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Sandy, mixed Entic Haploborolls

### Typical Pedon

Lihen loamy fine sand in an area of Chinook-Lihen-Twilight complex, 8 to 15 percent slopes, in an area of rangeland; 1,000 feet south and 900 feet east of the northwest corner of sec. 35, T. 10 N., R. 55 E.

A—0 to 12 inches; brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; many medium pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—12 to 44 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 5/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C—44 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 4/3) moist; single grain; loose, nonsticky

and nonplastic; few very fine roots; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 12 and 35 inches  
*Mollic epipedon thickness:* 12 to 30 inches  
*Depth to Bk horizon:* Mainly 10 to 36 inches but are as deep as 45 inches in some pedons

#### A horizon

Hue: 10YR to 2.5Y  
 Value: 3 to 4 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Texture: Loamy sand or loamy fine sand  
 Clay content: 5 to 10 percent  
 Reaction: pH 6.1 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 3 to 6 moist  
 Chroma: 2 to 4  
 Texture: Loamy sand, loamy fine sand, fine sand, or sand  
 Clay content: 0 to 10 percent  
 Calcium carbonate equivalent: 2 to 15 percent  
 Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 2 or 3  
 Texture: Loamy sand, loamy fine sand, fine sand, or sand  
 Clay content: 0 to 10 percent  
 Reaction: pH 7.4 to 8.4

### 990E—Lihen-Tinsley complex, 8 to 35 percent slopes

#### Setting

##### Landform:

- Lihen—Hills
- Tinsley—Relict stream terraces

##### Position on landform:

- Lihen—Backslopes and footslopes
- Tinsley—Shoulders and summits

##### Slope:

- Lihen—8 to 35 percent
- Tinsley—8 to 35 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Lihen and similar soils: 45 percent  
 Tinsley and similar soils: 35 percent

#### Minor Components

Degradand and similar soils: 0 to 5 percent  
 Delpoint and similar soils: 0 to 5 percent  
 Parshall and similar soils: 0 to 5 percent  
 Yetull and similar soils: 0 to 5 percent

### Major Component Description

#### Lihen

*Surface layer texture:* Loamy sand  
*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 5.1 inches

#### Tinsley

*Surface layer texture:* Gravelly sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Excessively drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 1.2 inches

### 542E—Lihen-Yetull complex, 8 to 35 percent slopes

#### Setting

##### *Landform:*

- Lihen—Hills
- Yetull—Hills

##### *Position on landform:*

- Lihen—Backslopes
- Yetull—Backslopes and shoulders

##### *Slope:*

- Lihen—15 to 35 percent
- Yetull—8 to 35 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Lihen and similar soils: 60 percent  
 Yetull and similar soils: 25 percent

#### Minor Components

Busby and similar soils: 0 to 4 percent  
 Yamacall and similar soils: 0 to 4 percent  
 Tinsley and similar soils: 0 to 4 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

### Major Component Description

#### Lihen

*Surface layer texture:* Loamy 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 5.2 inches

#### Yetull

*Surface layer texture:* Very gravelly loamy 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 3.3 inches

### Lilsheep Series

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Relict stream terraces

*Parent material:* Gravelly alluvium or colluvium

*Slope range:* 4 to 45 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Lilsheep gravelly loam in an area of Floweree-Cambeth-Lilsheep complex, 4 to 15 percent slopes,

in an area of rangeland; 1,300 feet south and 700 feet west of the northeast corner of sec. 26, T. 12 N., R. 45 E.

A—0 to 7 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots and common fine roots; 25 percent rounded pebbles; slightly alkaline; clear smooth boundary.

Bk1—7 to 12 inches; light yellowish brown (2.5Y 6/4) very gravelly loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots and common fine roots; common fine and very fine pores; 40 percent rounded pebbles; common medium masses of lime around pebbles; violently effervescent; strongly alkaline; clear wavy boundary.

Bk2—12 to 23 inches; light yellowish brown (2.5Y 6/4) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; 50 percent rounded pebbles; common medium masses of lime around pebbles; violently effervescent; strongly alkaline; gradual smooth boundary.

BC—23 to 43 inches; light yellowish brown (2.5Y 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft very friable, nonsticky and nonplastic; 55 percent rounded pebbles; few fine masses of lime around pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—43 to 60 inches; light gray (2.5Y 7/2) semiconsolidated sandstone, (2.5Y 5/2) moist.

### Range in Characteristics

*Soil temperature:* 43 to 46 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 9 inches

*Depth to Bk horizon:* 7 to 9 inches

#### A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 60 percent—0 to 5 percent cobbles, 15 to 60 percent pebbles

Reaction: pH 7.4 to 7.8

#### Bk horizons

Hue: 10YR or 2.5Y

Chroma: 2 to 4

Texture: Sandy loam, loam, or sandy clay loam

Clay content: 18 to 27 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent cobbles, 35 to 60 percent pebbles

Calcium carbonate equivalent: 10 to 30 percent

Reaction: pH 8.4 to 9.0

#### BC horizon

Chroma: 2 to 4

Texture: Sandy loam, loam, or sandy clay loam

Clay content: 18 to 27 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent cobbles, 35 to 60 percent pebbles

Calcium carbonate equivalent: 10 to 30 percent

Reaction: pH 7.9 to 9.0

### Lisk Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid

*Landform:* Sedimentary plains and hills

*Parent material:* Alluvium or eolian material

*Slope range:* 8 to 25 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Lisk fine sandy loam in an area of Shambo-Lisk-Dast complex, 8 to 25 percent slopes, in a grazed forestland area; 1,600 feet south and 1,200 feet east of northwest corner of sec. 23, T. 6 N., R. 50 E.

Oi—2 inches to 0; undecomposed and partially decomposed forest litter.

A—0 to 3 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate coarse platy structure parting to moderate medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; slightly alkaline; clear smooth boundary.

Bw1—3 to 8 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; moderate coarse angular blocky structure parting to strong medium subangular blocky structure;

slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common fine and very fine pores; moderately alkaline; clear wavy boundary.

Bw2—8 to 15 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium and fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—15 to 21 inches; pale yellow (2.5Y 7/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common fine and very fine pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—21 to 32 inches; pale yellow (2.5Y 7/4) fine sandy loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and very fine pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—32 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; loose, nonsticky and nonplastic; violently effervescent; moderately alkaline.

### Range in Characteristics

#### *A horizon*

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 3 or 4 moist  
Chroma: 2 or 3  
Clay content: 10 to 18 percent  
Reaction: pH 7.4 to 7.8

#### *Bw horizons*

Hue: 2.5Y or 10YR  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 to 4  
Clay content: 8 to 18 percent  
Reaction: pH 7.9 to 8.4

#### *Bk horizons*

Hue: 2.5Y and 10YR  
Value: 6 or 7 dry; 4 to 6 moist  
Chroma: 2 to 4  
Clay content: 8 to 18 percent

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

#### *2C horizon*

Value: 5 or 6 moist  
Chroma: 2 to 4  
Clay content: 0 to 10 percent  
Reaction: pH 7.9 to 8.4

## 971E—Lisk-Cohagen-Dast fine sandy loams, 8 to 25 percent slopes

### Setting

#### *Landform:*

- Lisk—Sedimentary plains
- Cohagen—Hills
- Dast—Hills

#### *Position on landform:*

- Lisk—Backslopes and footslopes
- Cohagen—Shoulders and summits
- Dast—Backslopes and shoulders

#### *Slope:*

- Lisk—8 to 15 percent
- Cohagen—15 to 25 percent
- Dast—15 to 25 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Lisk and similar soils: 40 percent  
Cohagen and similar soils: 25 percent  
Dast and similar soils: 20 percent

#### Minor Components

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

### Major Component Description

#### Lisk

*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 6.3 inches

**Cohagen**

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, sandy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.0 inches

**Dast**

*Surface layer texture:* Fine sandy loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, sandy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.6 inches

**Lonna Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Sedimentary plains and hills

*Parent material:* Alluvium

*Slope range:* 0 to 25 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed, frigid Aridic Ustochrepts

**Typical Pedon**

Lonna silt loam in an area of Lonna-Cambeth silt loams, 2 to 8 percent slopes, in an area of rangeland; 1,300 feet east and 300 feet north of southwest corner of sec. 20, T. 12 N., R. 46 E.

Ap1—0 to 3 inches; brown (10YR 5/3) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure parting to moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; strongly effervescent; slightly alkaline; clear smooth boundary.

Ap2—3 to 6 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly

hard, friable, slightly sticky and slightly plastic; common very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—6 to 16 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—16 to 31 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common coarse rounded masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—31 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; slightly hard, firm, sticky and plastic; common very fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

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

*Soil phases:* Gullied

**Ap horizons**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 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

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  
 Sodium absorption ratio: 1 to 13  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 9.0

*Bk2 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: 10 to 35 percent  
 Sodium absorption ratio: 10 to 20  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 9.0

**57A—Lonna silt loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Lonna and similar soils: 85 percent

**Minor Components**

Cambeth and similar soils: 0 to 3 percent  
 Floweree and similar soils: 0 to 3 percent  
 Alona and similar soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 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 9.3 inches

**57C—Lonna silt loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Lonna and similar soils: 85 percent

**Minor Components**

Cambeth and similar soils: 0 to 3 percent  
 Floweree and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Alona and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 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 9.3 inches

**576A—Lonna silty clay loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Lonna and similar soils: 85 percent

**Minor Components**

Lonna silt loam: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent

Yamacall and similar soils: 0 to 4 percent  
Saline 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 9.3 inches

## 576C—Lonna silty clay loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Lonna and similar soils: 85 percent

#### Minor Components

Lonna silt loam: 0 to 3 percent  
Cambeth and similar soils: 0 to 3 percent  
Kobase and similar soils: 0 to 3 percent  
Yamacall and similar soils: 0 to 3 percent  
Alona 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 9.3 inches

## 573D—Lonna, Cambeth, and Yamacall soils, gullied, 8 to 15 percent slopes

### Setting

*Landform:*

- Lonna—Sedimentary plains
- Cambeth—Sedimentary plains

- Yamacall—Sedimentary plains

*Slope:*

- Lonna—8 to 15 percent
- Cambeth—8 to 15 percent
- Yamacall—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Lonna and similar soils: 30 percent  
Cambeth and similar soils: 30 percent  
Yamacall and similar soils: 30 percent

#### Minor Components

Cabbart and similar soils: 0 to 2 percent  
Kobase and similar soils: 0 to 2 percent  
Busby and similar soils: 0 to 2 percent  
Areas of rock outcrop: 0 to 2 percent  
Flooded 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:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.3 inches

#### Cambeth

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

#### Yamacall

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

**945A—Lonna-Alona silt loams, 0 to 2 percent slopes****Setting***Landform:*

- Lonna—Sedimentary plains
- Alona—Sedimentary plains

*Slope:*

- Lonna—0 to 2 percent
- Alona—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Lonna and similar soils: 70 percent

Alona and similar soils: 20 percent

**Minor Components**

Antwerp and similar soils: 0 to 10 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:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.1 inches**Alona***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*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 7.3 inches**945C—Lonna-Alona silt loams, 2 to 8 percent slopes****Setting***Landform:*

- Lonna—Sedimentary plains
- Alona—Sedimentary plains

*Slope:*

- Lonna—2 to 8 percent
- Alona—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Lonna and similar soils: 65 percent

Alona and similar soils: 20 percent

**Minor Components**

Cambeth and similar soils: 0 to 15 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:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.0 inches**Alona***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*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 7.2 inches**946A—Lonna-Antwerp silty clay loams, 0 to 2 percent slopes****Setting***Landform:*

- Lonna—Sedimentary plains
- Antwerp—Sedimentary plains

*Slope:*

- Lonna—0 to 2 percent
- Antwerp—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Lonna and similar soils: 70 percent  
Antwerp and similar soils: 20 percent

### Minor Components

Alona and similar soils: 0 to 10 percent

### Major Component Description

#### Lonna

*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

#### Antwerp

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 7.0 inches

### 946C—Lonna-Antwerp silty clay loams, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Lonna—Sedimentary plains
- Antwerp—Sedimentary plains

##### *Slope:*

- Lonna—2 to 8 percent
- Antwerp—2 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

### Major Components

Lonna and similar soils: 65 percent  
Antwerp and similar soils: 20 percent

## Minor Components

Alona and similar soils: 0 to 15 percent

### Major Component Description

#### Lonna

*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

#### Antwerp

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.8 inches

### 947E—Lonna-Cabbart-Yawdim complex, 8 to 25 percent slopes

#### Setting

##### *Landform:*

- Lonna—Sedimentary plains
- Cabbart—Hills
- Yawdim—Hills

##### *Position on landform:*

- Lonna—Backslopes
- Cabbart—Shoulders and summits
- Yawdim—Shoulders and summits

##### *Slope:*

- Lonna—8 to 15 percent
- Cabbart—8 to 25 percent
- Yawdim—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

### Major Components

Lonna and similar soils: 50 percent  
Cabbart and similar soils: 20 percent  
Yawdim and similar soils: 15 percent

**Minor Components**

Kobase and similar soils: 0 to 5 percent  
 Busby and similar soils: 0 to 5 percent  
 Yamacall and similar soils: 0 to 5 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:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.0 inches

**Cabbart**

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

**Yawdim**

*Surface layer texture:* Silty clay loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 inches

**575C—Lonna-Cambeth silt loams, 2 to 8 percent slopes****Setting***Landform:*

- Lonna—Sedimentary plains
- Cambeth—Sedimentary plains

*Position on landform:*

- Lonna—Foothills
- Cambeth—Backslopes and shoulders

*Slope:*

- Lonna—2 to 8 percent
- Cambeth—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Lonna and similar soils: 50 percent  
 Cambeth and similar soils: 35 percent

**Minor Components**

Floweree and similar soils: 0 to 3 percent  
 Magonot and similar soils: 0 to 3 percent  
 Cabbart and similar soils: 0 to 3 percent  
 Twilight and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 0 to 3 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:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.3 inches

**Cambeth**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

**574E—Lonna-Cambeth-Cabbart silt loams, 12 to 25 percent slopes****Setting***Landform:*

- Lonna—Hills
- Cambeth—Hills
- Cabbart—Hills

*Position on landform:*

- Lonna—Backslopes and foothills
- Cambeth—Backslopes and shoulders
- Cabbart—Shoulders and summits

*Slope:*

- Lonna—12 to 20 percent
- Cambeth—12 to 25 percent
- Cabbart—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Lonna and similar soils: 40 percent  
 Cambeth and similar soils: 25 percent  
 Cabbart and similar soils: 20 percent

**Minor Components**

Busby and similar soils: 0 to 3 percent  
 Floweree and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Blacksheep and similar soils: 0 to 2 percent  
 Areas of rock outcrop: 0 to 2 percent  
 Yawdim 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:* Alluvium or colluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.3 inches**Cambeth***Surface layer texture:* Silt loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, silty sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.6 inches**Cabbart***Surface layer texture:* Silt loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.6 inches**577D—Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes****Setting***Landform:*

- Lonna—Sedimentary plains
- Cambeth—Sedimentary plains
- Cabbart—Sedimentary plains

*Position on landform:*

- Lonna—Foothslopes
- Cambeth—Backslopes
- Cabbart—Shoulders and summits

*Slope:*

- Lonna—4 to 12 percent
- Cambeth—4 to 12 percent
- Cabbart—4 to 12 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Lonna and similar soils: 40 percent  
 Cambeth and similar soils: 30 percent  
 Cabbart and similar soils: 15 percent

**Minor Components**

Kobase and similar soils: 0 to 3 percent  
 Mego not and similar soils: 0 to 3 percent  
 Floweree and similar soils: 0 to 3 percent  
 Twilight and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 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:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.3 inches

**Cambeth**

*Surface layer texture:* Silt loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, silty sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.6 inches

**Cabbart**

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

**Macar Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains and hills  
*Parent material:* Alluvium or colluvium  
*Slope range:* 0 to 25 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Macar loam in an area of Macar-Doney-Cabba complex, 8 to 15 percent slopes, in an area of rangeland; 2,200 feet west and 1,100 feet south of the northeast corner of sec. 10, T. 2 N., R. 47 E.

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

Bw—3 to 11 inches; pale brown (10YR 6/3) loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic

structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and many very fine roots; common fine and very fine pores; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—11 to 22 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; strong coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; common fine and very fine pores; many very fine and fine irregular masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—22 to 60 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak coarse and medium prismatic structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; common fine and very fine pores; few fine and very fine irregular masses of lime; strongly effervescent; strongly alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Depth to the Bk horizon:* 11 to 24 inches

**A horizon**

Hue: 10YR or 2.5Y  
 Value: 4 to 6 dry; 3 to 5 moist  
 Chroma: 3 or 4  
 Clay content: 18 to 27 percent  
 Reaction: pH 6.6 to 7.8

**Bw horizon**

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 3 to 5 moist  
 Chroma: 2 to 4  
 Texture: Loam, clay loam, or silty clay loam  
 Clay content: 18 to 35 percent  
 Reaction: pH 7.4 to 8.4

**Bk horizons**

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 2 to 4  
 Texture: Loam, clay loam, or silty clay loam  
 Clay content: 18 to 35 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

**98A—Macar loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Macar and similar soils: 85 percent

**Minor Components**

Doney and similar soils: 0 to 4 percent

Sagedale and similar soils: 0 to 4 percent

Cambert and similar soils: 0 to 4 percent

Soils that have slopes more than 2 percent: 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 9.7 inches

**98C—Macar loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Macar and similar soils: 85 percent

**Minor Components**

Sagedale and similar soils: 0 to 4 percent

Doney and similar soils: 0 to 4 percent

Cambert and similar soils: 0 to 4 percent

Soils that have slopes more than 8 percent: 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 9.7 inches

**981C—Macar-Doney loams, 2 to 8 percent slopes****Setting**

*Landform:*

- Macar—Sedimentary plains
- Doney—Sedimentary plains

*Position on landform:*

- Macar—Foothills and toe slopes
- Doney—Backslopes and shoulders

*Slope:*

- Macar—2 to 8 percent
- Doney—2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Macar and similar soils: 50 percent

Doney and similar soils: 35 percent

**Minor Components**

Lisk and similar soils: 0 to 5 percent

Cabba and similar soils: 0 to 5 percent

Dast and similar soils: 0 to 5 percent

**Major Component Description****Macar**

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### **Doney**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.9 inches

## **982D—Macar-Doney-Cabba loams, 8 to 15 percent slopes**

### **Setting**

#### *Landform:*

- Macar—Sedimentary plains
- Doney—Sedimentary plains
- Cabba—Sedimentary plains

#### *Position on landform:*

- Macar—Backslopes and footslopes
- Doney—Backslopes and shoulders
- Cabba—Shoulders and summits

#### *Slope:*

- Macar—8 to 15 percent
- Doney—8 to 15 percent
- Cabba—8 to 15 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Macar and similar soils: 40 percent  
 Doney and similar soils: 30 percent  
 Cabba and similar soils: 15 percent

#### **Minor Components**

Wayden and similar soils: 0 to 4 percent  
 Dast and similar soils: 0 to 4 percent  
 Lisk and similar soils: 0 to 4 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

### **Major Component Description**

#### **Macar**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)

*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### **Doney**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.9 inches

### **Cabba**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

## **983E—Macar-Lisk-Cohagen complex, 8 to 25 percent slopes**

### **Setting**

#### *Landform:*

- Macar—Sedimentary plains
- Lisk—Sedimentary plains
- Cohagen—Hills

#### *Position on landform:*

- Macar—Backslopes and footslopes
- Lisk—Backslopes and footslopes
- Cohagen—Shoulders and summits

#### *Slope:*

- Macar—8 to 15 percent
- Lisk—8 to 15 percent
- Cohagen—15 to 25 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Macar and similar soils: 45 percent  
 Lisk and similar soils: 25 percent  
 Cohagen and similar soils: 20 percent

**Minor Components**

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

**Major Component Description****Macar**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium or colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

**Lisk**

*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 6.3 inches

**Cohagen**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, sandy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.0 inches

**Marias Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Very slow  
*Landform:* Stream terrace and sedimentary plains  
*Parent material:* Alluvium or lacustrine deposits  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid  
 Chromic Udic Haplusterts

**Typical Pedon**

Marias silty clay, 0 to 2 percent slopes, in hayland; 1,200 feet north and 2,200 feet east of southwest corner of sec. 24, T. 8 N., R. 47 E.

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

Bss1—5 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, firm, very sticky and very plastic; common very fine, fine, and medium roots; common fine tubular pores; few intersecting slickensides; slightly effervescent; moderately alkaline; clear wavy boundary.

Bss2—14 to 30 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; common fine tubular pores; few intersecting slickensides; slightly effervescent; moderately alkaline; clear wavy boundary.

By—30 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; common very fine roots; common fine pores; common fine threads of gypsum; slightly effervescent; strongly alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

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

*Depth to By horizon:* 20 to 45 inches

*Linear extensibility:* .06 to .10 in the upper 30 inches of soil; cracks 5 mm or more wide to 50 cm

**Ap horizon**

Hue: 10YR, 2.5Y, or 5Y  
 Value: 4 to 6 dry; 3 to 5 moist  
 Chroma: 2 or 3  
 Texture: Clay or silty clay  
 Clay content: 40 to 60 percent  
 Reaction: pH 7.4 to 8.4

**Bss horizons**

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  
 Calcium carbonate equivalent: 5 to 10 percent  
 Reaction: pH 7.9 to 9.0

*By horizon*

Hue: 10YR, 2.5Y, or 5Y  
 Value: 5 or 6 dry; 3 to 5 moist  
 Chroma: 2 or 3  
 Texture: Clay or silty clay  
 Clay content: 40 to 60 percent  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 4 to 13  
 Gypsum content: 1 to 6 percent  
 Calcium carbonate equivalent: 5 to 10 percent  
 Reaction: pH 7.9 to 9.0

**25A—Marias clay, 0 to 2 percent slopes****Setting**

*Landform:* Stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Marias and similar soils: 85 percent

**Minor Components**

Vanda and similar soils: 0 to 4 percent  
 Marvan and similar soils: 0 to 4 percent  
 Soils that have slopes more than 2 percent: 0 to 4 percent  
 Poorly drained 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  
*Available water capacity:* Mainly 8.5 inches

**534C—Marias clay, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Marias and similar soils: 85 percent

**Minor Components**

Marvan and similar soils: 0 to 5 percent  
 Kobase and similar soils: 0 to 5 percent  
 Vanda and similar soils: 0 to 5 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  
*Available water capacity:* Mainly 8.5 inches

**61A—Marias silty clay, 0 to 2 percent slopes****Setting**

*Landform:* Stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Marias and similar soils: 85 percent

**Minor Components**

Marvan and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent  
 Vanda and similar soils: 0 to 4 percent  
 Poorly drained soils: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 8.5 inches

## Marvan Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Very slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Sodic Haplusterts

### Typical Pedon

Marvan silty clay in an area of Marvan-Vanda silty clays, 0 to 4 percent slopes, in an area of rangeland; 1,500 feet west and 700 feet north of southeast corner of sec. 16, T. 2 N., R. 45 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium granular structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bss—3 to 11 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine and coarse roots; common fine pores; few slickensides; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bssy—11 to 34 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; very hard, very firm, very sticky and very plastic; common very fine and fine roots; few slickensides; common fine threads of gypsum; slightly effervescent; strongly alkaline; diffuse wavy boundary.

Byz—34 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; common fine threads of gypsum; common medium and fine masses of salt; slightly effervescent; strongly alkaline.

## Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between of 4 and 12 inches; dry all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher  
*Summer temperature:* 60 to 68 degrees F  
*Depth to Bssy horizon:* 10 to 24 inches

### A horizon

Hue: 2.5Y or 5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Clay content: 40 to 60 percent  
 Calcium carbonate equivalent: 1 to 5 percent  
 Reaction: pH 7.4 to 8.4

### Bss horizon

Hue: 2.5Y or 5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Texture: Silty clay or clay  
 Clay content: 45 to 60 percent  
 Electrical conductivity: 2 to 4 mmhos/cm  
 Sodium absorption ratio: 8 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: Silty clay or clay  
 Clay content: 45 to 60 percent  
 Electrical conductivity: 2 to 4 mmhos/cm  
 Sodium absorption ratio: 4 to 13  
 Gypsum content: 1 to 3 percent  
 Calcium carbonate equivalent: 5 to 10 percent  
 Reaction: pH 7.9 to 9.0

### Byz horizon

Hue: 2.5Y or 5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Texture: Silty clay or clay  
 Clay content: 45 to 60 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 38  
 Gypsum content: 1 to 5 percent  
 Calcium carbonate equivalent: 5 to 10 percent  
 Reaction: pH 7.9 to 9.0

**62A—Marvan silty clay, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Marvan and similar soils: 85 percent

**Minor Components**

Vanda and similar soils: 0 to 3 percent  
 Mego not and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 7.7 inches

**62C—Marvan silty clay, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Marvan and similar soils: 85 percent

**Minor Components**

Mego not and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent

Soils that have slopes more than 8 percent: 0 to 3 percent  
 Vanda and similar soils: 0 to 2 percent  
 Soils that have slopes less than 2 percent: 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:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 7.7 inches

**621B—Marvan-Vanda silty clays, 0 to 4 percent slopes****Setting**

*Landform:*

- Marvan—Sedimentary plains
- Vanda—Sedimentary plains

*Slope:*

- Marvan—0 to 4 percent
- Vanda—0 to 4 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Marvan and similar soils: 50 percent  
 Vanda and similar soils: 35 percent

**Minor Components**

Marias and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent  
 Benz and similar soils: 0 to 4 percent  
 Poorly drained soils: 0 to 3 percent

**Major Component Description****Marvan**

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 7.7 inches

**Vanda**

*Surface layer texture:* Silty clay  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.0 inches

**Megonot Series**

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Semiconsolidated shale residuum  
*Slope range:* 2 to 15 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Aridic Ustochrepts

**Typical Pedon**

Megonot silty clay loam in an area of Cambeth, noncalcareous-Megonot complex, 2 to 8 percent slopes, in an area of rangeland; 700 feet west and 2,300 feet south of northeast corner of sec. 21, T. 5 N., R. 46 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots; common fine interstitial and tubular pores; neutral; clear smooth boundary.

Bw—4 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and very plastic; common very fine and fine roots; common very fine and fine tubular pores; slightly alkaline; clear wavy boundary.

Bk—12 to 18 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; moderate medium prismatic structure parting to

moderate fine and medium subangular blocky structure; hard, firm, sticky and very plastic; common very fine and fine roots; common very fine tubular pores; common fine irregular masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

By—18 to 28 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and very plastic; common very fine and fine roots; common fine irregular gypsum crystals; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cr—28 to 60 inches; light gray (2.5Y 7/2), semiconsolidated shale, light brownish gray (2.5Y 6/2) moist.

**Range in Characteristics**

*Soil temperature:* 41 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above  
*Depth to secondary lime:* 11 to 27 inches  
*Depth to paralithic contact:* 20 to 40 inches

**A horizon**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry  
 Chroma: 2 or 3  
 Clay content: 27 to 35  
 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  
 Reaction: pH 7.4 to 8.4

**Bk horizon**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Silty clay loam or silty clay  
 Clay content: 35 to 45  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

**By horizon**

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  
 Gypsum: 1 to 5 percent  
 Reaction: pH 7.4 to 9.0

## M-W—Miscellaneous Water

### Composition

#### Major Components

Miscellaneous water: 100 percent

#### Major Component Description

*Definition:* Areas of open water in sewage lagoons, industrial waste pits, fish hatcheries, etc.

## Morton Series

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains  
*Parent material:* Interbedded shale and siltstone residuum  
*Slope range:* 2 to 8 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Typic Argiborolls

#### Typical Pedon

Morton silt loam in an area of Morton-Farland silt loams, 2 to 8 percent slopes, in an area of rangeland; 800 feet south and 400 feet west of northeast corner of sec. 8, T. 8 N., R. 53 E.

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

Bt—5 to 13 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium angular blocky structure; hard, friable, sticky and

plastic, common medium roots and many fine and very fine roots; common fine and very fine pores; common distinct clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bk1—13 to 21 inches; light gray (10YR 7/2) silt loam, light yellowish brown (2.5Y 6/4) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common medium irregular masses of lime; violently effervescent; moderately alkaline; gradual irregular boundary.

Bk2—21 to 30 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; hard, friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common medium irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—30 to 60 inches; pale yellow (2.5Y 7/4) semiconsolidated siltstone, light olive brown (2.5Y 5/4) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 7 to 15 inches

#### 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 7.8

#### Bt horizon

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 4 to 6 dry; 3 or 4 moist  
 Chroma: 2 to 4  
 Texture: Loam, silt loam, or silty clay loam  
 Clay content: 18 to 35 percent  
 Reaction: pH 6.6 to 7.8

#### Bk horizons

Hue: 2.5Y or 10YR  
 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: 10 to 20 percent  
 Reaction: pH 7.4 to 8.4

## 871C—Morton-Farland silt loams, 2 to 8 percent slopes

### Setting

#### Landform:

- Morton—Sedimentary plains
- Farland—Sedimentary plains

#### Slope:

- Morton—2 to 8 percent
- Farland—2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Morton and similar soils: 45 percent

Farland and similar soils: 40 percent

#### Minor Components

Cabba and similar soils: 0 to 4 percent

Tally and similar soils: 0 to 4 percent

Sagedale and similar soils: 0 to 4 percent

Cambert and similar soils: 0 to 3 percent

### Major Component Description

#### Morton

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Interbedded shale and siltstone residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.6 inches

#### Farland

*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 10.8 inches

### Neldore Series

*Depth class:* Shallow

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Sedimentary plains and hills

*Parent material:* Semiconsolidated shale residuum

*Slope range:* 2 to 60 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

### Typical Pedon

Neldore silty clay in an area of Neldore-Abor silty clays, 4 to 25 percent slopes, in an area of rangeland; 2,400 feet south and 1,500 feet west of the northeast corner of sec. 15, T. 2 N., R. 45 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, firm, very sticky and very plastic; common very fine roots; common very fine pores; slightly alkaline; clear smooth boundary.

C1—3 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; common very fine pores; slightly alkaline; clear wavy boundary.

C2—14 to 18 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, very firm, very sticky and very plastic; common very fine roots; common medium irregular masses of gypsum; slightly alkaline; gradual wavy boundary.

Cr—18 to 60 inches; grayish brown (2.5Y 5/2) shale, dark grayish brown (2.5Y 4/2) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to shale:* 10 to 20 inches

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 1 or 2

Texture: Clay or silty clay

Clay content: 40 to 50 percent

Reaction: pH 5.6 to 7.8

*C horizons*

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  
 Gypsum content: 1 to 3 percent  
 Reaction: pH 5.6 to 7.8

**662F—Neldore-Abor silty clays, 25 to 60 percent slopes****Setting***Landform:*

- Neldore—Hills
- Abor—Hills

*Position on landform:*

- Neldore—Shoulders and summits
- Abor—Backslopes

*Slope:*

- Neldore—25 to 60 percent
- Abor—25 to 45 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Neldore and similar soils: 50 percent  
 Abor and similar soils: 30 percent

**Minor Components**

Marvan and similar soils: 0 to 15 percent  
 Areas of rock outcrop: 0 to 5 percent

**Major Component Description****Neldore**

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

**Abor**

*Surface layer texture:* Silty clay  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated shale residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.2 inches

**742E—Neldore-Abor silty clays, 4 to 25 percent slopes****Setting***Landform:*

- Neldore—Hills
- Abor—Sedimentary plains

*Position on landform:*

- Neldore—Shoulders and summits
- Abor—Backslopes and footslopes

*Slope:*

- Neldore—8 to 25 percent
- Abor—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

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

**Minor Components**

Marvan and similar soils: 0 to 3 percent  
 Yamacall and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Soils that have slopes more than 25 percent: 0 to 3 percent  
 Delpoint and similar soils: 0 to 3 percent

**Major Component Description****Neldore**

*Surface layer texture:* Silty clay  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.6 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 3.5 inches

### **552D—Neldore-Abor-Marvan complex, 2 to 15 percent slopes**

#### **Setting**

*Landform:*

- Neldore—Sedimentary plains
- Abor—Sedimentary plains
- Marvan—Sedimentary plains

*Position on landform:*

- Neldore—Shoulders and summits
- Abor—Backslopes
- Marvan—Footslopes and toe slopes

*Slope:*

- Neldore—2 to 15 percent
- Abor—2 to 15 percent
- Marvan—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Neldore and similar soils: 35 percent

Abor and similar soils: 30 percent

Marvan and similar soils: 25 percent

##### **Minor Components**

Kobase and similar soils: 0 to 2 percent

Gerdrum and similar soils: 0 to 2 percent

Delpoint and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Soils that have slopes more than 15 percent: 0 to 2 percent

#### **Major Component Description**

##### **Neldore**

*Surface layer texture:* Silty clay

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated shale residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

##### **Abor**

*Surface layer texture:* 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 3.5 inches

##### **Marvan**

*Surface layer texture:* Silty clay

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 7.7 inches

### **663F—Neldore-Abor-Rock outcrop complex, 8 to 35 percent slopes**

#### **Setting**

*Landform:*

- Neldore—Hills
- Abor—Hills

*Position on landform:*

- Neldore—Summits
- Abor—Backslopes

*Slope:*

- Neldore—8 to 35 percent
- Abor—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### **Composition**

##### **Major Components**

Neldore and similar soils: 40 percent

Abor and similar soils: 25 percent

Rock outcrop: 15 percent

##### **Minor Components**

Cabbart and similar soils: 0 to 20 percent

#### **Major Component Description**

##### **Neldore**

*Surface layer texture:* Silty clay

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

*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.0 inches

**Abor**

*Surface layer texture:* Silty clay  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.2 inches

**Rock outcrop**

*Definition:* Areas of exposed shale bedrock.

### 664F—Neldore-Rock outcrop complex, 15 to 60 percent slopes

**Setting**

*Landform:* Hills  
*Slope:* 15 to 60 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Neldore and similar soils: 45 percent  
 Rock outcrop: 30 percent

**Minor Components**

Cabbart and similar soils: 0 to 25 percent

**Major Component Description****Neldore**

*Surface layer texture:* Silty clay  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated shale residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 1.4 inches

**Rock outcrop**

*Definition:* Areas of exposed shale bedrock.

### 991F—Neldore-Rock outcrop-Abor complex, 15 to 50 percent slopes

**Setting**

*Landform:*

- Neldore—Hills
- Abor—Hills

*Position on landform:* Backslopes and shoulders  
*Slope:*

- Neldore—15 to 50 percent
- Abor—15 to 45 percent

*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Neldore and similar soils: 30 percent  
 Rock outcrop: 30 percent  
 Abor and similar soils: 20 percent

**Minor Components**

Delpoint and similar soils: 0 to 5 percent  
 Gerdrum and similar soils: 0 to 5 percent  
 Twilight and similar soils: 0 to 5 percent  
 Yamacall and similar soils: 0 to 5 percent

**Major Component Description****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 2.3 inches

**Rock outcrop**

*Definition:* Areas of exposed shale bedrock.

**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 4.2 inches

## 666C—Neldore-Volborg, saline complex, 1 to 8 percent slopes

### Setting

#### Landform:

- Neldore—Sedimentary plains
- Volborg—Sedimentary plains

#### Slope:

- Neldore—2 to 8 percent
- Volborg—1 to 4 percent

Elevation: 2,240 to 2,900 feet

Mean annual precipitation: 11 to 14 inches

Frost-free period: 110 to 135 days

### Composition

#### Major Components

Neldore and similar soils: 50 percent

Volborg and similar soils: 35 percent

#### Minor Components

Abor and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Strongly saline soils: 0 to 5 percent

### Major Component Description

#### Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

#### Volborg

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Available water capacity: Mainly 1.4 inches

#### Parshall Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Stream terraces

Parent material: Alluvium or eolian material

Slope range: 2 to 15 percent

Elevation range: 2,240 to 2,440 feet

Annual precipitation: 11 to 14 inches

Annual air temperature: 43 to 45 degrees F

Frost-free period: 110 to 135 days

**Taxonomic Class:** Coarse-loamy, mixed Pachic Haploborolls

#### Typical Pedon

Parshall fine sandy loam, 2 to 6 percent slopes, in an area of rangeland, 650 feet north and 200 feet west of the southeast corner of sec. 17, T. 12 N., R. 53 E., (in Prairie County, MT).

A—0 to 5 inches; brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure parting to weak fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine roots; neutral; clear smooth boundary.

Bw1—5 to 10 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; many very fine pores; slightly alkaline; clear smooth boundary.

Bw2—10 to 15 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; many very fine pores; slightly alkaline; clear smooth boundary.

Bw3—15 to 24 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine pores; 10 percent pebbles; slightly alkaline; clear smooth boundary.

C1—24 to 46 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; neutral; gradual smooth boundary.

C2—24 to 46 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F  
*Moisture control section:* Between 8 and 24 inches  
*Mollic epipedon thickness:* 16 to 24 inches

#### A horizon

Value: 2 to 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 10 to 18 percent  
 Reaction: pH 6.6 to 7.3

#### Bw horizons

Hue: 10YR or 2.5Y  
 Value: 3 to 6 dry; 2 to 5 moist  
 Chroma: 2 to 4  
 Texture: Fine sandy loam or sandy loam  
 Clay content: 10 to 18 percent  
 Reaction: pH 6.6 to 7.8

#### C horizons

Hue: 10YR, 2.5Y, or 5Y  
 Value: 4 to 7 dry; 3 to 6 moist  
 Chroma: 2 to 6  
 Texture: Fine sandy loam, sandy loam, or loamy sand  
 Clay content: 5 to 18 percent  
 Reaction: pH 6.6 to 8.4

## 992C—Parshall fine sandy loam, 2 to 6 percent slopes

### Setting

*Landform:* Stream terraces  
*Slope:* 2 to 6 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Parshall and similar soils: 85 percent

#### Minor Components

Degrad and similar soils: 0 to 5 percent  
 Lihen and similar soils: 0 to 5 percent  
 Tinsley and similar soils: 0 to 3 percent  
 Yetull 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 or eolian material  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 7.7 inches

## Pinehill Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 15 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Typic Eutroboralfs

### Typical Pedon

Pinehill loam, 2 to 8 percent slopes, in rangeland; 1,000 feet south and 800 feet west of northeast corner of sec. 9, T. 7 N., R. 46 E.

A—0 to 5 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak fine and medium angular blocky structure parting to weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many coarse to fine roots; slightly alkaline; clear smooth boundary.

Bt—5 to 11 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium and coarse prismatic structure parting to strong medium and coarse angular blocky structure; hard, friable, sticky and very plastic; common medium and fine roots; common fine and very fine pores; common distinct continuous dark gray (10YR 4/1), moist clay films on faces of peds and in pores; slightly alkaline; clear wavy boundary.

Btk1—11 to 16 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium and coarse angular blocky structure; hard, friable, sticky and very plastic; common medium and fine roots; common fine and very fine pores; common distinct clay films on faces of peds and in pores; few fine irregular masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

Btk2—16 to 26 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist;

moderate coarse prismatic structure parting to moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common medium and fine roots; common fine and very fine pores; common faint clay films on horizontal faces of peds; few fine irregular masses of lime; strongly effervescent; moderately alkaline; diffuse wavy boundary.

**Bk1**—26 to 47 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate coarse prismatic structure parting to moderate fine angular blocky structure; extremely hard, very firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common fine masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

**Bk2**—47 to 60 inches; light gray (10YR 7/2) loam, brown (10YR 4/3) moist; weak medium and coarse prismatic structure; extremely hard, very firm, slightly sticky and plastic; common very fine roots; common fine and very fine pores; common medium and fine irregular masses of lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

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

*Depth to Btk horizon:* 7 to 30 inches

#### *A horizon*

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 1 to 4

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

#### *Bt 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 50 percent

Reaction: pH 7.4 to 8.4

#### *Btk horizons*

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 40 percent

Calcium carbonate equivalent: 1 to 5 percent  
Reaction: pH 7.4 to 8.4

#### *Bk horizons*

Hue: 10YR, 5Y, or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Clay loam, silty clay loam, or loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

## 64A—Pinehill loam, 0 to 2 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Pinehill and similar soils: 85 percent

#### Minor Components

Kobase and similar soils: 0 to 3 percent

Sonnett and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 3 percent

Foreleft and similar soils: 0 to 3 percent

Soils that have slopes more than 2 percent: 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 10.2 inches

## 64C—Pinehill loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Pinehill and similar soils: 85 percent

### Minor Components

Kobase and similar soils: 0 to 3 percent

Delpoint and similar soils: 0 to 3 percent

Sonnett and similar soils: 0 to 3 percent

Foreleft and similar soils: 0 to 3 percent

Gerdrum 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 10.2 inches

## 64D—Pinehill loam, 8 to 15 percent slopes

### Setting

*Landform:* Sedimentary plains

*Position on landform:* Footslopes

*Slope:* 8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

### Major Components

Pinehill and similar soils: 85 percent

### Minor Components

Kobase and similar soils: 0 to 3 percent

Yamacall and similar soils: 0 to 3 percent

Sonnett and similar soils: 0 to 3 percent

Foreleft and similar soils: 0 to 3 percent

Soils that have slopes less than 8 percent: 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 10.2 inches

## 641D—Pinehill-Absher complex, 2 to 15 percent slopes

### Setting

*Landform:*

- Pinehill—Sedimentary plains

- Absher—Sedimentary plains

*Position on landform:*

- Pinehill—Microhighs

- Absher—Microlows

*Slope:*

- Pinehill—2 to 15 percent

- Absher—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

### Major Components

Pinehill and similar soils: 60 percent

Absher and similar soils: 30 percent

### Minor Components

Sonnett and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 2 percent

Creed and similar soils: 0 to 2 percent

Archin and similar soils: 0 to 2 percent

Areas of slickspots: 0 to 1 percent

### Major Component Description

#### Pinehill

*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

#### 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 4.1 inches

## 993C—Pinehill-Weingart-Gerdrum complex, 0 to 6 percent slopes

### Setting

#### Landform:

- Pinehill—Sedimentary plains
- Weingart—Sedimentary plains
- Gerdrum—Sedimentary plains

#### Slope:

- Pinehill—0 to 6 percent
- Weingart—0 to 6 percent
- Gerdrum—0 to 6 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Pinehill and similar soils: 45 percent  
 Weingart and similar soils: 30 percent  
 Gerdrum and similar soils: 15 percent

#### Minor Components

Cambeth and similar soils: 0 to 5 percent  
 Degrand and similar soils: 0 to 3 percent  
 Areas of slickspots: 0 to 2 percent

### Major Component Description

#### Pinehill

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 10.1 inches

#### Weingart

*Surface layer texture:* Clay loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Interbedded shale and siltstone residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 4.6 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 6.1 inches

### Ralore Series

*Depth class:* Shallow

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Sedimentary plains

*Parent material:* Semiconsolidated shale residuum

*Slope range:* 4 to 15 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 12 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Clayey, montmorillonitic, shallow  
 Typic Natriboralfs

#### Typical Pedon

Ralore clay loam, warm, 600 feet east and 2,300 feet south, of the northwest corner of sec. 29, T. 10 N., R. 42 E., (in Rosebud County, MT).

A—0 to 2 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium angular blocky structure parting to weak fine angular blocky structure; soft, very friable, slightly sticky and plastic; many very fine roots; many very fine pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Btn—2 to 7 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; strong fine prismatic structure parting to strong medium angular blocky structure; very hard, firm, sticky and plastic; many very fine roots; many very fine pores; many faint clay films on faces of peds and lining pores; slightly effervescent; very strongly alkaline; clear smooth boundary.

Btkn—7 to 12 inches; pale brown (10YR 6/4) silty clay loam, brown (10YR 5/3) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; many very fine roots; many very fine pores; common faint clay films on faces of peds; disseminated lime; common fine masses of lime; strongly effervescent; very strongly alkaline; clear smooth boundary.

Byz—12 to 16 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, sticky and plastic; common very fine root throughout; few very fine pores; few soft shale fragments in lower part; few fine masses of gypsum and other salts; slightly effervescent; strongly alkaline; clear smooth boundary.

Cr—16 to 60 inches; gray (10YR 6/1) shale, gray (10YR 5/1) moist.

### Range in Characteristics

*Soil temperature:* 40 to 47 degrees F

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

*Depth to Btkn horizon:* 6 to 10 inches

*Depth to Cr horizon:* 10 to 20 inches

#### A horizon

Hue: 2.5Y or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 20 to 27 percent

Reaction: pH 7.4 to 8.4

#### Btn horizon

Hue: 10YR or 7.5YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam, clay loam, or clay

Clay content: 35 to 45 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium absorption ratio: 13 to 20

Reaction: pH 7.4 to 8.4

#### Btkn horizon

Hue: 10YR or 7.5YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam, clay loam, or clay

Clay content: 35 to 45 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium absorption ratio: 20 to 30

Reaction: pH 8.5 to 9.4

#### Byz horizon

Hue: 10YR or 7.5YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam, clay loam, or clay

Clay content: 35 to 40 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 20 to 40

Reaction: pH 8.5 to 9.4

## Ralph Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Sedimentary plains

*Parent material:* Interbedded shale and siltstone residuum

*Slope range:* 2 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Aridic Argiborolls

### Typical Pedon

Ralph silt loam in an area of Ralph-Brushton silt loams, 2 to 8 percent slopes, in an area of pasture; 1,200 feet south and 65 feet east of northwest corner of sec. 27, T. 9 N., R. 53 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable, slightly sticky and plastic; many very fine and fine roots; slightly alkaline; abrupt smooth boundary.

A2—3 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong fine angular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots; slightly alkaline; abrupt smooth boundary.

Bt—7 to 15 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine and medium angular blocky structure; slightly hard, firm, sticky and plastic; many very fine and fine roots; common fine and very fine pores; common distinct continuous clay films on faces of peds and in pores; slightly alkaline; clear smooth boundary.

Bk1—15 to 20 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; moderate coarse prismatic structure parting to moderate medium angular blocky structure; slightly hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 28 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak medium angular blocky structure; slightly hard, firm, sticky and plastic; common very fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—28 to 60 inches; light gray (5Y 7/2) semiconsolidated shale, olive gray (5Y 5/2) moist.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Mollic epipedon thickness:* 7 to 11 inches

#### A horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

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, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 7.8

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

## 931C—Ralph-Brushton silt loams, 2 to 8 percent slopes

### Setting

#### *Landform:*

- Ralph—Sedimentary plains
- Brushton—Sedimentary plains

#### *Position on landform:*

- Ralph—Backslopes and shoulders
- Brushton—Footslopes and toe slopes

#### *Slope:*

- Ralph—2 to 8 percent
- Brushton—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Ralph and similar soils: 45 percent

Brushton and similar soils: 40 percent

#### Minor Components

Cambeth and similar soils: 0 to 4 percent

Cabbart and similar soils: 0 to 4 percent

Megonot and similar soils: 0 to 4 percent

Twilight and similar soils: 0 to 3 percent

### Major Component Description

#### Ralph

*Surface layer texture:* Silt loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Interbedded shale and siltstone residuum

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.3 inches

#### Brushton

*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 10.1 inches

## Ringling Series

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Moderately rapid above the fragmental material, rapid in the fragmental material

*Landform:* Hills

*Parent material:* Material weathered from baked sandstone and shale

*Slope range:* 15 to 70 percent

*Elevation range:* 2,900 to 3,760 feet

*Annual precipitation:* 15 to 17 inches

*Annual air temperature:* 43 to 46 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Loamy-skeletal over fragmental, mixed Typic Haploborolls

### Typical Pedon

Ringling channery loam in an area of Lamedeer-Cabba-Ringling complex, 25 to 70 percent slopes, in a grazed forestland area; 800 feet east and 2,200 feet north of southwest corner of sec. 16, T. 3 N., R. 45 E.

Oi—2 inches to 0; partly decomposed forest litter.

A—0 to 7 inches; weak red (2.5YR 4/2) channery loam, dusky red (2.5YR 3/2) moist; weak fine granular structure; slightly hard, friable, sticky and slightly plastic; common medium and fine roots; slightly effervescent; 20 percent channers; slightly alkaline; clear wavy boundary.

Bw—7 to 18 inches; reddish brown (2.5YR 5/4) very channery loam, reddish brown (2.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common medium to very fine roots; 50 percent channers; few distinct discontinuous lime coats on lower surfaces of peds and coarse fragments; strongly effervescent; slightly alkaline; clear wavy boundary.

2Ck—18 to 30 inches; light red (2.5YR 6/6) highly fractured baked shale and sandstone fragments with 5 percent fine material in voids, reddish brown (2.5YR 5/4) moist; slightly hard, friable, sticky and slightly plastic; common very fine roots along faces of fragments; 95 percent channers and flagstones; common distinct continuous lime coats on coarse fragments; violently effervescent; moderately alkaline; diffuse irregular boundary.

3C—30 to 60 inches; light red (2.5YR 6/6), red (2.5YR 5/8) moist; highly fractured baked shale and sandstone fragments with approximately 3 percent fine material in voids.

## Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Depth to fragmental material:* 12 to 20 inches

*Mollic epipedon thickness:* 7 to 10 inches

### A horizon

Hue: 2.5YR or 5YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 25 percent

Content of rock fragments: 15 to 60 percent channers

Reaction: pH 6.6 to 7.8

### Bw horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 3 or 4

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 80 percent channers and flagstones

Reaction: pH 6.6 to 7.8

### 2Ck horizon

Hue: 2.5YR or 5YR

Value: 4 or 5 moist

Chroma: 4 to 6

Content of clay in the control section: 0 to 5 percent

Content of rock fragments: 95 to 100 percent flagstones and channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 8.4

### 3C horizon

Hue: 2.5YR or 5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 4 to 6

Content of clay in the control section: 0 to 5 percent

Content of rock fragments: 95 to 100 percent flagstones and channers

Reaction: pH 6.6 to 8.4

## 67A—Riverwash

### Composition

#### Major Components

Riverwash: 90 percent

#### Minor Components

Havre and similar soils: 0 to 2 percent

Glendive and similar soils: 0 to 2 percent  
 Ryell and similar soils: 0 to 2 percent  
 Hanly and similar soils: 0 to 2 percent  
 Poorly drained soils that are ponded: 0 to 2 percent

### Major Component Description

*Definition:* Areas of recently deposited alluvial material, mostly sand and gravel, supporting little or no vegetation.

### Rivra Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Rapid  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Aridic Ustifluvents

### Typical Pedon

Rivra gravelly sandy loam, in an area of Rivra complex, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 200 feet south and 600 feet east of northwest corner of sec. 17, T. 9 N., R. 48 E.

A—0 to 5 inches; light brownish gray (2.5Y 6/2) gravelly sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common medium, fine, and very fine roots; common fine tubular pores; 25 percent rounded pebbles; few fine lime coats on lower surfaces of pebbles; slightly effervescent; slightly alkaline; gradual wavy boundary.

C—5 to 60 inches; light brownish gray (2.5Y 6/2) extremely gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; 65 percent rounded pebbles; common fine lime coats on coarse fragments; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 12 and 35 inches; dry in all parts between four-tenths and five-tenths

of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

*Depth to water table:* 0 to 42 inches

*Soil phases:* Gravelly

### A horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loam or sandy loam  
 Clay content: 5 to 27 percent  
 Content of rock fragments: 0 to 35 percent pebbles  
 Reaction: pH 6.6 to 8.4

### C horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loamy sand or sand  
 Clay content: 0 to 5 percent  
 Content of rock fragments: 60 to 80 percent—0 to 5 percent cobbles, 60 to 80 percent pebbles  
 Reaction: pH 7.4 to 8.4

## 681A—Rivra complex, 0 to 2 percent slopes, occasionally flooded

### Setting

#### Landform:

- Rivra—Flood plains
- Rivra—Flood plains

#### Slope:

- Rivra—0 to 2 percent
- Rivra—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Rivra and similar soils: 45 percent  
 Rivra and similar soils: 35 percent

#### Minor Components

Ryell and similar soils: 0 to 4 percent  
 Havre and similar soils: 0 to 4 percent  
 Glendive and similar soils: 0 to 4 percent  
 Hanly and similar soils: 0 to 4 percent  
 Frequently flooded soils: 0 to 4 percent

## Major Component Description

### Rivra

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* Occasional

*Water table:* Apparent

*Available water capacity:* Mainly 2.3 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:* Occasional

*Water table:* Apparent

*Available water capacity:* Mainly 1.9 inches

## 691F—Rock outcrop-Cabbart-Kirby complex, 25 to 70 percent slopes

### Setting

*Landform:*

- Cabbart—Hills
- Kirby—Hills

*Position on landform:*

- Cabbart—Backslopes
- Kirby—Shoulders and summits

*Slope:*

- Cabbart—25 to 70 percent
- Kirby—25 to 70 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Rock outcrop: 35 percent

Cabbart and similar soils: 30 percent

Kirby and similar soils: 20 percent

#### Minor Components

Delpoint and similar soils: 0 to 3 percent

Yawdim and similar soils: 0 to 3 percent

Twilight and similar soils: 0 to 2 percent

Armells and similar soils: 0 to 2 percent

Soils that have slopes less than 25 percent: 0 to 2 percent

## Major Component Description

### Rock outcrop

*Definition:* Areas of exposed baked shale and siltstone bedrock.

### Cabbart

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

### Kirby

*Surface layer texture:* Very channery loam

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

*Drainage class:* Excessively drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.1 inches

### Rominell Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 1 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Typic Natriboralfs

### Typical Pedon

Rominell fine sandy loam, 1,700 feet west and 1,200 feet north of the southeast corner of sec. 14, T. 9 N., R. 42 E., (in Rosebud County, MT).

Ap—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common

very fine pores; moderately alkaline; abrupt smooth boundary.

E—4 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine pore; moderately alkaline; abrupt smooth boundary.

Btn—8 to 13 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist, very dark grayish brown (10YR 3/2) moist coatings on peds; strong medium columnar structure; very hard, very firm, sticky and plastic; common very fine roots; common very fine pores; bleached sand and silt grains on the tops of columns; many faint clay films on faces of peds and in pores; very strongly alkaline; clear smooth boundary.

Bnz—13 to 17 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine pores; weakly effervescent; very strongly alkaline; clear smooth boundary.

Byz—17 to 21 inches; grayish brown (10YR 5/2) sandy clay loam, (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few fine masses of gypsum; few fine masses of salts; strongly effervescent; moderately alkaline; clear smooth boundary.

C—21 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive, slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; slightly effervescent; very strongly alkaline.

### Range in Characteristics

*Soil temperature:* 40 to 47 degrees F

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

#### *Ap horizon*

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 3 or 4 moist  
Chroma: 2 or 3  
Clay content: 10 to 20 percent  
Reaction: pH 6.6 to 8.4

#### *E horizon*

Hue: 10YR or 2.5Y  
Value: 6 or 7 dry  
Chroma: 1 or 2  
Texture: Very fine sandy loam, fine sandy loam, or silt loam  
Clay content: 10 to 27 percent  
Reaction: pH 7.4 to 8.4

#### *Btn horizon*

Hue: 10YR or 2.5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Clay loam, sandy clay loam, or loam  
Clay content: 20 to 35 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Sodium absorption ratio: 13 to 30  
Reaction: pH 8.4 to 9.6

#### *Bnz horizon*

Hue: 10YR to 5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 to 4  
Texture: Clay loam, sandy clay loam, or loam  
Clay content: 20 to 35 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Sodium absorption ratio: 13 to 30  
Calcium carbonate equivalent: 5 to 10 percent  
Reaction: pH 9.0 to 9.6

#### *Byz horizon*

Hue: 10YR to 5Y  
Value: 5 or 6 dry; 3 to 5 moist  
Chroma: 2 or 3  
Texture: Clay loam, sandy clay loam, or loam  
Clay content: 10 to 32 percent  
Electrical conductivity: 2 to 8 mmhos/cm  
Sodium absorption ratio: 15 to 30  
Calcium carbonate equivalent: 5 to 10 percent  
Reaction: pH 7.9 to 9.6

#### *C horizon*

Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 to 4  
Texture: Fine sandy loam, loam, or clay loam  
Clay content: 10 to 32 percent  
Sodium absorption ratio: 13 to 30  
Reaction: pH 7.9 to 9.6

## 948B—Rominell fine sandy loam, 1 to 4 percent slopes, eroded

### Setting

*Landform:* Sedimentary plains

*Slope:* 1 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Rominell and similar soils: 85 percent

#### Minor Components

Foreleft and similar soils: 0 to 10 percent

Areas of slickspots: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 7.5 inches

### Ryell Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate above the 2C horizon, rapid in the 2C horizon

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Elevation range:* 2,240 to 2,700 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents

#### Typical Pedon

Ryell very fine sandy loam, 0 to 2 percent slopes, occasionally flooded, in an area of rangeland; 1,100

feet south and 1,200 feet east of northwest corner of sec. 23, T. 8 N., R. 47 E.

A—0 to 6 inches; grayish brown (2.5Y 5/2) very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; very slightly effervescent; slightly alkaline; clear smooth boundary.

C1—6 to 12 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; very slightly effervescent; slightly alkaline; gradual smooth boundary.

C2—12 to 28 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; very slightly effervescent; slightly alkaline; abrupt smooth boundary.

2C3—28 to 40 inches; grayish brown (2.5Y 5/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; common fine and very fine pores; very slightly effervescent; slightly alkaline; 5 percent cobbles, 55 percent pebbles; gradual smooth boundary.

2C4—40 to 60 inches; grayish brown (2.5Y 5/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; common fine and very fine pores; very slightly effervescent; 60 percent pebbles; moderately alkaline.

#### Range in Characteristics

*Soil temperature:* 40 to 47 degrees F

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

*Depth to 2C3 horizon:* 18 to 36 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3  
 Texture: Loam or very fine sandy loam  
 Clay content: 10 to 27 percent  
 Reaction: pH 7.4 to 8.4

*C horizons*

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

*2C horizons*

Hue: 10YR or 2.5Y  
 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 5 percent cobbles, 35 to 70 percent  
 pebbles  
 Reaction: pH 7.4 to 8.4

**311A—Ryell loam, 0 to 2 percent slopes,  
 occasionally flooded**

**Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition**

**Major Components**

Ryell and similar soils: 85 percent

**Minor Components**

Rivra and similar soils: 0 to 3 percent  
 Havre and similar soils: 0 to 3 percent  
 Glendive and similar soils: 0 to 3 percent  
 Hanly and similar soils: 0 to 3 percent  
 Nonflooded 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:* Occasional  
*Available water capacity:* Mainly 5.6 inches

**31A—Ryell very fine sandy loam, 0 to 2  
 percent slopes, rarely flooded**

**Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition**

**Major Components**

Ryell and similar soils: 85 percent

**Minor Components**

Rivra and similar soils: 0 to 3 percent  
 Hanly and similar soils: 0 to 3 percent  
 Glendive and similar soils: 0 to 3 percent  
 Havre and similar soils: 0 to 3 percent  
 Poorly drained soils: 0 to 3 percent

**Major Component Description**

*Surface layer texture:* Very fine sandy loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Rare  
*Available water capacity:* Mainly 5.4 inches

**Sagedale Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Typic Ustochrepts

**Typical Pedon**

Sagedale silty clay loam, 2 to 8 percent slopes, in an area of rangeland; 600 feet north and 200 feet west of the southeast corner of sec. 12, T. 7 N., R. 48 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium angular blocky structure parting to strong medium and coarse granular structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; slightly alkaline; clear smooth boundary.

Bw—5 to 16 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 strong medium angular blocky structure; hard, firm, sticky and plastic; common very fine roots; few fine and common very fine tubular pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—16 to 24 inches; light yellowish brown (2.5Y 6/4) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to strong fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; few fine irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky—24 to 40 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to strong fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; common irregular masses of lime; common medium irregular masses of gypsum; violently effervescent; strongly alkaline; diffuse wavy boundary.

BC—40 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; violently effervescent; strongly alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to Bk horizon:* 10 to 18 inches

*Depth to gypsum:* 17 to 36 inches

*A horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 to 4

Clay content: 30 to 40 percent

Reaction: pH 7.4 to 8.4

*Bw horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 to 4

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

Clay content: 32 to 45 percent

Reaction: pH 7.4 to 8.4

*Bk horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4.

*Bky horizon*

Hue: 10YR or 2.5Y

Value: 4 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

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

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum content: 1 to 7 percent

Reaction: pH 7.9 to 9.0

*BC horizon*

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Reaction: pH 7.4 to 9.0

**52A—Sagedale silty clay loam, 0 to 2 percent slopes**

**Setting**

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Sagedale and similar soils: 85 percent

### Minor Components

Macar and similar soils: 0 to 5 percent  
Soils that have silty clay surfaces: 0 to 5 percent  
Soils that have slopes more than 2 percent: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.4 inches

## 52C—Sagedale silty clay loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Sagedale and similar soils: 85 percent

#### Minor Components

Macar and similar soils: 0 to 3 percent  
Soils that have silty clay surfaces: 0 to 3 percent  
Soils that have slopes more than 8 percent: 0 to 3 percent  
Widen and similar soils: 0 to 3 percent  
Soils that have slopes less than 2 percent: 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 9.4 inches

## Savage Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Typic Argiborolls

### Typical Pedon

Savage silty clay loam, 2 to 8 percent slopes, in an area of rangeland; 1,800 feet north and 2,300 feet east of southwest corner of sec. 11, T. 1 N., R. 46 E.

A—0 to 6 inches; brown (10YR 4/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine and medium granular structure; slightly hard, friable, sticky and plastic; common fine roots and many very fine roots; slightly alkaline; gradual wavy boundary.

Bt—6 to 15 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate medium angular blocky structure; very hard, firm, sticky and very plastic; many very fine roots; common fine and very fine pores; many distinct clay films on faces of peds and in pores; slightly alkaline; clear wavy boundary.

Btk—15 to 18 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; very hard, firm, sticky and very plastic; common very fine roots; common fine and very fine pores; common distinct clay films on faces of peds and in pores; common fine threads and masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—18 to 24 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common medium irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 36 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky structure; hard, firm, slightly sticky and plastic; common medium and coarse irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—36 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, sticky and plastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* between 4 and 12 inches.

*Mollic epipedon thickness:* 7 to 16 inches

#### A horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 7.8

#### Bt horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 2 to 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 50 percent

Reaction: pH 7.4 to 7.8

#### Btk horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3 to 5 dry; 2 to 5 moist

Chroma: 2 to 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 50 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

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

Clay content: 30 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Silty clay loam or silty clay

Clay content: 30 to 40 percent

Reaction: pH 7.9 to 8.4

## 40A—Savage silty clay loam, 0 to 2 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 0 to 2 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Savage and similar soils: 85 percent

#### Minor Components

Farnuf and similar soils: 0 to 5 percent

Sonnett and similar soils: 0 to 5 percent

Soils that have slopes more than 2 percent: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 9.0 inches

## 40C—Savage silty clay loam, 2 to 8 percent slopes

### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Savage and similar soils: 85 percent

### Minor Components

Farnuf and similar soils: 0 to 5 percent  
 Sonnett and similar soils: 0 to 5 percent  
 Soils that have slopes less than 2 percent: 0 to 5 percent

### Major Component Description

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.0 inches

### Shambo Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium  
*Slope range:* 2 to 15 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-loamy, mixed Typic Haploborolls

#### Typical Pedon

Shambo loam, 2 to 8 percent slopes, in an area of rangeland; 250 feet north and 1,600 feet west of the southeast corner of sec. 28, T. 3 N., R. 50 E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine granular structure; soft, very friable, sticky and plastic; many fine and very fine roots; slightly alkaline; abrupt smooth boundary.

A2—2 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure parting to strong fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bw—7 to 12 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong medium subangular blocky structure; slightly hard,

friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; slightly alkaline; gradual wavy boundary.

Bk1—12 to 24 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; strong medium and coarse prismatic structure parting to moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common very fine pores; common medium irregular masses of lime; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bk2—24 to 47 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; common very fine roots; common very fine pores; common fine and medium irregular masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—47 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common medium irregular masses of lime; violently effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Mollic epipedon thickness:* 7 to 16 inches

#### A horizons

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 horizon

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 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, clay loam, silty clay loam, or silt loam

Clay content: 18 to 35 percent  
 Calcium carbonate equivalent: 10 to 15 percent  
 Reaction: pH 7.4 to 8.4

### 51C—Shambo loam, 2 to 8 percent slopes

#### Setting

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Shambo and similar soils: 85 percent

##### Minor Components

Soils that have slopes more than 8 percent: 0 to 3 percent  
 Doney and similar soils: 0 to 3 percent  
 Dast and similar soils: 0 to 3 percent  
 Soils that have calcareous surfaces: 0 to 3 percent  
 Sagedale 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 10.9 inches

### 511C—Shambo-Doney loams, 2 to 8 percent slopes

#### Setting

*Landform:*

- Shambo—Sedimentary plains
- Doney—Sedimentary plains

*Position on landform:*

- Shambo—Foothills and toe slopes
- Doney—Foothills

*Slope:*

- Shambo—2 to 8 percent
- Doney—2 to 8 percent

*Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Shambo and similar soils: 50 percent  
 Doney and similar soils: 35 percent

##### Minor Components

Cabba and similar soils: 0 to 4 percent  
 Dast and similar soils: 0 to 4 percent  
 Cherry and similar soils: 0 to 4 percent  
 Soils that have calcareous surfaces: 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

##### Doney

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.9 inches

### 802E—Shambo-Lisk-Dast complex, 8 to 25 percent slopes

#### Setting

*Landform:*

- Shambo—Sedimentary plains
- Lisk—Hills
- Dast—Hills

*Position on landform:*

- Shambo—Foothills
- Lisk—Backslopes and foothills
- Dast—Backslopes and shoulders

*Slope:*

- Shambo—8 to 15 percent
- Lisk—8 to 25 percent
- Dast—8 to 25 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Shambo and similar soils: 35 percent

Lisk and similar soils: 30 percent

Dast and similar soils: 20 percent

#### Minor Components

Doney and similar soils: 0 to 3 percent

Cohagen and similar soils: 0 to 3 percent

Sagedale and similar soils: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Widen 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

#### Lisk

*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:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 6.3 inches

#### Dast

*Surface layer texture:* Fine sandy loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, sandy sedimentary beds

*Native plant cover type:* Forest land

*Flooding:* None

*Available water capacity:* Mainly 4.5 inches

## 432D—Slickspots-Abor complex, 2 to 12 percent slopes

### Setting

#### *Landform:*

- Abor—Sedimentary plains

#### *Position on landform:*

- Abor—Backslopes and shoulders

#### *Slope:*

- Abor—2 to 12 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Slickspots: 50 percent

Abor and similar soils: 40 percent

#### Minor Components

Neldore and similar soils: 0 to 4 percent

Weingart and similar soils: 0 to 3 percent

Marvan and similar soils: 0 to 3 percent

### Major Component Description

#### Slickspots

*Definition:* Areas having a puddled, crusted surface with high sodium levels. These areas support little or no vegetation.

#### 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 3.5 inches

### Sonnett Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Typic  
 Eutroboralfs

### Typical Pedon

Sonnett loam in an area of Sonnett-Sonnett, thin surface, complex, 0 to 2 percent slopes, in an area of rangeland; 2,000 feet west and 1,800 feet south of the northeast corner of sec. 24, T. 5 N., R. 51 E.

E—0 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; slightly alkaline; clear smooth boundary.

Bt—6 to 14 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium columnar structure parting to strong medium and coarse subangular blocky structure; very hard, very firm, sticky and very plastic; common medium and fine roots between peds; common fine and very fine pores; very few distinct patchy black (10YR 2/1) organic coats on vertical faces of peds; very few distinct continuous clay films on faces of peds and in pores; slightly alkaline; gradual wavy boundary.

Btk—14 to 20 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; strong coarse prismatic structure parting to strong coarse subangular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots between peds; common fine and very fine pores; very few faint patchy black (10YR 2/1) organic coats on vertical faces of peds; very few faint clay films on faces of peds and in pores; common medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—20 to 25 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots between peds; common fine and very fine pores; common medium irregular masses of lime; violently effervescent; moderately alkaline; gradual irregular boundary.

Bky1—25 to 31 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium and coarse angular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; very few faint patchy black (10YR 2/1) organic coats on vertical faces of peds; common medium irregular masses of lime; few medium irregular gypsum threads; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky2—31 to 47 inches; light brownish gray (10YR 6/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure; slightly hard, friable, sticky and plastic; few fine roots; common very fine pores; common medium irregular gypsum threads; common medium irregular threads of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bky3—47 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure; hard, friable, sticky and plastic; common fine irregular threads of lime; common fine and medium irregular gypsum threads; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

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

*Soil phases:* Thin surface

#### E horizon

Value: 6 or 7 dry; 3 or 4 moist  
 Texture: Loam or silty clay loam  
 Clay content: 15 to 35 percent  
 Reaction: pH 6.6 to 7.8

#### Bt horizon

Hue: 10YR or 2.5Y  
 Value: 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Silty clay or clay  
 Clay content: 40 to 45 percent  
 Reaction: pH 7.4 to 8.4

*Btk horizon*

Hue: 10YR or 2.5Y  
 Value: 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Silty clay loam or clay loam  
 Clay content: 30 to 40 percent  
 Calcium carbonate equivalent: 1 to 10 percent  
 Reaction: pH 7.4 to 8.4

*Bk horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry  
 Chroma: 2 or 3  
 Texture: Clay loam or loam  
 Clay content: 20 to 30 percent  
 Calcium carbonate equivalent: 1 to 10 percent  
 Reaction: pH 7.4 to 8.4

*Bky horizons*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Clay loam or loam  
 Clay content: 20 to 30 percent  
 Calcium carbonate equivalent: 1 to 10 percent  
 Gypsum: 1 to 3 percent  
 Reaction: pH 7.9 to 9.0

**90A—Sonnnett loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Sonnnett and similar soils: 85 percent

**Minor Components**

Gerdrum and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Archin and similar soils: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent  
 Foreleft 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 9.5 inches

**90C—Sonnnett loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Sonnnett and similar soils: 85 percent

**Minor Components**

Gerdrum and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Creed and similar soils: 0 to 3 percent  
 Archin and similar soils: 0 to 3 percent  
 Soils that have slopes less than 2 percent: 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 9.5 inches

**902C—Sonnnett, thin surface-Slickspots complex, 0 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 8 percent  
*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Sonnett and similar soils: 60 percent  
 Slickspots: 25 percent

#### Minor Components

Archin and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent  
 Gerdrum and similar soils: 0 to 4 percent  
 Foreleft and similar soils: 0 to 3 percent

### Major Component Description

#### Sonnett

*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 9.6 inches

#### Slickspots

*Definition:* Areas having a puddled, crusted surface with high sodium levels. These areas support little or no vegetation.

### 901A—Sonnett-Sonnett, thin surface, complex, 0 to 2 percent slopes

#### Setting

##### *Landform:*

- Sonnett—Sedimentary plains
- Sonnett—Sedimentary plains

##### *Position on landform:*

- Sonnett—Microhighs
- Sonnett—Microlows

##### *Slope:*

- Sonnett—0 to 2 percent
- Sonnett—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Sonnett and similar soils: 50 percent  
 Sonnett and similar soils: 35 percent

#### Minor Components

Archin and similar soils: 0 to 3 percent  
 Gerdrum and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Areas of slickspots: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent

### Major Component Description

#### Sonnett

*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 9.5 inches

#### Sonnett

*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

### 901C—Sonnett-Sonnett, thin surface, complex, 2 to 8 percent slopes

#### Setting

##### *Landform:*

- Sonnett—Sedimentary plains
- Sonnett—Sedimentary plains

##### *Position on landform:*

- Sonnett—Microhighs
- Sonnett—Microlows

##### *Slope:*

- Sonnett—2 to 8 percent
- Sonnett—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Sonnett and similar soils: 45 percent  
 Sonnett and similar soils: 40 percent

#### Minor Components

Archin and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Foreleft and similar soils: 0 to 3 percent  
 Areas of slickspots: 0 to 3 percent

### Major Component Description

#### Sonnett

*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 9.5 inches

#### Sonnett

*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

### Spinekop Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately slow  
*Landform:* Stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Elevation range:* 2,240 to 2,700 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

#### Typical Pedon

Spinekop silty clay loam, 0 to 2 percent slopes, in hayland; 700 feet east and 2,400 feet north of southwest corner of sec. 26, T. 3 N., R. 49 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure parting to strong fine and medium subangular blocky structure; hard, firm, sticky and plastic; common medium, fine, and very fine roots; slightly alkaline; abrupt smooth boundary.

Bw—6 to 12 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium

and coarse subangular blocky structure parting to moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common medium, fine, and very fine roots; common fine and very fine pores; slightly alkaline; clear smooth boundary.

2Bk—12 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium and coarse angular blocky structure parting to moderate fine and medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; common fine and medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

2BC—18 to 34 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium and fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C—34 to 60 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 44 to 47 degrees F

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

#### A horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 40 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  
 Clay content: 27 to 35 percent  
 Reaction: pH 7.4 to 7.8

#### 2Bk horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam  
 Clay content: 18 to 35 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 8.4

**2BC 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 30 percent  
 Reaction: pH 7.9 to 8.4

**2C 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 30 percent  
 Reaction: pH 7.9 to 8.4

## 489A—Spinekop silty clay loam, 0 to 2 percent slopes

### Setting

*Landform:* Stream terraces  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Spinekop and similar soils: 85 percent

#### Minor Components

Yamacall and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 4 percent  
 Marias and similar soils: 0 to 4 percent  
 Soils that have slopes more than 2 percent: 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 10.1 inches

### Tally Series

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid  
*Landform:* Sedimentary plains  
*Parent material:* Alluvium or eolian material  
*Slope range:* 2 to 12 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Coarse-loamy, mixed Typic Haploborolls

### Typical Pedon

Tally fine sandy loam in an area of Tally-Vebar fine sandy loams, 2 to 12 percent slopes, in an area of rangeland; 2,300 feet south and 2,300 feet east of northwest corner of sec. 16, T. 1 N., R. 46 E.

A—0 to 4 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

Bw1—4 to 9 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; slightly alkaline; gradual wavy boundary.

Bw2—9 to 16 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; common very fine pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—16 to 32 inches; very pale brown (10YR 7/4) fine sandy loam, yellowish brown (10YR 5/4) moist; moderate coarse prismatic structure; hard,

very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; common coarse masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

**Bk<sub>2</sub>**—32 to 41 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; common medium and coarse masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

**C**—41 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; massive; loose, nonsticky and nonplastic; slightly effervescent; moderately alkaline.

#### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Depth to Bk horizon:* 15 to 35 inches

#### A horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Reaction: pH 6.6 to 7.8

#### Bw horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry; 2 to 4 moist

Chroma: 2 or 3

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Reaction: pH 6.6 to 8.4

#### Bk horizons

Hue: 10YR, 2.5Y, or 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Fine sandy loam or loamy fine sand

Clay content: 5 to 18 percent

Reaction: pH 7.4 to 8.4

### 34C—Tally fine sandy loam, 2 to 8 percent slopes

#### Setting

*Landform:* Sedimentary plains

*Slope:* 2 to 8 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Tally and similar soils: 85 percent

#### Minor Components

Dast and similar soils: 0 to 4 percent

Doney and similar soils: 0 to 4 percent

Soils that have slopes more than 8 percent: 0 to 4 percent

Macar 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 or eolian material

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 7.6 inches

### 342C—Tally-Shambo complex, 2 to 8 percent slopes

#### Setting

*Landform:*

- Tally—Sedimentary plains
- Shambo—Sedimentary plains

*Slope:*

- Tally—2 to 8 percent

- Shambo—2 to 8 percent
- Elevation:* 2,900 to 3,760 feet  
*Mean annual precipitation:* 15 to 17 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Tally and similar soils: 50 percent  
 Shambo and similar soils: 40 percent

#### Minor Components

Doney and similar soils: 0 to 4 percent  
 Dast and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 0 to 3 percent

### Major Component Description

#### Tally

*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 7.6 inches

#### Shambo

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 10.9 inches

### 341D—Tally-Vebar fine sandy loams, 2 to 12 percent slopes

#### Setting

##### *Landform:*

- Tally—Sedimentary plains
- Vebar—Sedimentary plains

##### *Position on landform:*

- Tally—Foothills and toe slopes
- Vebar—Backslopes and foothills

##### *Slope:*

- Tally—2 to 12 percent
- Vebar—2 to 12 percent

*Elevation:* 2,900 to 3,760 feet

*Mean annual precipitation:* 15 to 17 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Tally and similar soils: 50 percent  
 Vebar and similar soils: 40 percent

#### Minor Components

Dast and similar soils: 0 to 4 percent  
 Cohagen and similar soils: 0 to 4 percent  
 Soils that have slopes more than 12 percent: 0 to 2 percent

### Major Component Description

#### Tally

*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 7.6 inches

#### Vebar

*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 3.6 inches

### Tinsley Series

*Depth class:* Very deep  
*Drainage class:* Excessively drained  
*Permeability:* Rapid  
*Landform:* Relict stream terraces  
*Parent material:* Gravelly alluvium or colluvium  
*Slope range:* 4 to 45 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Typic Ustorthents

#### Typical Pedon

Tinsley very gravelly sandy loam in an area of Tinsley-Delpoint-Cabbart complex, 8 to 45 percent slopes, in an area of rangeland; 2,000 feet south and 1,700 feet east of northwest corner of sec. 12, T. 9 N., R. 48 E.

A—0 to 6 inches; brown (10YR 5/3) very gravelly sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; 40 percent rounded pebbles; slightly effervescent; slightly alkaline; gradual smooth boundary.

C—6 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; 50 percent rounded pebbles; strongly effervescent; slightly alkaline.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 12 and 35 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 60 percent—0 to 10 percent cobbles, 15 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

#### C horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 moist; 5 to 7 dry

Chroma: 2 to 4

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 80 percent—5 to 25 percent stones and cobbles, 30 to 55 percent pebbles

Reaction: pH 6.6 to 8.4

### 949E—Tinsley very gravelly sandy loam, 15 to 35 percent slopes

#### Setting

*Landform:* Relict stream terraces

*Position on landform:* Risers

*Slope:* 15 to 35 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Tinsley and similar soils: 85 percent

#### Minor Components

Cabba and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

#### Major Component Description

*Surface layer texture:* Very gravelly sandy loam

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

*Drainage class:* Excessively drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.2 inches

### 665F—Tinsley-Cabbart complex, 15 to 45 percent slopes

#### Setting

*Landform:*

- Tinsley—Relict stream terraces
- Cabbart—Hills

*Position on landform:*

- Tinsley—Risers
- Cabbart—Backslopes

*Slope:*

- Tinsley—15 to 45 percent
- Cabbart—15 to 45 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Tinsley and similar soils: 35 percent

Cabbart and similar soils: 35 percent

#### Minor Components

Twilight and similar soils: 0 to 30 percent

#### Major Component Description

##### Tinsley

*Surface layer texture:* Very gravelly sandy loam

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

*Drainage class:* Excessively drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 1.4 inches

**Cabbart**

*Surface layer texture:* Loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 3.0 inches

**122D—Tinsley-Chanta complex, 4 to 15 percent slopes****Setting***Landform:*

- Tinsley—Relict stream terraces
- Chanta—Relict stream terraces

*Position on landform:*

- Tinsley—Risers
- Chanta—Risers

*Slope:*

- Tinsley—4 to 15 percent
- Chanta—4 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Tinsley and similar soils: 60 percent  
 Chanta and similar soils: 30 percent

**Minor Components**

Chinook and similar soils: 0 to 2 percent  
 Degrand and similar soils: 0 to 2 percent  
 Delpoint and similar soils: 0 to 2 percent  
 Soils that have slopes less than 4 percent: 0 to 2 percent  
 Soils that have slopes more than 15 percent: 0 to 2 percent

**Major Component Description****Tinsley**

*Surface layer texture:* Very gravelly sandy 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 1.3 inches

**Chanta**

*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 5.6 inches

**123F—Tinsley-Delpoint-Cabbart complex, 8 to 45 percent slope****Setting***Landform:*

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

*Position on landform:*

- Tinsley—Risers
- Delpoint—Backslopes and shoulders
- Cabbart—Shoulders

*Slope:*

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

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Tinsley and similar soils: 40 percent  
 Delpoint and similar soils: 25 percent  
 Cabbart and similar soils: 20 percent

**Minor Components**

Yawdim and similar soils: 0 to 4 percent  
 Areas of rock outcrop: 0 to 4 percent  
 Yamacall and similar soils: 0 to 4 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent

**Major Component Description****Tinsley**

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

*Flooding:* None

*Available water capacity:* Mainly 1.3 inches

### **Delpoint**

*Surface layer texture:* Loam

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 5.2 inches

### **Cabbart**

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, loamy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.6 inches

## **Twilight Series**

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid

*Landform:* Sedimentary plains and hills

*Parent material:* Semiconsolidated sandy sedimentary beds

*Slope range:* 2 to 25 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

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

### **Typical Pedon**

Twilight fine sandy loam in an area of Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes, in an area of rangeland; 2,500 feet west and 400 feet south of northeast corner of sec. 19, T. 4 N., R. 48 E.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many medium and fine roots and common coarse roots; slightly alkaline; clear smooth boundary.

Bw—4 to 10 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; many fine and coarse roots; slightly alkaline; clear wavy boundary.

Bk1—10 to 16 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak very coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots and common coarse roots; common medium irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—16 to 30 inches; light gray (2.5Y 7/2) fine sandy loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky and nonplastic; common medium irregular masses of lime; strongly effervescent throughout; moderately alkaline; clear wavy boundary.

Cr—30 to 60 inches; light gray (2.5Y 7/2) semiconsolidated sandstone, light brownish gray (2.5Y 6/2) moist.

### **Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 8 and 24 inches

*Depth to 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 horizons*

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

## 921F—Twilight-Blacksheep-Busby fine sandy loams, 8 to 45 percent slopes

### Setting

#### Landform:

- Twilight—Hills
- Blacksheep—Hills
- Busby—Sedimentary plains

#### Position on landform:

- Twilight—Backslopes and shoulders
- Blacksheep—Shoulders and summits
- Busby—Backslopes and footslopes

#### Slope:

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

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Twilight and similar soils: 45 percent  
 Blacksheep and similar soils: 20 percent  
 Busby and similar soils: 20 percent

#### Minor Components

Yamacall and similar soils: 0 to 4 percent  
 Delpoint and similar soils: 0 to 4 percent  
 Cabbart and similar soils: 0 to 4 percent  
 Areas of rock outcrop: 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 4.2 inches

#### Blacksheep

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Semiconsolidated, sandy sedimentary beds

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 2.3 inches

#### Busby

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 8.2 inches

### Vanda Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Very slow

*Landform:* Sedimentary plains and stream terraces

*Parent material:* Alluvium

*Slope range:* 0 to 4 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

#### Typical Pedon

Vanda silty clay, in an area of Marvan-Vanda silty clays, 0 to 4 percent slopes, in an area of rangeland, 1,400 feet north and 200 feet east of the southwest corner of sec. 5, T. 8 N., R. 48 E.

A1—0 to 1 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium platy structure; hard, firm, sticky and plastic; common fine and very fine roots; moderately alkaline; abrupt smooth boundary.

Bw—1 to 7 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine and very fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.

Bz—7 to 20 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist;

moderate coarse prismatic structure; very hard, very firm, very sticky and very plastic; common fine and very fine roots; common fine and very fine pores; few fine masses of salt; slightly effervescent; moderately alkaline; gradual smooth boundary.

Byz1—20 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common very fine roots; common fine and very fine pores; many medium masses of salt; common fine gypsum threads; strongly effervescent; strongly alkaline; gradual smooth boundary.

Byz2—30 to 60 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; many medium masses of salt; common fine gypsum threads; slightly effervescent; strongly alkaline.

#### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Byz horizon:* 4 to 24 inches

*Phases:* Wet (The wet phase has a water table at 18 to 36 inches)

#### A horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay or clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm, wet phase greater than 16 mmhos/cm

Reaction: pH 7.9 to 9.0

#### Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay or clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm; wet phase greater than 16 mmhos/cm

Reaction: pH 7.9 to 9.6

#### Bz horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay or clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm; wet phase greater than 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Reaction: pH 7.9 to 9.6

#### Byz horizons

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay or clay

Clay content: 40 to 60 percent

Electrical conductivity: 8 to 16 mmhos/cm, wet phase greater than 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Gypsum content: 1 to 5 percent

Reaction: pH 7.9 to 9.6

### 781A—Vanda clay, wet, 0 to 2 percent slopes

#### Setting

*Landform:* Stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

#### Major Components

Vanda and similar soils: 85 percent

#### Minor Components

Marvan and similar soils: 0 to 3 percent

Benz and similar soils: 0 to 3 percent

Nonsaline soils: 0 to 3 percent

Nonsodic soils: 0 to 3 percent

Poorly drained 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

*Water table:* Apparent

*Salt affected:* Saline within 30 inches

*Sodium affected:* Sodic within 30 inches

*Available water capacity:* Mainly 3.3 inches

## Vanstel Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Sedimentary plains

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine-silty, mixed Typic Eutroboralfs

### Typical Pedon

Vanstel silt loam, 2 to 8 percent slopes, in an area of rangeland; 600 feet west and 500 feet north of southeast corner of sec. 18, T. 2 N., R. 46 E.

A—0 to 3 inches; grayish brown (10YR 5/2) silt loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt1—3 to 7 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure parting to moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine and very fine pores; few faint continuous clay films on faces of peds and in pores; slightly alkaline; clear wavy boundary.

Bt2—7 to 13 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; few distinct continuous clay films on faces of peds and in pores; slightly alkaline; gradual wavy boundary.

Btk—13 to 20 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; common fine and very fine masses of lime; few distinct patchy clay films on faces of peds and in pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—20 to 32 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; common fine and very fine pores; common medium and coarse irregular masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—32 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Soil temperature:* 40 to 47 degrees F

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

#### A horizon

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 14 to 25 percent

Reaction: pH 6.6 to 7.8

#### Bt horizons

Value: 5 or 6 dry

Chroma: 2 or 3

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

Clay content: 25 to 35 percent

Reaction: pH 7.4 to 8.4.

#### Btk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

*BC horizon*

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 to 6 moist  
 Chroma: 2 or 3  
 Texture: Silt loam or loam  
 Clay content: 18 to 27 percent  
 Reaction: pH 7.9 to 8.4

**76B—Vanstel loam, 0 to 4 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 4 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Vanstel and similar soils: 85 percent

**Minor Components**

Pinehill and similar soils: 0 to 3 percent  
 Soils that have slopes more than 4 percent: 0 to 3 percent  
 Yamacall and similar soils: 0 to 3 percent  
 Sodic soils: 0 to 3 percent  
 Saline 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 9.4 inches

**951C—Vanstel loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Vanstel and similar soils: 85 percent

**Minor Components**

Lonna and similar soils: 0 to 5 percent  
 Gerdrum and similar soils: 0 to 5 percent  
 Ivanell and similar soils: 0 to 5 percent

**Major Component Description**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.4 inches

**76C—Vanstel silt loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Vanstel and similar soils: 85 percent

**Minor Components**

Pinehill and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 0 to 3 percent  
 Foreleft and similar soils: 0 to 3 percent  
 Saline soils: 0 to 3 percent  
 Sodic 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 9.4 inches

## Vebar Series

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid  
*Landform:* Sedimentary plains  
*Parent material:* Semiconsolidated sandy sedimentary beds  
*Slope range:* 2 to 12 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Coarse-loamy, mixed Typic Haploborolls

### Typical Pedon

Vebar fine sandy loam in an area of Tally-Vebar fine sandy loams, 2 to 12 percent slopes, in an area of rangeland; 2,100 feet west and 1,600 feet south of northeast corner of sec. 13, T. 4 N., R. 45 E.

A—0 to 5 inches; brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, friable, nonsticky and nonplastic; common medium and coarse roots and many very fine and fine roots; slightly alkaline; clear smooth boundary.

Bw—5 to 12 inches; brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common coarse and medium roots and many fine and very fine roots; common fine and very fine pores; slightly alkaline; clear wavy boundary.

Bk1—12 to 23 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; common medium irregular masses of lime; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk2—23 to 35 inches; pale brown (10YR 6/3) fine sandy loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to

moderate medium and coarse subangular blocky structure; soft, friable, nonsticky and nonplastic; common fine and very fine roots; common medium irregular masses of lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Cr—35 to 60 inches; pale brown (10YR 6/3) sandstone, light brownish gray (2.5Y 6/2) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 8 and 24 inches  
*Depth to Cr horizon:* 20 to 40 inches  
*Mollic epipedon thickness:* 7 to 16 inches

#### A horizon

Value: 3 or 4 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 10 to 18 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 to 4  
 Texture: Fine sandy loam or sandy loam  
 Clay content: 10 to 18 percent  
 Reaction: pH 6.6 to 8.4

#### Bk horizons

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: 7 to 15 percent  
 Calcium carbonate equivalent: 5 to 10 percent  
 Reaction: pH 7.4 to 8.4

## Volborg Series

*Depth class:* Shallow  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains  
*Parent material:* Semiconsolidated shale residuum  
*Slope range:* 1 to 4 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Clayey, montmorillonitic, acid, frigid, shallow Aridic Ustorthents

**Typical Pedon**

Volborg silty clay, 200 feet north and 25 feet east of the southwest corner of sec. 19, T. 8. N., R. 40 E., (in Rosebud County, MT).

A—0 to 3 inches; grayish brown (10YR 5/2) silty clay, brown (10YR 4/3) moist; moderate fine granular structure with weak thin crust at horizon surface; soft, very friable, sticky and plastic; common very fine roots; moderately acid; abrupt smooth boundary.

C1—3 to 15 inches; grayish brown (10YR 5/2) silty clay, brown (10YR 4/3) moist; moderate very fine granular structure; hard, friable, sticky and very plastic; common very fine roots; common very fine pores; very strongly acid; clear wavy boundary.

Cr—15 to 60 inches; gray (10YR 6/1) semiconsolidated shale, dark gray (10YR 4/1) moist.

**Range in Characteristics**

*Soil temperature:* 41 to 47 degrees F

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

*Depth to bedrock:* 10 to 20 inches

*Soil phases:* Saline

**A horizon**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 40 to 50 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 4.5 to 6.5.

**C horizon**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 40 to 50 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 0 to 13

Reaction: pH 3.6 to 5.5

**Wabek Series**

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Very rapid

*Landform:* Relict stream terraces

*Parent material:* Gravelly alluvium

*Slope range:* 8 to 35 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 12 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Sandy-skeletal, mixed Entic Haploborolls

**Typical Pedon**

Wabek gravelly sandy loam, 8 to 35 percent slopes, in an area of rangeland; 1,000 feet east and 1,000 feet north of the southwest corner of sec. 29, T. 2 N., R. 49 E.

A1—0 to 3 inches; brown (10YR 4/3) gravelly sandy loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many medium and fine roots; 25 percent rounded pebbles; slightly alkaline; clear smooth boundary.

A2—3 to 9 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure parting to weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common medium roots and many fine and very fine roots; 20 percent rounded pebbles; common fine masses of lime; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk—9 to 35 inches; light gray (10YR 7/2) very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; 50 percent rounded pebbles; few distinct coats of lime on pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

C—35 to 60 inches; very pale brown (10YR 7/4) extremely gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; 70 percent rounded pebbles; violently effervescent; moderately alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F

*Moisture control section:* Between 12 and 35 inches

*Depth to sand and gravel:* 7 to 14 inches

*Depth to carbonates:* 4 to 9 inches

*Mollic epipedon thickness:* 7 to 14 inches

*A horizons*

Value: 3 or 4 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 10 to 20 percent  
 Content of rock fragments: 15 to 35 percent pebbles  
 Reaction: pH 6.6 to 7.8

*Bk horizon*

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Loamy sand or sand  
 Clay content: 5 to 12 percent  
 Content of rock fragments: 35 to 60 percent—0 to 5 percent cobbles, 35 to 55 percent pebbles  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 9.0

*C horizon*

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 or 5 moist  
 Chroma: 2 to 4  
 Texture: Loamy sand or sand  
 Clay content: 0 to 3 percent  
 Content of rock fragments: 35 to 70 percent—0 to 5 percent cobbles, 35 to 70 percent pebbles  
 Reaction: pH 7.9 to 9.0

**12E—Wabek gravelly sandy loam, 8 to 35 percent slopes****Setting**

*Landform:* Relict stream terraces  
*Position on landform:* Risers  
*Slope:* 8 to 35 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Wabek and similar soils: 85 percent

**Minor Components**

Cabba and similar soils: 0 to 3 percent  
 Doney and similar soils: 0 to 3 percent  
 Tally and similar soils: 0 to 3 percent  
 Cohagen and similar soils: 0 to 3 percent  
 Dast and similar soils: 0 to 3 percent

**Major Component Description**

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

**W—Water****Composition****Major Components**

Water: 100 percent

**Major Component Description**

*Definition:* Areas of open water.

**Wayden Series**

*Depth class:* Shallow  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Hills  
*Parent material:* Semiconsolidated shale residuum  
*Slope range:* 25 to 70 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 46 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents

**Typical Pedon**

Wayden silty clay loam in an area of Doney-Cabba-Wayden complex, 25 to 70 percent slopes, in an area of rangeland; 1,350 feet south and 1,200 feet west of the northeast corner of sec. 9, T. 1 N., R. 50 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/2) moist; moderate very fine granular structure; slightly hard, friable, slightly sticky and plastic; common fine and very fine roots; many fine and very fine pores; slightly effervescent; slightly alkaline; clear wavy boundary.

C1—3 to 10 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist;

moderate medium subangular blocky structure parting to moderate fine and very fine platy structure; hard, firm, sticky and plastic; common very fine roots; many very fine pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

C2—10 to 16 inches; light gray (2.5Y 7/2) silty clay, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; slightly effervescent; strongly alkaline; gradual wavy boundary.

Cr—16 to 60 inches; pinkish gray (5Y 7/2) semiconsolidated shale, reddish gray (5Y 5/2) moist.

### Range in Characteristics

*Soil temperature:* 41 to 47 degrees F

*Moisture control section:* Between 4 and 12 inches

*Depth to Cr horizon:* 10 to 20 inches

#### A horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 35 to 40 percent

Reaction: pH 7.4 to 9.0

#### C horizons

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 50 percent

Reaction: pH 7.4 to 9.0

## Weingart Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Very slow

*Landform:* Sedimentary plains

*Parent material:* Interbedded shale and siltstone residuum

*Slope range:* 0 to 8 percent

*Elevation range:* 2,240 to 2,900 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs

### Typical Pedon

Weingart clay loam in an area of Weingart-Ivanell clay loams, 2 to 8 percent slopes, in an area of rangeland; 2,200 feet east and 800 feet south of the northwest corner of sec. 34, T. 2 N., R. 50 E.

E—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine platy structure parting to moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; common medium, fine, and very fine roots; common fine and very fine pores; slightly alkaline; abrupt wavy boundary.

Btn—4 to 9 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong coarse columnar structure parting to strong medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; common fine and very fine pores; distinct continuous very dark grayish brown (10YR 3/2) moist clay films on vertical and horizontal faces of peds; moderately alkaline; clear wavy boundary.

Btkn—9 to 12 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong coarse prismatic structure parting to strong medium angular blocky structure; hard, firm, sticky and plastic; common fine roots; common fine and very fine pores; distinct very dark grayish brown (10YR 3/2) moist clay films on vertical faces of peds; common fine irregular masses of lime; strongly effervescent; strongly alkaline; clear wavy boundary.

Bknyz—12 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; common fine roots; common very fine pores; common fine and medium irregular masses of gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cr—30 to 60 inches; gray (5Y 5/1) shale, dark gray (5Y 4/1) moist.

### Range in Characteristics

*Soil temperature:* 42 to 47 degrees F

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

*Depth to Bk horizon:* 7 to 16 inches

*Depth to gypsum and other salts:* 10 to 24 inches

*Depth to bedrock:* 20 to 40 inches

*E horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 40 percent (mixed to 7 inches)  
 Reaction: pH 5.6 to 7.8

*Btn horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Silty clay or clay  
 Clay content: 40 to 60 percent  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 10 to 30  
 Reaction: pH 6.6 to 9.6

*Btkn horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Texture: Clay loam, silty clay loam, or clay  
 Clay content: 35 to 55 percent  
 Electrical conductivity: 4 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 30  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 9.6

*Bknyz horizon*

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 clay  
 Clay content: 35 to 55 percent  
 Electrical conductivity: 4 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 30  
 Gypsum: 1 to 5 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 9.6

## 75C—Weingart-Ivanell clay loams, 2 to 8 percent slopes

### Setting

*Landform:*

- Weingart—Sedimentary plains
- Ivanell—Sedimentary plains

*Slope:*

- Weingart—2 to 8 percent
- Ivanell—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Weingart and similar soils: 45 percent  
 Ivanell and similar soils: 40 percent

### Minor Components

Sonnett and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Gerdrum and similar soils: 0 to 3 percent  
 Cabbart and similar soils: 0 to 3 percent  
 Areas of rock outcrop: 0 to 3 percent

### Major Component Description

#### Weingart

*Surface layer texture:* Clay loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Interbedded shale and siltstone residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 3.4 inches

#### Ivanell

*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  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 5.0 inches

## 667E—Weingart-Neldore complex, 4 to 25 percent slopes

### Setting

*Landform:*

- Weingart—Sedimentary plains
- Neldore—Hills

*Slope:*

- Weingart—4 to 8 percent
- Neldore—4 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Weingart and similar soils: 55 percent  
 Neldore and similar soils: 20 percent

#### Minor Components

Gerdrum and similar soils: 0 to 10 percent  
 Areas of rock outcrop: 0 to 5 percent  
 Cabbart and similar soils: 0 to 5 percent  
 Cambeth and similar soils: 0 to 5 percent

### Major Component Description

#### Weingart

*Surface layer texture:* Clay  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Interbedded shale and siltstone residuum  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 3.3 inches

#### Neldore

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

#### Widen Series

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains and hills  
*Parent material:* Interbedded shale and siltstone residuum  
*Slope range:* 2 to 25 percent  
*Elevation range:* 2,900 to 3,760 feet  
*Annual precipitation:* 15 to 17 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Typic Ustochrepts

#### Typical Pedon

Widen silty clay loam in an area of Cambert-Widen complex, 2 to 8 percent slopes, in an area of cropland; 1,520 feet north and 2,030 feet east of the southwest corner of sec. 26, T. 7 N., R. 50 E.

Ap—0 to 3 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, friable, sticky and plastic; common medium, fine, and very fine roots; slightly alkaline; clear smooth boundary.

Bw—3 to 11 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and very plastic; common fine and very fine roots; common fine and very fine pores; slightly alkaline; clear smooth boundary.

Bk—11 to 25 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky structure; hard, firm, sticky and very plastic; common fine and very fine roots; common fine and very fine pores; common medium and coarse irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

By—25 to 32 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky structure; hard, firm, sticky and very plastic; common fine and very fine roots; common fine and very fine pores; common medium irregular masses of gypsum; strongly effervescent; strongly alkaline; clear smooth boundary.

Cr—32 to 60 inches; light gray (2.5Y 7/2) semiconsolidated shale, grayish brown (2.5Y 5/2) moist.

### Range in Characteristics

*Soil temperature:* 41 to 45 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Depth to Cr horizon:* 20 to 40 inches  
*Depth to Bk horizon:* 10 to 20 inches

#### Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 40 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 or 3  
 Clay content: 35 to 40 percent  
 Reaction: pH 7.4 to 8.4

*Bk horizon*

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 or 5 moist  
 Chroma: 2 or 4  
 Texture: Silty clay loam or silty clay  
 Clay content: 35 to 50 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

*By horizon*

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 40 to 50 percent  
 Gypsum content: 5 to 10 percent  
 Reaction: pH 7.4 to 9.0

**Yamacall Series**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landform:* Stream terraces, sedimentary plains, and hills  
*Parent material:* Alluvium  
*Slope range:* 0 to 25 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

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

**Typical Pedon**

Yamacall loam, 0 to 2 percent slopes, in an area of cropland; 2,600 feet south of northwest corner of sec. 14, T. 7 N., R. 47 E.

Ap—0 to 7 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure parting to moderate

fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—7 to 14 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine roots; common fine and very fine pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—14 to 24 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine roots; common fine and very fine pores; common medium and coarse irregular masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—24 to 30 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common medium irregular masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—30 to 60 inches; pale brown (10YR 6/3) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline.

**Range in Characteristics**

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher  
*Depth to Bk horizon:* 10 to 20 inches  
*Soil phases:* Gullied

*Ap horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 18 to 27 percent  
 Reaction: pH 6.6 to 8.4

*Bw horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 to 6 moist  
 Chroma: 2 to 4  
 Texture: Loam or silt loam  
 Clay content: 18 to 27 percent  
 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: Loam or silt loam  
 Clay content: 18 to 27 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.9 to 8.4

*BC horizon*

Hue: 10YR or 2.5Y  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 2 to 4  
 Clay content: 18 to 27 percent  
 Reaction: pH 7.9 to 9.0

**79A—Yamacall loam, 0 to 2 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 0 to 2 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 85 percent

**Minor Components**

Busby and similar soils: 0 to 4 percent  
 Kobase and similar soils: 0 to 3 percent  
 Lonna and similar soils: 0 to 3 percent  
 Soils that have slopes more than 2 percent: 0 to 3 percent  
 Poorly drained 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

*Available water capacity:* Mainly 9.7 inches

**79C—Yamacall loam, 2 to 8 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 2 to 8 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 85 percent

**Minor Components**

Delpoint and similar soils: 0 to 3 percent  
 Busby and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Lonna and similar soils: 0 to 3 percent  
 Soils that have slopes more than 8 percent: 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 9.7 inches

**79D—Yamacall loam, 8 to 15 percent slopes****Setting**

*Landform:* Sedimentary plains  
*Slope:* 8 to 15 percent  
*Elevation:* 2,240 to 2,900 feet  
*Mean annual precipitation:* 11 to 14 inches  
*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 85 percent

**Minor Components**

Delpoint and similar soils: 0 to 3 percent  
 Kobase and similar soils: 0 to 3 percent  
 Busby and similar soils: 0 to 3 percent  
 Soils that have slopes less than 8 percent: 0 to 3 percent  
 Twilight 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 9.7 inches

**952D—Yamacall-Birney complex, 8 to 15 percent slopes****Setting***Landform:*

- Yamacall—Sedimentary plains
- Birney—Sedimentary plains

*Position on landform:*

- Yamacall—Backslopes
- Birney—Shoulders and summits

*Slope:*

- Yamacall—8 to 15 percent
- Birney—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 50 percent  
 Birney and similar soils: 35 percent

**Minor Components**

Kirby and similar soils: 0 to 10 percent  
 Busby and similar soils: 0 to 5 percent

**Major Component Description****Yamacall**

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 9.7 inches

**Birney**

*Surface layer texture:* Channery loam

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

*Drainage class:* Well drained

*Dominant parent material:* Material weathered from baked sandstone and shale

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 4.2 inches

**953E—Yamacall-Birney-Cabbart complex, 15 to 25 percent slopes****Setting***Landform:*

- Yamacall—Hills
- Birney—Hills
- Cabbart—Hills

*Position on landform:*

- Yamacall—Backslopes and footslopes
- Birney—Shoulders and summits
- Cabbart—Summits

*Slope:*

- Yamacall—15 to 25 percent
- Birney—15 to 25 percent
- Cabbart—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 45 percent  
 Birney and similar soils: 20 percent  
 Cabbart and similar soils: 20 percent

**Minor Components**

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

## Major Component Description

### Yamacall

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### Birney

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.2 inches

### Cabbart

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

## 799E—Yamacall-Birney-Delpoint complex, 15 to 25 percent slopes

### Setting

#### *Landform:*

- Yamacall—Hills
- Birney—Hills
- Delpoint—Hills

#### *Position on landform:*

- Yamacall—Backslopes
- Birney—Backslopes and shoulders
- Delpoint—Backslopes and shoulders

#### *Slope:*

- Yamacall—15 to 25 percent
- Birney—15 to 25 percent
- Delpoint—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

## Composition

### Major Components

Yamacall and similar soils: 40 percent  
 Birney and similar soils: 30 percent  
 Delpoint and similar soils: 20 percent

### Minor Components

Kirby and similar soils: 0 to 3 percent  
 Twilight and similar soils: 0 to 3 percent  
 Cabbart and similar soils: 0 to 2 percent  
 Areas of rock outcrop: 0 to 2 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

### Birney

*Surface layer texture:* Channery loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Material weathered from baked sandstone and shale  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 4.1 inches

### Delpoint

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

## 891D—Yamacall-Birney-Delpoint complex, 4 to 15 percent slopes

### Setting

#### *Landform:*

- Yamacall—Sedimentary plains
- Birney—Sedimentary plains
- Delpoint—Sedimentary plains

*Position on landform:*

- Yamacall—Foothills
- Birney—Backslopes
- Delpoint—Backslopes and shoulders

*Slope:*

- Yamacall—4 to 8 percent
- Birney—4 to 15 percent
- Delpoint—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Yamacall and similar soils: 50 percent

Birney and similar soils: 20 percent

Delpoint and similar soils: 20 percent

**Minor Components**

Kirby and similar soils: 0 to 3 percent

Cabbart and similar soils: 0 to 3 percent

Busby and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 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**Birney***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Material weathered from baked sandstone and shale*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.1 inches**Delpoint***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**954C—Yamacall-Busby complex, 2 to 8 percent slopes****Setting***Landform:*

- Yamacall—Sedimentary plains
- Busby—Sedimentary plains

*Slope:*

- Yamacall—2 to 8 percent
- Busby—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Yamacall and similar soils: 50 percent

Busby and similar soils: 40 percent

**Minor Components**

Yetull and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

**Major Component Description****Yamacall***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.1 inches**Busby***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 8.2 inches

### 954D—Yamacall-Busby complex, 8 to 15 percent slopes

#### Setting

*Landform:*

- Yamacall—Sedimentary plains
- Busby—Sedimentary plains

*Slope:*

- Yamacall—8 to 15 percent
- Busby—8 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Yamacall and similar soils: 50 percent  
 Busby and similar soils: 40 percent

##### Minor Components

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

#### Major Component Description

##### Yamacall

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 9.7 inches

##### Busby

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or eolian material

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 8.2 inches

### 797E—Yamacall-Busby-Blacksheep complex, 8 to 25 percent slopes

#### Setting

*Landform:*

- Yamacall—Sedimentary plains
- Busby—Hills
- Blacksheep—Hills

*Position on landform:*

- Yamacall—Foothills
- Busby—Backslopes and foothills
- Blacksheep—Backslopes and shoulders

*Slope:*

- Yamacall—8 to 15 percent
- Busby—8 to 25 percent
- Blacksheep—8 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Yamacall and similar soils: 45 percent  
 Busby and similar soils: 25 percent  
 Blacksheep and similar soils: 20 percent

##### Minor Components

Delpoint and similar soils: 0 to 4 percent  
 Areas of rock outcrop: 0 to 3 percent  
 Cabbart and similar soils: 0 to 3 percent

#### Major Component Description

##### Yamacall

*Surface layer texture:* Loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 9.7 inches

##### Busby

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or colluvium

*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 8.2 inches

### **Blacksheep**

*Surface layer texture:* Fine sandy loam  
*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, sandy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 2.3 inches

## **798C—Yamacall-Delpoint loams, 2 to 8 percent slopes**

### **Setting**

#### *Landform:*

- Yamacall—Sedimentary plains
- Delpoint—Sedimentary plains

#### *Position on landform:*

- Yamacall—Foothills
- Delpoint—Backslopes and shoulders

#### *Slope:*

- Yamacall—2 to 8 percent
- Delpoint—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Yamacall and similar soils: 50 percent  
 Delpoint and similar soils: 35 percent

#### **Minor Components**

Cabbart and similar soils: 0 to 4 percent  
 Busby and similar soils: 0 to 4 percent  
 Twilight and similar soils: 0 to 4 percent  
 Soils that have calcareous surfaces: 0 to 3 percent

### **Major Component Description**

#### **Yamacall**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained

*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### **Delpoint**

*Surface layer texture:* Loam  
*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Semiconsolidated, loamy sedimentary beds  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 5.2 inches

## **955D—Yamacall-Delpoint loams, 4 to 15 percent slopes**

### **Setting**

#### *Landform:*

- Yamacall—Sedimentary plains
- Delpoint—Sedimentary plains

#### *Slope:*

- Yamacall—4 to 15 percent
- Delpoint—4 to 15 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### **Composition**

#### **Major Components**

Yamacall and similar soils: 50 percent  
 Delpoint and similar soils: 35 percent

#### **Minor Components**

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

### **Major Component Description**

#### **Yamacall**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.2 inches

**Delpoint***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.6 inches**892D—Yamacall-Delpoint-Cabbart loams,  
4 to 15 percent slopes****Setting***Landform:*

- Yamacall—Sedimentary plains
- Delpoint—Sedimentary plains
- Cabbart—Sedimentary plains

*Position on landform:*

- Yamacall—Foothills
- Delpoint—Backslopes
- Cabbart—Shoulders and summits

*Slope:*

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

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Yamacall and similar soils: 40 percent

Delpoint and similar soils: 30 percent

Cabbart and similar soils: 15 percent

**Minor Components**

Twilight and similar soils: 0 to 4 percent

Yawdim and similar soils: 0 to 4 percent

Migonot and similar soils: 0 to 4 percent

Busby and similar soils: 0 to 3 percent

**Major Component Description****Yamacall***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.7 inches**Delpoint***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.2 inches**Cabbart***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.6 inches**995C—Yamacall-Gerdrum complex, 2 to 8  
percent slopes****Setting***Landform:*

- Yamacall—Sedimentary plains
- Gerdrum—Sedimentary plains

*Slope:*

- Yamacall—2 to 8 percent
- Gerdrum—2 to 8 percent

*Elevation:* 2,240 to 2,900 feet*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 110 to 135 days**Composition****Major Components**

Yamacall and similar soils: 50 percent

Gerdrum and similar soils: 35 percent

**Minor Components**

Creed and similar soils: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Pinehill and similar soils: 0 to 5 percent

**Major Component Description****Yamacall***Surface layer texture:* Loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

**Gerdrum**

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Salt affected:* Saline within 30 inches  
*Sodium affected:* Sodic within 30 inches  
*Available water capacity:* Mainly 6.2 inches

**615C—Yamacall-Havre loams, 2 to 8 percent slopes****Setting***Landform:*

- Yamacall—Sedimentary plains
- Havre—Flood plains

*Slope:*

- Yamacall—2 to 8 percent
- Havre—2 to 4 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 70 percent

Havre and similar soils: 20 percent

**Minor Components**

Delpoint and similar soils: 0 to 4 percent

Poorly drained soils: 0 to 3 percent

Soils that have slopes more than 8 percent: 0 to 3 percent

**Major Component Description****Yamacall**

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

*Flooding:* None

*Available water capacity:* Mainly 9.7 inches

**Havre**

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

**30C—Yamacall-Havre, occasionally flooded, loams, 0 to 8 percent slopes****Setting***Landform:*

- Yamacall—Stream terraces
- Havre—Flood plains

*Slope:*

- Yamacall—2 to 8 percent
- Havre—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

**Composition****Major Components**

Yamacall and similar soils: 50 percent

Havre and similar soils: 35 percent

**Minor Components**

Glendive and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 3 percent

Rivra and similar soils: 0 to 3 percent

Hanly and similar soils: 0 to 3 percent

Poorly drained soils: 0 to 3 percent

**Major Component Description****Yamacall**

*Surface layer texture:* Loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

**Havre**

*Surface layer texture:* Loam

*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Native plant cover type:* Rangeland  
*Flooding:* Occasional  
*Available water capacity:* Mainly 9.8 inches

## Yawdim Series

*Depth class:* Shallow  
*Drainage class:* Well drained  
*Permeability:* Slow  
*Landform:* Sedimentary plains and hills  
*Parent material:* Semiconsolidated shale residuum  
*Slope range:* 4 to 70 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents

### Typical Pedon

Yawdim silty clay loam in an area of Cambeth-Cabbart-Yawdim complex, 15 to 25 percent slopes, in an area of rangeland; 1,900 feet north and 300 feet east of southwest corner of sec. 15, T. 9 N., R. 53 E.

- A—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure parting to weak medium granular structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; strongly effervescent; slightly alkaline; clear smooth boundary.
- C1—5 to 9 inches; light gray (5Y 7/2) silty clay, light olive gray (5Y 6/2) moist; weak coarse prismatic structure; hard, firm, sticky and very plastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C2—9 to 18 inches; light gray (5Y 7/1) silty clay, light olive gray (5Y 6/2) moist; weak coarse prismatic structure; hard, firm, sticky and very plastic; common very fine and fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.
- Cr—18 to 60 inches; light gray (5Y 7/2) semiconsolidated shale, light olive gray (5Y 6/2) moist.

## Range in Characteristics

*Soil temperature:* 42 to 47 degrees F  
*Moisture control section:* Between 4 and 12 inches  
*Depth to Cr horizon:* 10 to 20 inches

### A horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 or 4 moist  
 Chroma: 1 or 2  
 Clay content: 35 to 40 percent  
 Reaction: pH 7.4 to 7.8

### C horizons

Hue: 2.5Y or 5Y  
 Value: 5 to 7 dry; 4 to 6 moist  
 Chroma: 1 or 2  
 Texture: Silty clay loam or silty clay  
 Clay content: 35 to 50 percent  
 Reaction: pH 7.9 to 8.4

## 956F—Yawdim-Cabbart-Kobase complex, 15 to 70 percent slopes

### Setting

#### Landform:

- Yawdim—Hills
- Cabbart—Hills
- Kobase—Hills

#### Position on landform:

- Yawdim—Shoulders and summits
- Cabbart—Shoulders and summits
- Kobase—Backslopes

#### Slope:

- Yawdim—15 to 70 percent
- Cabbart—15 to 70 percent
- Kobase—15 to 25 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Yawdim and similar soils: 30 percent  
 Cabbart and similar soils: 30 percent  
 Kobase and similar soils: 25 percent

#### Minor Components

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

## Major Component Description

### Yawdim

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

### Cabbart

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

### Kobase

*Surface layer texture:* Silty clay loam  
*Depth class:* Very deep (more than 60 inches)  
*Drainage class:* Well drained  
*Dominant parent material:* Colluvium  
*Native plant cover type:* Rangeland  
*Flooding:* None  
*Available water capacity:* Mainly 9.7 inches

### Yetull Series

*Depth class:* Very deep  
*Drainage class:* Somewhat excessively drained  
*Permeability:* Rapid  
*Landform:* Sedimentary plains and hills  
*Parent material:* Alluvium and eolian material  
*Slope range:* 0 to 35 percent  
*Elevation range:* 2,240 to 2,900 feet  
*Annual precipitation:* 11 to 14 inches  
*Annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Mixed, frigid Typic Ustipsamments

### Typical Pedon

Yetull loamy fine sand in an area of Busby-Yetull complex, 2 to 15 percent slopes, in an area of rangeland; 1,400 feet south and 2,800 feet west of the northeast corner of sec. 20, T. 3 N., R. 47 E.

A—0 to 6 inches; light olive brown (2.5Y 5/4) loamy fine sand, olive brown (2.5Y 4/4) moist; weak fine and medium granular structure; loose, nonsticky and nonplastic; common fine and many very fine roots; slightly alkaline; clear smooth boundary.

C1—6 to 17 inches; light olive brown (2.5Y 5/4) loamy fine sand, olive brown (2.5Y 4/4) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; slightly effervescent; slightly alkaline; clear wavy boundary.

C2—17 to 40 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—40 to 60 inches; light olive brown (2.5Y 5/4) loamy fine sand, olive brown (2.5Y 4/4) moist; massive; loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

## Range in Characteristics

*Soil temperature:* 40 to 47 degrees

*Moisture control section:* Between 12 and 35 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

*Soil phases:* Gravelly

### A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Loamy fine sand or loamy sand

Clay content: 0 to 10 percent

Content of rock fragments: Gravelly phase—35 to 60 percent rounded pebbles

Reaction: pH 6.6 to 7.8

### C horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loamy fine sand or sand

Clay content: 0 to 10 percent

Reaction: pH 7.4 to 8.4

## 996A—Yetull-Busby complex, 0 to 2 percent slopes

### Setting

#### Landform:

- Yetull—Sedimentary plains
- Busby—Sedimentary plains

#### Slope:

- Yetull—0 to 2 percent
- Busby—0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

### Composition

#### Major Components

Yetull and similar soils: 50 percent

Busby and similar soils: 40 percent

#### Minor Components

Areas of blowouts: 0 to 5 percent

Yamacall and similar soils: 0 to 3 percent

Busby soils that have loam textures: 0 to 2 percent

### Major Component Description

#### 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 3.7 inches

#### Busby

*Surface layer texture:* Fine sandy loam

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

*Drainage class:* Well drained

*Dominant parent material:* Alluvium or eolian material

*Native plant cover type:* Rangeland

*Flooding:* None

*Available water capacity:* Mainly 7.4 inches

#### Zatoville Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Slow

*Landform:* Stream terraces

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Elevation range:* 2,240 to 2,800 feet

*Annual precipitation:* 11 to 14 inches

*Annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 110 to 135 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Aridic Ustochrepts

#### Typical Pedon

Zatoville silty clay loam, 1,800 feet west and 400 feet north of the southeast corner of sec. 5, T. 11 N., R. 38 E., (in Rosebud County, MT).

A—0 to 3 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine granular structure; slightly hard, friable, sticky and plastic; common fine and very fine roots; slightly alkaline; abrupt smooth boundary.

Bw—3 to 12 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; many very fine pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—12 to 21 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine pores; few fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

By—21 to 46 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; common very fine pores; few yellow (10YR 7/6) iron stains; common fine masses of gypsum; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C—46 to 60 inches; grayish brown (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine pores; common reddish yellow (7.5YR 6/6) iron stains; moderately acid; clear smooth boundary.

### Range in Characteristics

*Soil temperature:* 43 to 47 degrees F

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

*Depth to By horizon:* 13 to 24 inches

*Depth to water table:* 36 to 60 inches

#### A 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

Reaction: pH 7.4 to 9.0

#### Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### By horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 30 to 45 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 18 to 30

Gypsum content: 10 to 20 percent

Reaction: pH 7.9 to 9.0

#### C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 1 or 2

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 25 to 35

Reaction: pH 7.9 to 9.0

### 668A—Zatoville silty clay loam, loamy substratum, 0 to 2 percent slopes

#### Setting

*Landform:* Stream terraces

*Slope:* 0 to 2 percent

*Elevation:* 2,240 to 2,900 feet

*Mean annual precipitation:* 11 to 14 inches

*Frost-free period:* 110 to 135 days

#### Composition

##### Major Components

Zatoville and similar soils: 90 percent

##### Minor Components

Kobase and similar soils: 0 to 10 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 7.7 inches



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# Glossary

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**Ablation till.** Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvial fan.** A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Animal-unit-month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Argillite.** Weakly metamorphosed mudstone or shale.

**Association, soil.** A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low ..... 0 to 3.75

Low ..... 3.75 to 5.0

Moderate ..... 5.0 to 7.5

High ..... More than 7.5

**Avalanche chute.** The track or path formed by an avalanche.

**Back slope.** The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

**Badland.** Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

**Basal area.** The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

**Basal till.** Compact glacial till deposited beneath the ice.

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

**Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-floored plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

- Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
- Blowout.** A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.
- Board foot.** A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.
- Bottom land.** The normal flood plain of a stream, subject to flooding.
- Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.
- Breaks.** The steep or very steep broken land at the border of an upland summit that is dissected by ravines.
- Breast height.** An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.
- Brush management.** Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.
- Cable yarding.** A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.
- Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
- Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.
- California bearing ratio (CBR).** The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.
- Canopy.** The leafy crown of trees or shrubs. (See Crown.)
- Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.
- Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.
- Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.
- Catsteps.** Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.
- Channeled.** Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.
- Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.
- Chemical treatment.** Control of unwanted vegetation by use of chemicals.
- Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.
- Cirque.** A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.
- Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.
- Clayey soil.** Silty clay, sandy clay, or clay.
- Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.
- Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

**Clearcut.** A method of forest harvesting that removes the entire stand of trees in one cutting.

Reproduction is achieved artificially or by natural seeding from adjacent stands.

**Climax plant community.** The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

**Closed depression.** A low area completely surrounded by higher ground and having no natural outlet.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

**Codominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

**Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Commercial forest.** Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Compressible** (in tables). Excessive decrease in volume of soft soil under load.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Conglomerate.** A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It

commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Conservation tillage.** Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Consolidated sandstone.** Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

- Consolidated shale.** Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.
- Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.
- Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
- Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.
- Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.
- Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.
- Cropping system.** Growing crops according to a planned system of rotation and management practices.
- Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.
- Cross-slope farming.** Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.
- Crown.** The upper part of a tree or shrub, including the living branches and their foliage.
- Culmination of the mean annual increment (CMAI).** The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.
- Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.
- Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.
- Deep soil.** A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.
- Deferred grazing.** Postponing grazing or arresting grazing for a prescribed period.
- Dense layer** (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.
- Depth to rock** (in tables). Bedrock is too near the surface for the specified use.
- Dip slope.** A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.
- Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
- Divided-slope farming.** A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.
- Dominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.
- Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:  
*Excessively drained.*—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.  
*Somewhat excessively drained.*—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.  
*Well drained.*—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.  
*Moderately well drained.*—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless

a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

*Somewhat poorly drained.*—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

*Poorly drained.*—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

*Very poorly drained.*—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drainageway.** An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**Duff.** A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Dune.** A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion (geologic).* Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion (accelerated).* Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

**Esker.** A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

**Even aged.** Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Excess lime** (in tables). Excess carbonates in the soil that restrict the growth of some plants.

**Excess salts** (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

**Excess sodium** (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

- Excess sulfur** (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.
- Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.
- Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.
- Fast intake** (in tables). The rapid movement of water into the soil.
- Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
- Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.
- Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.
- Fine textured soil.** Sandy clay, silty clay, or clay.
- Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.
- First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.
- Flaggy soil material.** Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.
- Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.
- Flood plain.** A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.
- Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.
- Foothills.** A region of relatively low, rounded hills at the base of a mountain range.
- Foot slope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).
- Forb.** Any herbaceous plant not a grass or a sedge.
- Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.
- Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.
- Fragile** (in tables). A soil that is easily damaged by use or disturbance.
- Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
- Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.
- Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
- Giant ripple mark.** The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.
- Glacial drift (geology).** Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.
- Glacial outwash (geology).** Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.
- Glacial till (geology).** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Glaciated uplands.** Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

**Glaciofluvial deposits (geology).** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

**Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

**Green manure crop (agronomy).** A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water (geology).** Water filling all the unblocked pores of the material below the water table.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

**Gypsum.** A mineral consisting of hydrous calcium sulfate.

**Habitat type.** An aggregation of all land areas potentially capable of producing similar plant communities at climax.

**Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey

and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Head out.** To form a flower head.

**Heavy metal.** Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

**High-residue crops.** Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected

by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

*Cr horizon.*—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

*R layer.*—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Increasesers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and are less palatable to livestock.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 .....	Very low
0.2 to 0.4 .....	Low
0.4 to 0.75 .....	Moderately low
0.75 to 1.25 .....	Moderate
1.25 to 1.75 .....	Moderately high
1.75 to 2.5 .....	High
More than 2.5 .....	Very high

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:  
*Basin.*—Water is applied rapidly to nearly level plains surrounded by levees or dikes.  
*Border.*—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

*Controlled flooding.*—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

*Corrugation.*—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

*Drip (or trickle).*—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

*Furrow.*—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*—Water, released at high points, is allowed to flow onto an area without controlled distribution.

**Kame.** A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

**Kame terrace.** A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

**Lacustrine deposit (geology).** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Lake plain.** A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

**Landslide.** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

**Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Lateral moraine.** A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loamy soil.** Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.

**Low-residue crops.** Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

**Mean annual increment (MAI).** The average annual increase in volume of a tree during the entire life of the tree.

**Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Merchantable trees.** Trees that are of sufficient size to be economically processed into wood products.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Microhigh.** An area that is 2 to 12 inches higher than the adjacent microlow.

**Microlow.** An area that is 2 to 12 inches lower than the adjacent microhigh.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Miscellaneous water.** A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately deep soil.** A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Moraine.** An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—

*few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

**Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Observed rooting depth.** Depth to which roots have been observed to penetrate.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Outwash plain.** An extensive area of glaciofluvial material that was deposited by meltwater streams.

**Overstory.** The trees in a forest that form the upper crown cover.

**Oxbow.** The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan, and traffic pan.*

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Perco slowly** (in tables). The slow movement of water through the soil, adversely affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow .....	Less than 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	More than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Playa.** The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Ponding.** Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

**Poor filter** (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Quartzite, metamorphic.** Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

**Quartzite, sedimentary.** Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

**Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

**Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike

plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid .....	Below 4.5
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Medium acid .....	5.6 to 6.0
Slightly acid .....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Mildly alkaline .....	7.4 to 7.8
Moderately alkaline .....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

**Recessional moraine.** A moraine formed during a temporary but significant halt in the retreat of a glacier.

**Red beds.** Sedimentary strata mainly red in color and composed largely of sandstone and shale.

**Regeneration.** The new growth of a natural plant community, developing from seed.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relict stream terrace.** One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

**Riser.** The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

**Riverwash.** Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rock outcrop.** Exposures of bare bedrock other than lava flows and rock-lined pits.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Rubble land.** Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Saline soil.** A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

**Salinity.** The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline .....	0 to 4
Slightly saline .....	4 to 8
Moderately saline .....	8 to 16
Strongly saline .....	More than 16

**Salty water** (in tables). Water that is too salty for consumption by livestock.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**Sandy soil.** Sand or loamy sand.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Sawlogs.** Logs of suitable size and quality for the production of lumber.

**Scarification.** The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

**Scribner's log rule.** A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

**Sedimentary plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Sedimentary uplands.** Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

**Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

**Semiconsolidated sedimentary beds.** Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Shallow soil.** A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

**Shelterwood system.** A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

**Shoulder slope.** The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

**Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

**Sinkhole.** A depression in the landscape where limestone has been dissolved.

**Site class.** A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

**Site curve (50-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

**Site curve (100-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of

ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

**Skid trails.** Pathways along which logs are dragged to a common site for loading onto a logging truck.

**Slash.** The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

**Slickens.** Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

**Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

**Slick spot.** A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

**Slippage** (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level .....	0 to 2 percent
Gently sloping .....	2 to 4 percent
Moderately sloping .....	4 to 8 percent
Strongly sloping .....	8 to 15 percent
Moderately steep .....	15 to 25 percent
Steep .....	25 to 45 percent
Very steep .....	More than 45 percent

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Slow intake** (in tables). The slow movement of water into the soil.

**Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Sodic (alkali) soil.** A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

**Sodicity.** The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of  $\text{Na}^+$  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

**Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand .....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	Less than 0.002

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant

and animal activities are largely confined to the solum.

**Species.** A single, distinct kind of plant or animal having certain distinguishing characteristics.

**Stone line.** A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Strath terrace.** A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

**Stream channel.** The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

**Stream terrace.** One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

**Summer fallow.** The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

**Summit.** A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Tailwater.** The water directly downstream of a structure.

**Talus.** Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

**Till plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toe slope.** The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

**Too arid** (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Toxicity** (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

**Trafficability.** The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

**Tread.** The relatively flat terrace surface that was cut or built by stream or wave action.

**Tuff.** A compacted deposit that is 50 percent or more volcanic ash and dust.

**Understory.** Any plants in a forest community that grow to a height of less than 5 feet.

**Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley.** An elongated 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.

**Waterspreading.** Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The action of uprooting and tipping over trees by the wind.