United States
Department of
Agriculture

Natural Resources
Conservation
Service

In cooperation with
Montana Agricultural
Experiment Station

Soil Survey of Liberty County, Montana Part II

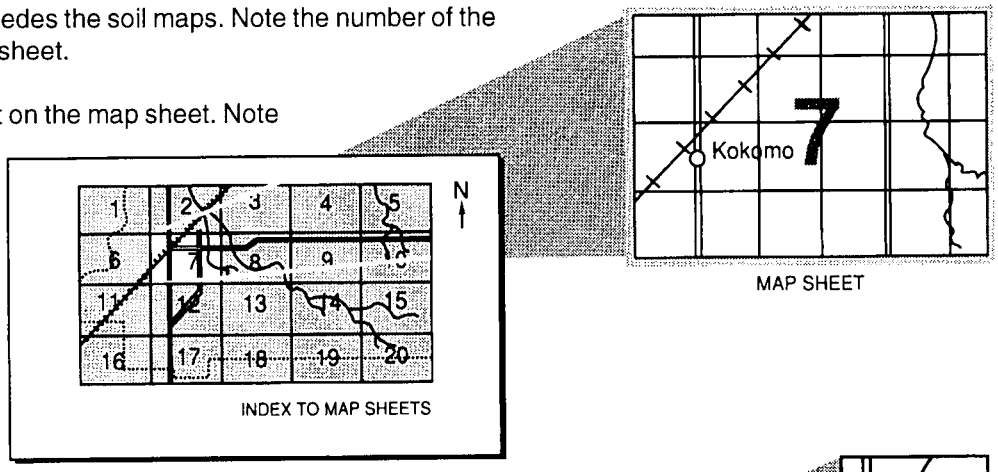
How to Use This Soil Survey

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.

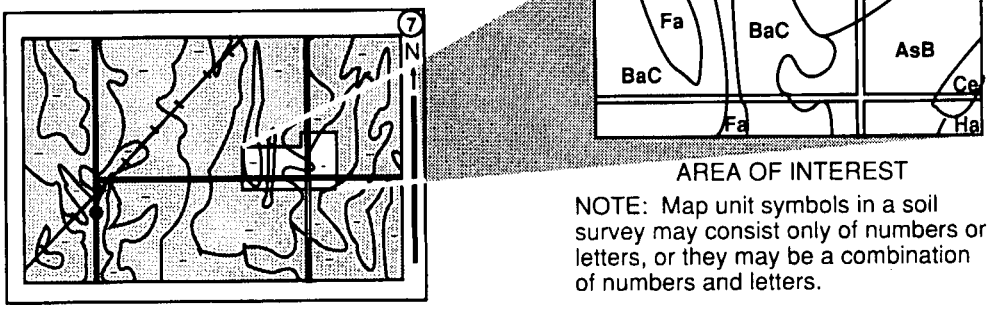


INDEX TO MAP SHEETS

MAP 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.



MAP SHEET

AREA OF INTEREST

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.

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Liberty 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.

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

Cover: In the foreground is an area of Tamaneen complex, 2 to 8 percent slopes. In the background are the Sweetgrass Hills.

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").

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Soil Survey of
Liberty County, Montana

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretative ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

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.

Classification of the Soils

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

Soil name	Family or higher taxonomic class
Absher	Fine, montmorillonitic Typic Natriboralfs
Acel	Fine, montmorillonitic Mollic Eutroboralfs
Assinniboine	Fine-loamy, mixed Aridic Argiborolls
Attewan	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Auchard	Fine, mixed Typic Natriboralfs
Barkof	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw	Fine, montmorillonitic Typic Argiborolls
Beaverell	Loamy-skeletal over sandy or sandy-skeletal, mixed Aridic Argiborolls
Beaverton	Loamy-skeletal over sandy or sandy-skeletal, mixed Typic Argiborolls
Benz	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Bigsandy	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Blacksheep	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Brockway	Fine-silty, mixed, frigid Haplocalcidic Ustochrepts
Busby	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook	Coarse-loamy, mixed Aridic Haploborolls
Cozberg	Coarse-loamy, mixed Aridic Haploborolls
Creed	Fine, montmorillonitic Typic Natriboralfs
Daglum	Fine, montmorillonitic Vertic Natriborolls
Dast	Coarse-loamy, mixed, frigid Typic Ustochrepts
Degrand	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint	Fine-loamy, mixed, frigid Aridic Ustochrepts
Elloam	Fine, montmorillonitic Typic Natriboralfs
Elve	Loamy-skeletal, mixed Typic Cryochrepts
Enbar	Fine-loamy, mixed Cumulic Haploborolls
Ethridge	Fine, montmorillonitic Aridic Argiborolls
Evanston	Fine-loamy, mixed Aridic Argiborolls
Farnuf	Fine-loamy, mixed Typic Argiborolls
Ferd	Fine, montmorillonitic Glossic Eutroboralfs
Fortbenton	Fine-loamy, mixed Aridic Haploborolls
Gerdrum	Fine, montmorillonitic Typic Natriboralfs
Glendive	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Harlake	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedstrom	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Hillon	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Joplin	Fine-loamy, mixed Aridic Argiborolls
Kenilworth	Fine-loamy, mixed Aridic Argiborolls
Kevin	Fine-loamy, mixed Aridic Argiborolls
Kobase	Fine, montmorillonitic, frigid Aridic Ustochrepts
Korchea	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents

Classification of the Soils—Continued

Soil name	Family or higher taxonomic class
Kremlin	Fine-loamy, mixed Aridic Haploborolls
Lambeth	Fine-silty, mixed (calcareous), frigid Aridic Ustorthents
Lawther	Fine, montmorillonitic, frigid Udic Haplusterts
Linnet	Fine, montmorillonitic Ustertic Argiborolls
Lisk	Coarse-loamy, mixed, frigid Typic Ustochrepts
Lonna	Aridic Ustochrepts, Fine-silty, mixed, frigid
Marias	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth	Fine-loamy, mixed Aridic Argiborolls
Marvan	Fine, montmorillonitic, frigid Sodic Haplusterts
McKenzie	Fine, montmorillonitic, frigid Chromic Endoaquerts
Nesda	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon	Fine, montmorillonitic, frigid Typic Albaqualfs
Nunemaker	Fine, montmorillonitic, frigid Aridic Ustochrepts
Perma	Loamy-skeletal, mixed Typic Haploborolls
Phillips	Fine, montmorillonitic Typic Eutroboralfs
Reeder	Fine-loamy, mixed Typic Argiborolls
Roy	Clayey-skeletal, mixed Typic Argiborolls
Sagedale	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage	Fine, montmorillonitic Typic Argiborolls
Scobey	Fine, montmorillonitic Aridic Argiborolls
Sunburst	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Tamaneen	Fine, montmorillonitic Typic Argiborolls
Telstad	Fine-loamy, mixed Aridic Argiborolls
Thibadeau	Fine-loamy, mixed (calcareous), frigid Oxyaquic Ustifluvents
Thoeny	Fine, montmorillonitic Typic Natriboralfs
Tinsley	Sandy-skeletal, mixed, frigid Typic Ustorthents
Turner	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Twilight	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Vanda	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Vida	Fine-loamy, mixed Typic Argiborolls
Wayden	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Weingart	Fine, montmorillonitic Typic Natriboralfs
Whitlash	Loamy-skeletal, mixed Lithic Haploborolls
Williams	Fine-loamy, mixed Typic Argiborolls
Winspect	Loamy-skeletal, mixed Typic Calciborolls
Work	Fine, montmorillonitic Typic Argiborolls
Yamacall	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yawdim	Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents
Zahill	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
5A	McKenzie clay, 0 to 1 percent slope	1,265	0.1
12C	Beaverton gravelly loams, 2 to 8 percent slopes	430	*
14C	Brockway silt loam, 2 to 8 percent slopes	4,077	0.4
15E	Lambeth silt loam, 8 to 25 percent slopes	1,476	0.2
15F	Lambeth silt loam, 25 to 70 percent slopes	1,223	0.1
16B	Degrand fine sandy loam, 0 to 4 percent slopes	455	*
18E	Yawdim silty clay, 8 to 25 percent slopes	857	*
21E	Cabbart-Delpoint loams, 8 to 25 percent slopes	1,303	0.1
22F	Hillon loam, 25 to 60 percent slopes	18,468	2.0
23B	Acel silty clay loam, 0 to 4 percent slopes	540	*
24B	Farnuf loam, 0 to 4 percent slopes	1,782	0.2
27B	Attewan loam, 0 to 4 percent slopes	987	0.1
28A	Nishon clay loam, 0 to 1 percent slope	7,311	0.8
30B	Marvan silty clay, 0 to 4 percent slopes	30,324	3.3
30C	Marvan silty clay, 4 to 8 percent slopes	1,578	0.2
32B	Kobase silty clay loam, 0 to 4 percent slopes	16,893	1.8
32C	Kobase silty clay loam, 4 to 8 percent slopes	1,837	0.2
34A	Linnet clay, 0 to 2 percent slopes	395	*
35B	Assinniboine fine sandy loam, 0 to 4	6,737	0.7
36C	Chinook fine sandy loam, 2 to 8 percent slopes	2,891	0.3
37B	Evanston loam, 0 to 4 percent slopes	19,592	2.1
37C	Evanston loam, 4 to 8 percent slopes	546	*
38B	Ethridge silty clay loam, 0 to 4 percent slopes	19,281	2.1
39C	Lisk sandy loam, 2 to 8 percent slopes	147	*
39E	Lisk sandy loam, 8 to 25 percent slopes	322	*
41C	Reeder loam, 2 to 8 percent slopes	660	*
43B	Marmarth loam, 0 to 4 percent slopes	512	*
47B	Marias silty clay, 0 to 4 percent slopes	4,308	0.5
51F	Elve very cobbly loam, 25 to 60 percent slopes	508	*
54B	Lawther clay, 0 to 4 percent slopes	3,352	0.4
54C	Lawther clay, 4 to 8 percent slopes	787	*
58B	Lonna silty clay loam, 0 to 4 percent slopes	2,637	0.3
58C	Lonna silty clay loam, 4 to 8 percent slopes	4,536	0.5
60A	Havre clay loam, 0 to 1 percent slope	3,924	0.4
63B	Nunemaker silty clay loam, 0 to 4 percent slopes	3,742	0.4
63C	Nunemaker silty clay loam, 4 to 8 percent slopes	600	*
64D	Barkof clay, 4 to 15 percent slopes	815	*
67B	Bearpaw clay loam, 0 to 4 percent slopes	5,407	0.6
67C	Bearpaw clay loam, 4 to 8 percent slopes	1,410	0.2
69C	Vida clay loam, 2 to 8 percent slopes	4,487	0.5
71D	Roy complex, 8 to 15 percent slopes	4,250	0.4
71F	Roy gravelly clay loam, 15 to 45 percent slopes	1,600	0.2
72F	Zahill clay loam, 25 to 60 percent slopes	4,125	0.4
75C	Benz clay loam, 2 to 8 percent slopes	1,214	0.1
77D	Tinsley gravelly sandy loam, 4 to 15 percent slopes	434	*
77F	Tinsley gravelly sandy loam, 15 to 70 percent slopes	490	*
79B	Yamacall loam, 0 to 4 percent slopes	6,192	0.7
82B	Savage silty clay loam, 0 to 4 percent slopes	600	*
86C	Work clay loam, 2 to 8 percent slopes	1,843	0.2
87C	Tamaneen complex, 2 to 8 percent slopes	5,740	0.6
88C	Perma gravelly loam, 2 to 8 percent slopes	560	*
88E	Perma gravelly loam, 8 to 25 percent slopes	945	0.1
90A	Harlake silty clay, 0 to 1 percent slope	1,484	0.2
92D	Sunburst clay loam, 8 to 15 percent slopes	4,159	0.4
92F	Sunburst clay loam, 15 to 45 percent slopes	7,347	0.8
94C	Busby fine sandy loam, 2 to 8 percent slopes	3,736	0.4
94E	Busby fine sandy loam, 8 to 25 percent slopes	510	*
98C	Kremlin loam, 2 to 8 percent slopes	577	*
100F	Rubble land	1,628	0.2

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
115B	Thoeny-Elloam complex, 0 to 4 percent slopes	63,572	6.9
171C	Delpoint-Cabbart loams, 2 to 8 percent slopes	1,958	0.2
190B	Hedstrom fine sandy loam, 0 to 4 percent slopes	235	*
200F	Badland	1,514	0.2
201D	Cabba-Wayden complex, 4 to 15 percent slopes	2,628	0.3
201F	Cabba-Wayden-Rock outcrop complex, 15 to 60 percent slopes	5,440	0.6
211E	Cabbart-Yawdim complex, 8 to 25 percent slopes	3,011	0.3
211F	Cabbart-Yawdim-Rock outcrop complex, 25 to 70 percent slopes	5,129	0.6
221E	Hillon-Kevin clay loams, 8 to 25 percent slopes	6,231	0.7
224B	Hillon-Joplin complex, 0 to 4 percent slopes	14,479	1.6
224E	Hillon-Joplin loams, 8 to 25 percent slopes	27,716	3.0
225F	Hillon-Cabbart-Yawdim complex, 25 to 70 percent slopes	5,910	0.6
261C	Auchard-Williams complex, 2 to 8 percent slopes	2,257	0.2
271D	Beaverell-Tinsley complex, 4 to 15 percent slopes	1,766	0.2
272C	Attewan-Tinsley complex, 2 to 8 percent slopes	278	*
301C	Marvan-Vanda complex, 2 to 8 percent slopes	624	*
302B	Marvan clay, 0 to 4 percent slopes	2,649	0.3
304B	Marvan-Joplin, complex, 0 to 4 percent slopes	1,371	0.1
306D	Marvan-Yawdim-Cabbart complex, 4 to 15 percent slopes	785	*
311B	Ferd-Creed-Gerdrum complex, 0 to 4	30,681	3.3
321B	Kobase silty clay loam, calcareous, 0 to 4 percent	12,277	1.3
321C	Kobase silty clay loam, calcareous, 4 to 8 percent	651	*
323B	Sagedale silty clay, 0 to 4 percent slopes	609	*
323C	Sagedale silty clay, 4 to 8 percent slopes	487	*
331B	Phillips-Elloam complex, 0 to 4 percent slopes	20,735	2.2
351B	Kenilworth-Fortbenton fine sandy loams, 0 to 4 percent slopes	4,216	0.4
363B	Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes	7,143	0.8
368C	Fortbenton-Hillon complex, 2 to 8 percent slopes	1,659	0.2
385B	Ethridge-Kobase complex, 0 to 4 percent slopes	2,118	0.2
401C	Gerdrum-Yamacall loams, 2 to 8 percent slopes	3,636	0.4
421C	Joplin-Hillon loams, 2 to 8 percent slopes	115,559	12.5
441C	Kevin-Hillon clay loams, 2 to 8 percent slopes	27,267	2.9
442C	Kevin-Elloam clay loams, 2 to 8 percent slopes	54,372	5.9
445E	Kevin-Hillon-Nishon complex, 0 to 25 percent slopes	2,147	0.2
471B	Marias-Kobase complex, 0 to 4 percent slopes	4,233	0.4
491B	Enbar-Nesda loams, 0 to 4 percent slopes	1,240	0.1
493B	Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes	6,134	0.7
503B	Telstad-Joplin loams, 0 to 4 percent slopes	79,684	8.6
503C	Telstad-Joplin loams, 4 to 8 percent slopes	9,307	1.0
512F	Elve-Rubble land complex, 25 to 60 percent slopes	1,815	0.2
521C	Elloam-Absher complex, 2 to 8 percent slopes	3,214	0.3
531C	Turner-Beaverton complex, 2 to 8 percent slopes	913	*
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes	42,588	4.6
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes	3,755	0.4
601A	Havre-Glendive, complex, 0 to 2 percent slopes	2,143	0.2
603B	Thibadeau loam, 0 to 4 percent slopes	1,320	0.1
605C	Yamacall-Havre loams, 0 to 8 percent slopes	17,282	1.9
631B	Nunemaker silty clay loam, calcareous, 0 to 4 percent slopes	5,973	0.6
631C	Nunemaker silty clay loam, calcareous, 4 to 8 percent slopes	565	*
661C	Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes	364	*
671C	Bearpaw-Vida-Nishon clay loams, 0 to 8 percent slopes	5,887	0.6
673B	Bearpaw-Daglum clay loams, 0 to 4 percent slopes	2,353	0.2
691D	Vida-Williams complex, 4 to 15 percent slopes	1,654	0.2
692D	Vida-Bearpaw clay loams, 4 to 15 percent slopes	7,461	0.8
693D	Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes	6,395	0.7
695C	Vida-Zahill clay loams, 2 to 8 percent slopes	3,006	0.3
695E	Vida-Zahill clay loams, 8 to 25 percent slopes	9,240	1.0
702F	Winspect-Winspect, cool-Rock outcrop complex, 25 to 60 percent slopes	1,005	0.1

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
712E	Roy-Barkof complex, 8 to 25 percent slopes	3,179	0.3
712F	Roy-Barkof-Rock outcrop complex, 25 to 60 percent slopes	5,308	0.6
723F	Zahill-Cabba complex, 15 to 45 percent slopes	4,032	0.4
781C	Creed-Weingart complex, 2 to 8 percent slopes	1,242	0.1
791B	Yamacall loam, calcareous, 0 to 4 percent slopes	1,119	0.1
801B	Williams-Vida complex, 0 to 4 percent slopes	4,414	0.5
801C	Williams-Vida complex, 4 to 8 percent slopes	4,158	0.4
812A	Glendive-Havre, complex, 0 to 2 percent slopes	1,893	0.2
882F	Perma-Whitlash gravelly loams, 25 to 70 percent slopes	4,952	0.5
892F	Whitlash-Rock outcrop complex, 25 to 70 percent slopes	3,534	0.4
952F	Dast-Rock outcrop complex, 15 to 45 percent slopes	992	0.1
DA	Denied access	3,680	0.4
M-W	Miscellaneous water	30	*
W	Water	13,090	1.4
	Total	926,100	100.0

* Less than 0.1 percent.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Limitations and Hazards

The management concerns affecting the use of the detailed map units in the survey area for crops are shown in the table "Main Cropland Limitations and Hazards." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and erosion by water, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water intake rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *soil blowing* and *erosion by water.* Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation cropping systems, crop residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels, flooding, depth to rock, ponding, gullies,* and *lack of timely precipitation.*

Additional limitations and hazards are as follows:

Areas of rock outcrop and slick spots.—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

Excessive permeability.—This limitation causes deep leaching of nutrients and pesticides. The capacity of the soil to retain moisture for plant use is poor.

Potential for ground-water pollution.—This is a hazard in soils with excessive permeability, hard bedrock, or a water table within the profile.

Lime content, limited available water capacity, poor tilth, restricted permeability, and *surface crusting.*—These limitations can be overcome by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Short frost-free period.—If the growing season is less than 90 days, short-season crops or grasses should be grown.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Slope.—Where the slope is more than 8 percent, erosion by water and soil blowing may be accelerated unless conservation farming practices are applied.

Surface stones.—Stones or boulders on the surface can hinder normal tillage unless they are removed.

Salt and sodium content.—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use, nutrient management, control of erosion, pest and weed control,* and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation

wastes water, leaches plant nutrients, and causes erosion. Overirrigation can also create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop.—Rock outcrop is a named component of the map unit.

Areas of rubble land.—Rubble land is a named component of the map unit.

Areas of slick spots.—Slick spots are a named component of the map unit.

Channeled.—The word "channeled" is included in the name of the map unit.

Depth to rock.—Bedrock is within a depth of 40 inches.

Erosion by water.—The surface K factor multiplied by the upper slope limit is more than 2 (same as prime farmland criteria).

Excessive permeability.—The upper limit of the permeability range is 6 inches or more within the soil profile.

Flooding.—The component of the map unit is occasionally flooded or frequently flooded.

Gullied.—The word "gullied" is included in the name of the map unit.

Lack of timely precipitation.—The component of the map unit has a Xeric moisture regime. The amount of annual precipitation is no more than 14 inches.

Lime content.—The component is assigned to wind erodibility group 4L or has more than 5 percent lime in the upper 10 inches.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 5 inches or less.

Ponding.—Ponding duration is assigned to the component of the map unit.

Potential for ground-water pollution.—The soil has a water table within a depth of 4 feet or hard bedrock within the profile, or permeability is more than 6 inches per hour within the soil.

Poor tilth.—The component of the map unit has more than 35 percent clay in the surface layer.

Restricted permeability.—Permeability is 0.06 inch per hour or less within the soil profile.

Salt content.—The component of the map unit has an electrical conductivity of more than 4 in the surface layer or more than 8 within a depth of 30 inches.

Short frost-free period.—The map unit has a growing season of less than 90 frost-free days.

Slope.—The upper slope range of the component of the map unit is more than 8 percent.

Sodium content.—The sodium adsorption ratio of the component of the map unit is more than 13 within a depth of 30 inches.

Soil blowing.—The wind erodibility index multiplied by the selected high C factor for the survey area and then divided by the T factor is more than 8 for the component of the map unit.

Surface rock fragments.—The terms describing the texture of the surface layer include any rock fragment modifier except for gravelly or channery, and "surface stones" is not already indicated as a limitation.

Surface crusting.—The sodium adsorption ratio in the surface layer is 5 or more for any texture and 4 or more if the texture is silt, silt loam, loam, or very fine sandy loam.

Surface stones.—The terms describing the texture of the surface layer include any stony or bouldery modifier, or the soil is a stony or bouldery phase.

Water table.—The component of the map unit has a water table within a depth of 60 inches.

Cropland of Liberty County

About 65 percent of Liberty County is used for cropland. There are about 608,000 acres of dryland farming and 7,000 acres of irrigated land.

The two main dryland crops are barley and wheat. Spring wheat is the predominant wheat crop; however, winter wheat increases in importance to become the major crop toward extreme southern Liberty County. Other crops include malting barley, alfalfa hay, grass for hay and pasture, durum wheat, triticale, oats, safflower, canary seed, canola, and grass for seed production.

The main considerations in managing nonirrigated cropland are conserving moisture, reducing erosion by wind or by water, and controlling soil salinity.

Conserving soil moisture.—Most of the survey area does not receive enough annual precipitation to produce a profitable crop every year. A small grain-fallow rotation is commonly used to assure a successful crop. In this rotation, the soil moisture accumulated after harvest of the previous crop and during the fallow period is critical to the yield of the next crop. Each additional inch of stored soil moisture helps to produce an estimated 4 to 5 bushels of wheat or 5 to 7 bushels of barley.

Some soils are not capable of storing all of the moisture received from snow and rainfall before the next crop in a small grain-fallow system. Sandy soils and shallow soils are in this category. Water is lost by deep percolation below the crop root zone or lost by runoff, where the infiltration rate of precipitation is too

slow. These soils are sometimes cropped every year, since accumulated moisture from summer fallow is lost to the crop.

Management practices that help conserve moisture include good weed control, leaving the stubble stand over the first winter after harvest, reducing tillage operations, leaving 30 percent or more of the residue on the surface during the fallow year, and planting moisture-efficient crops and varieties. Barley is generally more efficient than spring wheat; semidwarf varieties of spring wheat are generally more efficient than tall varieties in ability to convert soil moisture into bushels of grain.

Where enough soil moisture is accumulated after harvest and over the winter, recropping may be more profitable than the traditional crop-fallow system. Though the science is not exact, 2 feet of moist soil by probing in medium to heavy textured soils is considered enough to produce an adequate crop in most years. This is equal to 3.5 and 4.5 inches of stored soil moisture. Growing season precipitation is expected to be normal or near normal for a successful crop. Additional fertilizer is needed to recrop, since most of the nutrients normally released from the crop residue breakdown in a crop-fallow system are still contained in the residue.

Reducing soil blowing.—Soil blowing is a problem on most cultivated soils in a crop-fallow rotation. Most soil blowing takes place after the fallow season from November through May. It is a special problem early in the spring when there are persistent strong winds. Unless well managed, sands and clays are readily eroded during this period. If loamy soils are cultivated in wide strips or in blocks, they can erode during dry periods when the wind velocity is high.

Loss of the surface layer through soil blowing affects soil productivity, soil tilth, available water-holding capacity, rooting depth, and the sediment load in streams. In addition, soil blowing often affects crop yields indirectly by removing or displacing chemical fertilizers and pesticides; it also contributes to chemical pollution of surface waters.

Management practices that help reduce soil blowing include grasses and legumes in the rotation, alternating strips of crop and fallow, recropping when feasible, maintaining crop residue on the soil surface with mulch or reduced tillage, using low-crown shovels and sweeps, reducing tillage speeds, maintaining a cloddy or ridged surface, and planting wind barriers such as trees or tall wheatgrass rows.

The primary methods used to reduce soil blowing are to combine the proper width of wind strips and to maintain adequate crop residue on the soil surface. The amount of crop residue needed for good protection varies with the soil, the topography, the size of the field, and the climate. There are enough differences in precipitation and wind velocity within Liberty County to cause significantly different erosion hazards from area to area. For specific information on climactic factors and erosion hazards, contact the local office of the Natural Resources Conservation Service.

Reducing erosion by water.—Runoff causes erosion on most of the cropland with slopes of 2 percent or more; however, the majority of erosion by water takes place on cropland with slopes of 6 percent or more. The factors that contribute to erosion by water are percent slope, slope length, soil type, crop and residue management, and climate. Liberty County is also influenced heavily by chinook periods, where snowmelt and runoff occur very quickly, thus increasing the erosion hazard. Of these factors, only slope length and crop and residue management can be changed by the operator.

A practice that can reduce slope length is a diversion ditch. It can be used to divert runoff water from uphill areas, usually steep grassed or rocky areas. The water is carried away from cropland to grassed areas or to grassed waterways in the field in order to prevent gullying. Diversion ditches are not common in the survey area due to the expense of construction and the maintenance required.

A grassed waterway is an excellent method to carry runoff water through a cropped field and to avoid gullying. Farm equipment must be raised when crossing the waterway. The only maintenance required is mowing or harvesting the grass in order to prevent deep snowpacks from forming in the waterway. Rapid melting of deep snowpacks can cause gullying even within a grassed waterway.

Practices that are commonly used to reduce erosion by water are related to crop and residue management. On livestock farms, good hay and pasture crops in rotation with small grains help to reduce soil loss to an acceptable level. On grain farms, practices include cross-slope farming, field stripcropping with grass buffer strips, contour stripcropping, and maintaining crop residue on the soil surface. Leaving crop residue on the surface helps to reduce erosion by protecting the soil from raindrop splash and by reducing overland transport of soil. Crop residue can also increase water infiltration into the soil before it begins to run off.

Controlling soil salinity.—Saline seep results when excess water moves through a saline soil, commonly formed in glacial till, and collects on top of impermeable underlying shale or bedrock. The problem of excess water occurs mainly in areas of crop-fallow dryland farming. During fallow periods, more water is stored in the soil than can be used by the crop and dissolves salts in the soil or parent material below. When it reaches the impermeable layer below, it begins to move laterally and downslope dissolving more salts and resurfacing to form saline seeps. They are commonly too wet to farm across and too time-consuming to farm around. Once formed, saline seeps may increase in size at the rate of 5 to 10 percent per year.

The most effective solution to the saline seep problem on nonirrigated cropland is to use the water where it falls. This can be done by recropping or by establishing grasses and legumes in the recharge area. The recharge area is the area of excess water accumulation and is usually at least ten times the size of the existing seep itself.

Early detection of potential saline seep areas is needed so that the problem can be corrected. New or developed wet spots, areas of late-maturing crops, the prolific growth of foxtail barley or kochia indicate areas that should be examined by soil probing and by soil sampling for soil salinity. Identified seep areas may be complex with more than one recharge area involved. These should be investigated with a drill rig, placing several shallow wells in the suspected recharge areas to determine the direction of water flow into the seep area. More specific information can be obtained by contacting the local office of the Natural Resources Conservation Service or the Montana Salinity Control Association.

Irrigated Farming

Approximately 7,000 acres are irrigated in Liberty County. The irrigated land is primarily used for winter wheat, spring wheat, alfalfa hay, and grass hay production as well as for some feed barley and malting barley. The only row crops are a variety of vegetables grown by truck garden operations. The most common needs in managing irrigated soils are practices for efficient water use, controlling erosion by water, and maintaining productivity and soil tilth.

Water supplies along the Marias River are generally very good. Operations on the benches above the river have higher pumping costs because of the extra horsepower needed to lift the water out of the Marias River valley. Approximately half of the irrigated acres along the Marias River are under center pivot sprinklers and the valley bottoms are surface irrigated by using contour ditches. Water loss from high winds lower the irrigation efficiency of high pressure sprinkler systems.

Most of the irrigation water originating from drainages of the Sweetgrass Hills is applied through random ditch systems. On drainages where there are no storage reservoirs, the irrigation may only be supplemental because of high salt levels from saline seeps.

The method of applying water to the soil should be compatible with the soil intake rates, soil slopes, vegetative cover, volume of water available, and the time required to irrigate. Successful management also depends on knowing the correct time to irrigate and the amount of water to apply. As a general rule, small grain and forage crops should be irrigated when half the available soil moisture has been used. This will depend on the water-holding capacity of the soil and the crop rooting depth. The objective of irrigation water management is to apply water to the soil in a way to meet the crop needs without excessive water loss through deep percolation or runoff. Deep percolation is not only a water loss and plant nutrient leaching problem, but the excess water in the soil profile can cause saline seeps to appear downslope. Some practices that have the potential to increase irrigation efficiency are irrigation scheduling, low pressure sprinkler systems, low profile center pivots, irrigation land leveling, well-designed contour ditch systems, and increased reservoir storage. Contact the local office of the Natural Resources Conservation Service for more detailed information.

Water runoff can cause rill erosion and gully erosion. Excessive volumes in return flow channels can cause erosion and water quality problems downstream. Erosion by water is caused by runoff from irrigating too frequently, by continuing to apply water after the profile is saturated, or by applying volumes that are too large. These runoff and erosion problems are greater as the slope increases. Improperly designed sprinkler systems, especially on low intake soils, can cause ponding and erosion by water from runoff. Contour ditch irrigation can be suitable on soils with slopes up to 15 percent. Erosion by water can be a hazard on slopes exceeding 4 percent. Close contour ditch spacings and permanent vegetative cover on slopes greater than 4 percent will reduce the potential of erosion by water. If the proper volume of water and set time meet the surface system design, runoff and erosion by water are minimized.

Continuous small grain production and removing crop residue through baling or burning can cause a deficiency of nitrogen and phosphorus. Nitrogen is also lost through excessive use of irrigation water. Fertilization is necessary for high crop yields on irrigated soils. Including legumes in the cropping system will help soil tilth and correct part of the nitrogen deficiency. Mineral fertilizers can be applied according to soil tests to provide required nitrogen and phosphorus levels. When feasible, all crop residue should be returned to the soil. Residue will return some nutrients to the soil, increase organic matter, improve soil structure, and increase the water intake of most soils.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops are shown in the table "Land Capability and Yields per Acre of Crops and Pasture." In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The non-irrigated small grain yields presented are a maximum potential estimated using a crop yield model based on Montana Agricultural Experiment Station Special Report number 35. Basic model assumptions include soil moisture at field capapcity to 40 inches, a 70 percent annual precipitation probability as published by the National Climatic Center, fertilization to yield, and full pest and weed control. Irrigated small grain yields are not provided. The model has been validated with collected yield data.

Forage crop yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss. Yields for dryland crops are based on a crop-fallow system.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed; however, the productivity of a given soil compared with that of other soils is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Soils are assigned to pasture and hayland groups according to their suitability for the production of forage. The soils in each group are similar enough to be suited to the same species of grasses or legumes, have similar limitations and hazards, require similar management, and have similar productivity levels and other responses to management.

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the table "Land Capability and Yields per Acre of Crops."

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded.

The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, as described in "Land Capability Classification" (USDA, 1961), soils generally are grouped at three levels: capability class, subclass, and unit. These levels indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 5. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7. The local office of the Cooperative Extension Service or of the Natural Resources Conservation Service can provide guidance on the use of these soils as cropland.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses indicate the dominant limitations in the class. They are designated by adding a small letter, *e, w, s,* or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, rangeland, woodland, wildlife habitat, or for recreation.

The capability classification of each map unit is given in the table "Land Capability and Yields per Acre of Crops" at the end of this section.

Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the survey area that are considered prime farmland are listed in the table "Prime Farmland" at the end of this section.

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, seed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results
in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10

acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and state parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes usually range from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland where these limitations are overcome by drainage measures, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 183,464 acres, or nearly 20 percent of the survey area, would meet the requirements for prime farmland if an adequate and dependable supply of irrigation water were available.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime Farmland." On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Map Units." This list does not constitute a recommendation for a particular land use.

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, and vegetables.

Unique farmland is used for a specific high-value food or fiber crop; has an adequate supply of available moisture for the specific crop because of stored moisture, precipitation, or irrigation; and has a combination of soil qualities, growing season, temperature, humidity, air drainage, elevation, aspect, and other factors, such as nearness to markets, that favors the production of a specific food or fiber crop.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

Additional Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate state agency or agencies. Generally, additional farmland of statewide importance includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states additional farmland of statewide importance may include tracts of land that have been designated for agriculture by state law.

A list of this land has not been maintained for Montana and thus is not presently available.

Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having national or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through erosion by water in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or of the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table "Windbreaks and Environmental Plantings" shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service, the Cooperative Extension Service, or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same.

Group 1 consists of soils that have no soil-related hazards or limitations or only slight hazards or limitations if they are used for windbreaks. Slopes are less than 15 percent.

Group 2M consists of soils that have a moderate available water capacity (5 to 10 inches) because of texture, depth, or both. The soils are well drained and are not affected by salinity. A layer of concentrated lime, if it occurs, is below a depth of 24 inches. Slopes are less than 15 percent.

Group 2L consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of about 15 to 24 inches. The available water capacity is at least 5 inches. The soils are well drained and are not affected by salinity or alkalinity (the electrical conductivity is less than 4 millimhos per centimeter). Slopes are less than 15 percent.

Group 2W consists of soils that have an available water capacity of 5 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. The depth to a permanent water table is 30 to 60 inches. The soils are not affected by salinity. Slopes are less than 15 percent.

Group 2S consists of soils that are moderately affected by salinity (the electrical conductivity is 4 to 12 millimhos per centimeter). The available water capacity is at least 5 inches. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

Group 3M consists of soils that have an available water capacity of 2 to 5 inches because of texture, depth, or both. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The soils are well drained and are not affected by salinity (the electrical conductivity is less than 4 millimhos per centimeter).

Group 3L consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of less than 15 inches. A permanent water table is at a depth of more than 30 inches. The available water capacity is more than 5 inches. The soils are not affected by salinity (the electrical conductivity is less than 4 millimhos per centimeter). Slopes are less than 15 percent.

Group 3W consists of soils that have an available water capacity of 2 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. The depth to a permanent water table is 30 inches or less. It is more than 10 inches during all or most of the growing season. The soils are not affected by salinity. Slopes are less than 15 percent.

Group 3S consists of soils that are severely affected by salinity or alkalinity (the electrical conductivity is 12 to 16 millimhos per centimeter). The available water capacity is 5 inches or more. A layer of concentrated lime, if it occurs, is at a depth of more than 15 inches. A permanent water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

Group 4 consists of soils that have slopes of more than 15 percent, except for those in areas where the length of the slopes is 100 feet or less, and the less sloping soils that have very severe limitations, including soils that have a very low available water capacity (2 inches or less); very shallow, stony, or gravelly soils; strongly saline and alkali soils, in which the electrical conductivity is more than 16 millimhos per centimeter; and soils that have a pH of more than 9.0. Rock outcrop also is in this group.

Main Cropland Limitations and Hazards

See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
5A:	
McKenzie	Lime content Ponding Poor tilth Potential for ground-water pollution Restricted permeability Salt content Soil blowing
12C:	
Beaverton	Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
14C:	
Brockway	Erosion by water Lime content Soil blowing
15E:	
Lambeth	Erosion by water Lime content Slope Soil blowing
15F:	
Lambeth	Erosion by water Lime content Slope Soil blowing
16B:	
Degrand	Excessive permeability Potential for ground-water pollution Soil blowing
18E:	
Yawdim	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
21E:	
Cabbart	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
Delpoint	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
22F:	
Hillon	Erosion by water
	Lime content
	Slope
	Soil blowing
23B:	
Acel	Surface crusting
24B:	
Farnuf	Soil blowing
27B:	
Attewan	Excessive permeability
	Limited available water capacity
	Potential for ground-water pollution
	Soil blowing
28A:	
Nishon	Ponding
	Potential for ground-water pollution
	Soil blowing
30B:	
Marvan	Lime content
	Poor tilth
	Restricted permeability
	Salt content
	Sodium content
	Soil blowing
30C:	
Marvan	Erosion by water
	Lime content
	Poor tilth
	Restricted permeability
	Salt content
	Sodium content
	Soil blowing
32B:	
Kobase	Poor tilth
	Soil blowing
32C:	
Kobase	Erosion by water
	Poor tilth
	Soil blowing
34A:	
Linnet	Poor tilth
	Soil blowing
35B:	
Assinniboine	Soil blowing
36C:	
Chinook	Soil blowing
37B:	
Evanston	Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
37C:	
Evanston	Erosion by water Soil blowing
38B:	
Ethridge	None
39C:	
Lisk	Soil blowing
39E:	
Lisk	Erosion by water Slope Soil blowing
41C:	
Reeder	Depth to rock Erosion by water Limited available water capacity Soil blowing
43B:	
Marmarth	Depth to rock Limited available water capacity Soil blowing
47B:	
Marias	Lime content Poor tilth Restricted permeability Soil blowing
51F:	
Elve	Erosion by water Limited available water capacity Slope Soil blowing Surface rock fragments
54B:	
Lawther	Poor tilth Soil blowing
54C:	
Lawther	Erosion by water Poor tilth Soil blowing
58B:	
Lonna	Lime content Soil blowing
58C:	
Lonna	Erosion by water Lime content Soil blowing
60A:	
Havre	Poor tilth Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
63B:	
Nunemaker	Poor tilth Restricted permeability Soil blowing
63C:	
Nunemaker	Erosion by water Poor tilth Restricted permeability Soil blowing
64D:	
Barkof	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
67B:	
Bearpaw	Soil blowing
67C:	
Bearpaw	Erosion by water Soil blowing
69C:	
Vida	Erosion by water Lime content Soil blowing
71D:	
Roy	Erosion by water Limited available water capacity Poor tilth Slope Soil blowing
Roy	Limited available water capacity Poor tilth Slope Soil blowing Surface rock fragments
71F:	
Roy	Erosion by water Limited available water capacity Poor tilth Slope Soil blowing
72F:	
Zahill	Erosion by water Lime content Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
75C:	
Benz	Erosion by water Lime content Salt content Sodium content Soil blowing Surface crusting
77D:	
Tinsley	Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
77F:	
Tinsley	Erosion by water Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
79B:	
Yamacall	Soil blowing
82B:	
Savage	None
86C:	
Work	Erosion by water Poor tilth Soil blowing
87C:	
Tamaneen	Erosion by water Soil blowing
Tamaneen	Soil blowing Surface rock fragments
88C:	
Perma	Limited available water capacity Soil blowing
88E:	
Perma	Erosion by water Limited available water capacity Slope Soil blowing
90A:	
Harlake	Lime content Poor tilth Soil blowing
92D:	
Sunburst	Erosion by water Lime content Poor tilth Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
92F:	
Sunburst	Erosion by water
	Lime content
	Poor tilth
	Slope
	Soil blowing
94C:	
Busby	Excessive permeability
	Potential for ground-water pollution
	Soil blowing
94E:	
Busby	Erosion by water
	Excessive permeability
	Potential for ground-water pollution
	Slope
	Soil blowing
98C:	
Kremlin	Erosion by water
	Soil blowing
100F:	
Rubble land	Nonsoil material
115B:	
Thoeny	Restricted permeability
	Salt content
	Sodium content
	Soil blowing
Elloam	Lime content
	Restricted permeability
	Salt content
	Sodium content
	Soil blowing
	Surface crusting
171C:	
Delpoint	Depth to rock
	Erosion by water
	Lime content
	Limited available water capacity
	Soil blowing
Cabbart	Depth to rock
	Erosion by water
	Lime content
	Limited available water capacity
	Soil blowing
190B:	
Hedstrom	Excessive permeability
	Limited available water capacity
	Potential for ground-water pollution
	Soil blowing
200F:	
Badland	Nonsoil material

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
201D:	
Cabba	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
Wayden	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
201F:	
Cabba	Areas of Rock outcrop Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
Wayden	Areas of Rock outcrop Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
Rock outcrop	Nonsoil material
211E:	
Cabbart	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
Yawdim	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
211F:	
Cabbart	Areas of Rock outcrop Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
211F:	
Yawdim	Areas of Rock outcrop Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
Rock outcrop	Nonsoil material
221E:	
Hillon	Erosion by water Lime content Slope Soil blowing
Kevin	Erosion by water Lime content Slope Soil blowing
224B:	
Hillon	Lime content Soil blowing
Joplin	Lime content Soil blowing
224E:	
Hillon	Erosion by water Lime content Slope Soil blowing
Joplin	Erosion by water Lime content Slope Soil blowing
225F:	
Hillon	Erosion by water Lime content Slope Soil blowing
Cabbart	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
Yawdim	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
261C:	
Auchard	Depth to rock Erosion by water Lime content Limited available water capacity Salt content Sodium content Soil blowing
Williams	Erosion by water Soil blowing
271D:	
Beaverell	Erosion by water Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
Tinsley	Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
272C:	
Attewan	Erosion by water Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
Tinsley	Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
301C:	
Marvan	Erosion by water Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing
Vanda	Erosion by water Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
302B:	
Marvan	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
304B:	
Marvan	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Joplin	Lime content Soil blowing
306D:	
Marvan	Erosion by water Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Yawdim	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
Cabbart	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
311B:	
Ferd	Soil blowing
Creed	Sodium content Soil blowing
Gerdrum	Restricted permeability Salt content Sodium content Soil blowing
321B:	
Kobase	Lime content Poor tilth Soil blowing Surface crusting
321C:	
Kobase	Erosion by water Lime content Poor tilth Soil blowing Surface crusting

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
323B:	
Sagedale	Poor tilth Soil blowing
323C:	
Sagedale	Erosion by water Poor tilth Soil blowing
331B:	
Phillips	Soil blowing
Elloam	Lime content Restricted permeability Salt content Sodium content Soil blowing Surface crusting
351B:	
Kenilworth	Soil blowing
Fortbenton	Soil blowing
363B:	
Cozberg	Excessive permeability Potential for ground-water pollution Soil blowing
Chinook	Soil blowing
368C:	
Fortbenton	Erosion by water Soil blowing
Hillon	Erosion by water Lime content Soil blowing
385B:	
Ethridge	None
Kobase	Lime content Poor tilth Soil blowing Surface crusting
401C:	
Gerdrum	Restricted permeability Salt content Sodium content Soil blowing
Yamacall	Erosion by water Soil blowing
421C:	
Joplin	Erosion by water Lime content Soil blowing
Hillon	Erosion by water Lime content Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
441C:	
Kevin	Erosion by water Lime content Soil blowing
Hillon	Erosion by water Lime content Soil blowing
442C:	
Kevin	Erosion by water Lime content Soil blowing
Elloam	Erosion by water Lime content Restricted permeability Salt content Sodium content Soil blowing Surface crusting
445E:	
Kevin	Erosion by water Lime content Slope Soil blowing
Hillon	Erosion by water Lime content Slope Soil blowing
Nishon	Ponding Potential for ground-water pollution Soil blowing
471B:	
Marias	Lime content Poor tilth Restricted permeability Soil blowing
Kobase	Lime content Poor tilth Soil blowing Surface crusting
491B:	
Enbar	Flooding Soil blowing Water table
Nesda	Excessive permeability Flooding Limited available water capacity Potential for ground-water pollution Soil blowing
493B:	
Enbar	Flooding Soil blowing Water table

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
493B:	
Bigsandy	Flooding Potential for ground-water pollution Salt content Soil blowing Water table
Korchea	Lime content Soil blowing
503B:	
Telstad	Soil blowing
Joplin	Lime content Soil blowing
503C:	
Telstad	Erosion by water Soil blowing
Joplin	Erosion by water Lime content Soil blowing
512F:	
Elve	Areas of Rubble land Erosion by water Limited available water capacity Slope Soil blowing Surface rock fragments
Rubble land	Nonsoil material
521C:	
Elloam	Erosion by water Lime content Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Absher	Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
531C:	
Turner	Erosion by water Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
Beaverton	Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
561B:	
Scobey	Soil blowing
Kevin	Lime content Soil blowing
561C:	
Scobey	Erosion by water Soil blowing
Kevin	Erosion by water Lime content Soil blowing
601A:	
Havre	Flooding Soil blowing
Glendive	Flooding Lime content Soil blowing
603B:	
Thibadeau	Flooding Potential for ground-water pollution Salt content Soil blowing Water table
605C:	
Yamacall	Erosion by water Soil blowing
Havre	Flooding Soil blowing
631B:	
Nunemaker	Lime content Poor tilth Restricted permeability Soil blowing
631C:	
Nunemaker	Erosion by water Lime content Poor tilth Restricted permeability Soil blowing
661C:	
Twilight	Depth to rock Limited available water capacity Soil blowing
Blacksheep	Depth to rock Lime content Limited available water capacity Soil blowing
671C:	
Bearpaw	Erosion by water Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
671C:	
Vida	Erosion by water Lime content Soil blowing
Nishon	Ponding Potential for ground-water pollution Soil blowing
673B:	
Bearpaw	Soil blowing
Daglum	Salt content Sodium content Soil blowing
691D:	
Vida	Erosion by water Lime content Slope Soil blowing
Williams	Erosion by water Soil blowing
692D:	
Vida	Erosion by water Lime content Slope Soil blowing
Bearpaw	Erosion by water Soil blowing
693D:	
Vida	Erosion by water Lime content Slope Soil blowing
Bearpaw	Erosion by water Soil blowing
Nishon	Ponding Potential for ground-water pollution Soil blowing Water table
695C:	
Vida	Erosion by water Lime content Soil blowing
Zahill	Erosion by water Lime content Soil blowing
695E:	
Vida	Erosion by water Lime content Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
695E:	
Zahill	Erosion by water
	Lime content
	Slope
	Soil blowing
702F:	
Winspect	Areas of Rock outcrop
	Erosion by water
	Lime content
	Slope
	Soil blowing
	Surface rock fragments
Winspect	Areas of Rock outcrop
	Erosion by water
	Lime content
	Slope
	Soil blowing
	Surface rock fragments
Rock outcrop	Nonsoil material
712E:	
Roy	Erosion by water
	Limited available water capacity
	Poor tilth
	Slope
	Soil blowing
Barkof	Depth to rock
	Erosion by water
	Lime content
	Limited available water capacity
	Poor tilth
	Restricted permeability
	Slope
	Soil blowing
712F:	
Roy	Areas of Rock outcrop
	Erosion by water
	Limited available water capacity
	Poor tilth
	Slope
	Soil blowing
Barkof	Areas of Rock outcrop
	Depth to rock
	Erosion by water
	Lime content
	Limited available water capacity
	Poor tilth
	Restricted permeability
	Slope
	Soil blowing
Rock outcrop	Nonsoil material
723F:	
Zahill	Erosion by water
	Lime content
	Slope
	Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
723F:	
Cabba	Depth to rock Erosion by water Lime content Limited available water capacity Slope Soil blowing
781C:	
Creed	Erosion by water Sodium content Soil blowing
Weingart	Depth to rock Erosion by water Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
791B:	
Yamacall	Lime content Soil blowing
801B:	
Williams	Soil blowing
Vida	Lime content Soil blowing
801C:	
Williams	Erosion by water Soil blowing
Vida	Erosion by water Lime content Soil blowing
812A:	
Glendive	Lime content Soil blowing
Havre	Soil blowing
882F:	
Perma	Erosion by water Limited available water capacity Slope Soil blowing
Whitlash	Depth to rock Erosion by water Limited available water capacity Potential for ground-water pollution Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
892F:	
Whitlash	Areas of Rock outcrop Depth to rock Erosion by water Limited available water capacity Potential for ground-water pollution Slope Soil blowing
Rock outcrop	Nonsoil material
952F:	
Dast	Areas of Rock outcrop Depth to rock Erosion by water Limited available water capacity Slope Soil blowing
Rock outcrop	Nonsoil material
DA:	
Denied access	Onsite required
M-W	
Miscellaneous water	Nonsoil material
W:	
Water	Nonsoil material

Land Capability and Yields per Acre of Crops

(Yields are those that can be expected under a high level of nonirrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
5A:				
McKenzie	5W	44	26	29
12C:				
Beaverton	6S	44	26	29
14C:				
Brockway	4E	63	38	44
15E:				
Lambeth	6E	57	34	39
15F:				
Lambeth	7E	---	---	---
16B:				
Degrand	4E	57	34	39
18E:				
Yawdim	7E	7	1	1
21E:				
Cabbart	7E	10	2	2
Delpoint	4E	35	20	22
22F:				
Hillon	7E	---	---	---
23B:				
Acel	3E	63	38	44
24B:				
Farnuf	3E	79	49	56
27B:				
Attewan	3E	41	23	27
28A:				
Nishon	4W	50	30	34
30B:				
Marvan	4E	45	27	29
30C:				
Marvan	4E	45	27	29
32B:				
Kobase	4E	64	39	44
32C:				
Kobase	4E	64	39	44
34A:				
Linnet	4E	62	38	43

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
35B:				
Assinniboine	4E	57	34	39
36C:				
Chinook	4E	52	31	35
37B:				
Evanston	3E	68	42	48
37C:				
Evanston	3E	68	42	48
38B:				
Ethridge	3E	68	42	48
39C:				
Lisk	4E	70	43	48
39E:				
Lisk	6E	61	36	42
41C:				
Reeder	3E	55	34	38
43B:				
Marmarth	3E	44	26	29
47B:				
Marias	4E	53	32	37
51F:				
Elve	7E	---	---	---
54B:				
Lawther	4E	79	49	56
54C:				
Lawther	4E	79	49	56
58B:				
Lonna	4E	64	39	44
58C:				
Lonna	4E	64	39	44
60A:				
Havre	3E	64	39	44
63B:				
Nunemaker	4E	57	34	39
63C:				
Nunemaker	4E	57	34	39
64D:				
Barkof	4E	48	29	31
67B:				
Bearpaw	3E	76	47	53
67C:				
Bearpaw	3E	76	47	53

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
69C:				
Vida	3E	80	49	56
71D:				
Roy	4E	35	21	23
Roy	6E	33	20	22
71F:				
Roy	6E	---	---	---
72F:				
Zahill	7E	---	---	---
75C:				
Benz	6E	---	---	---
77D:				
Tinsley	7S	13	5	5
77F:				
Tinsley	7E	---	---	---
79B:				
Yamacall	3E	67	42	46
82B:				
Savage	3E	77	48	55
86C:				
Work	3E	74	46	52
87C:				
Tamaneen	3E	50	30	35
Tamaneen	3E	48	29	34
88C:				
Perma	4E	42	25	28
88E:				
Perma	6E	33	19	21
90A:				
Harlake	4E	63	38	44
92D:				
Sunburst	4E	46	27	31
92F:				
Sunburst	6E	---	---	---
94C:				
Busby	4E	52	31	35
94E:				
Busby	6E	47	28	32
98C:				
Kremlin	3E	69	43	49
100F:				
Rubble land	8S	---	---	---

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
115B:				
Thoeny	4S	41	25	27
Elloam	6S	34	20	21
171C:				
Delpoint	4E	40	23	26
Cabbart	6E	23	11	12
190B:				
Hedstrom	4E	57	34	39
200F:				
Badland	8E	---	---	---
201D:				
Cabba	6E	31	17	18
Wayden	6E	26	13	14
201F:				
Cabba	7E	---	---	---
Wayden	7E	---	---	---
Rock outcrop	8S	---	---	---
211E:				
Cabbart	7E	10	2	2
Yawdim	7E	5	1	1
211F:				
Cabbart	7E	---	---	---
Yawdim	7E	---	---	---
Rock outcrop	8S	---	---	---
221E:				
Hillon	6E	51	31	34
Kevin	4E	64	39	44
224B:				
Hillon	4E	65	41	45
Joplin	4E	61	37	41
224E:				
Hillon	6E	52	32	35
Joplin	4E	61	37	41
225F:				
Hillon	7E	---	---	---
Cabbart	7E	---	---	---
Yawdim	7E	---	---	---

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
261C:				
Auchard	6S	---	---	---
Williams	3E	86	53	61
271D:				
Beaverell	6E	27	14	15
Tinsley	7S	16	6	6
272C:				
Attewan	3E	41	23	27
Tinsley	7S	13	5	5
301C:				
Marvan	4E	45	27	29
Vanda	7S	---	---	---
302B:				
Marvan	4E	50	30	33
304B:				
Marvan	6S	---	---	---
Joplin	3E	64	39	45
306D:				
Marvan	6S	---	---	---
Yawdim	6E	16	7	7
Cabbart	6E	22	10	11
311B:				
Ferd	3E	67	41	46
Creed	4S	38	21	23
Gerdrum	6S	33	18	21
321B:				
Kobase	4E	61	37	41
321C:				
Kobase	4E	61	37	41
323B:				
Sagedale	4E	79	49	56
323C:				
Sagedale	4E	79	49	56
331B:				
Phillips	3E	64	39	45
Elloam	6S	34	20	21
351B:				
Kenilworth	4E	68	42	48
Fortbenton	4E	61	37	41

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
363B:				
Cozberg	4E	51	31	34
Chinook	4E	52	31	35
368C:				
Fortbenton	4E	61	37	41
Hillon	4E	63	38	44
385B:				
Ethridge	3E	68	42	48
Kobase	4E	63	38	44
401C:				
Gerdrum	6S	30	17	18
Yamacall	3E	64	39	45
421C:				
Joplin	3E	64	39	45
Hillon	4E	65	41	45
441C:				
Kevin	3E	68	42	48
Hillon	4E	64	39	44
442C:				
Kevin	3E	65	41	45
Elloam	6S	34	20	21
445E:				
Kevin	4E	64	39	44
Hillon	6E	---	---	---
Nishon	4W	39	22	26
471B:				
Marias	4E	53	32	37
Kobase	4E	61	37	41
491B:				
Enbar	3W	99	62	72
Nesda	6W	40	22	25
493B:				
Enbar	3W	99	62	72
Bigsandy	5W	---	---	---
Korchea	3E	83	52	59
503B:				
Telstad	3E	69	43	48
Joplin	3E	64	39	45

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
503C:				
Telstad	3E	69	43	48
Joplin	3E	64	39	45
512F:				
Elve	7E	---	---	---
Rubble land	8S	---	---	---
521C:				
Elloam	6S	34	20	21
Absher	7S	---	---	---
531C:				
Turner	3E	83	51	59
Beaverton	6S	44	26	29
561B:				
Scobey	3E	68	42	48
Kevin	3E	68	42	48
561C:				
Scobey	3E	68	42	48
Kevin	3E	68	42	48
601A:				
Havre	3W	64	39	45
Glendive	4W	61	37	41
603B:				
Thibadeau	6W	---	---	---
605C:				
Yamacall	3E	67	42	46
Havre	6W	67	42	46
631B:				
Nunemaker	4E	52	31	35
631C:				
Nunemaker	4E	52	31	35
661C:				
Twilight	4E	53	32	37
Blacksheep	6E	30	16	18
671C:				
Bearpaw	3E	76	47	53
Vida	3E	80	49	56
Nishon	4W	50	30	34

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
673B:				
Bearpaw	3E	76	47	53
Daglum	4S	59	36	40
691D:				
Vida	4E	75	47	53
Williams	3E	86	53	61
692D:				
Vida	4E	75	47	53
Bearpaw	3E	76	47	53
693D:				
Vida	4E	75	47	53
Bearpaw	3E	76	47	53
Nishon	4W	50	30	34
695C:				
Vida	3E	75	47	53
Zahill	4E	75	47	53
695E:				
Vida	4E	71	43	49
Zahill	6E	62	38	42
702F:				
Winspect	7E	---	---	---
Winspect	7E	---	---	---
Rock outcrop	8S	---	---	---
712E:				
Roy	6E	29	16	18
Barkof	6E	31	17	20
712F:				
Roy	7E	---	---	---
Barkof	7E	---	---	---
Rock outcrop	8S	---	---	---
723F:				
Zahill	6E	---	---	---
Cabba	7E	---	---	---
781C:				
Creed	4E	35	20	22
Weingart	6E	---	---	---

Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Barley	Spring wheat	Winter wheat
		Bu	Bu	Bu
791B:				
Yamacall	4E	63	38	44
801B:				
Williams	3E	86	53	61
Vida	3E	80	49	56
801C:				
Williams	3E	86	53	61
Vida	3E	80	49	56
812A:				
Glendive	4E	61	38	43
Havre	3E	64	39	45
882F:				
Perma	7E	---	---	---
Whitlash	7E	---	---	---
892F:				
Whitlash	7E	---	---	---
Rock outcrop	8S	---	---	---
952F:				
Dast	6E	---	---	---
Rock outcrop	8S	---	---	---
DA:				
Denied access.				
M-W				
Miscellaneous water.				
W:				
Water.				

Prime Farmland

Map Symbol	Soil Mapunit Name
24B	Farnuf loam, 0 to 4 percent slopes (where irrigated)
37B	Evanston loam, 0 to 4 percent slopes (where irrigated)
38B	Ethridge silty clay loam, 0 to 4 percent slopes (where irrigated)
60A	Havre clay loam, 0 to 1 percent slope (where irrigated)
67B	Bearpaw clay loam, 0 to 4 percent slopes (where irrigated)
79B	Yamacall loam, 0 to 4 percent slopes (where irrigated)
82B	Savage silty clay loam, 0 to 4 percent slopes (where irrigated)
* 90A	Harlake silty clay, 0 to 1 percent slope (where irrigated)
503B	Telstad-Joplin loams, 0 to 4 percent slopes (where irrigated)
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes (where irrigated)
801B	Williams-Vida complex, 0 to 4 percent slopes (where irrigated)

* Only irrigated area that the product of soil erodibility (I) and climate factor (C) does not exceed 60 are prime farmland.

Windbreak Suitability Groups

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
5A:	
McKenzie	4
12C:	
Beaverton	3M
14C:	
Brockway	3L
15E:	
Lambeth	4
15F:	
Lambeth	4
16B:	
Degrand	3M
18E:	
Yawdim	4
21E:	
Cabbart	4
Delpoint	4
22F:	
Hillon	4
23B:	
Acel	2M
24B:	
Farnuf	1
27B:	
Attewan	3M
28A:	
Nishon	4
30B:	
Marvan	2S
30C:	
Marvan	2S
32B:	
Kobase	1
32C:	
Kobase	1
34A:	
Linnet	1
35B:	
Assinniboine	3M

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
36C:	
Chinook	2M
37B:	
Evanston	1
37C:	
Evanston	1
38B:	
Ethridge	1
39C:	
Lisk	2M
39E:	
Lisk	2M
41C:	
Reeder	3M
43B:	
Marmarth	3M
47B:	
Marias	2M
51F:	
Elve	--
54B:	
Lawther	1
54C:	
Lawther	1
58B:	
Lonna	1
58C:	
Lonna	1
60A:	
Havre	1
63B:	
Nunemaker	2M
63C:	
Nunemaker	2M
64D:	
Barkof	1
67B:	
Bearpaw	1
67C:	
Bearpaw	1
69C:	
Vida	1

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
71D:	
Roy	3M
Roy	3M
71F:	
Roy	4
72F:	
Zahill	4
75C:	
Benz	2S
77D:	
Tinsley	4
77F:	
Tinsley	4
79B:	
Yamacall	1
82B:	
Savage	1
86C:	
Work	1
87C:	
Tamaneen	2M
Tamaneen	2M
88C:	
Perma	3M
88E:	
Perma	4
90A:	
Harlake	2M
92D:	
Sunburst	2M
92F:	
Sunburst	4
94C:	
Busby	2M
94E:	
Busby	4
98C:	
Kremlin	1
100F:	
Rubble land	4
115B:	
Thoeny	2S
Elloam	3S

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
171C:	
Delpoint	3M
Cabbart	3M
190B:	
Hedstrom	3M
200F:	
Badland	3M
201D:	
Cabba	3M
Wayden	3M
201F:	
Cabba	4
Wayden	4
Rock outcrop	4
211E:	
Cabbart	4
Yawdim	4
211F:	
Cabbart	4
Yawdim	4
Rock outcrop	4
221E:	
Hillon	4
Kevin	1
224B:	
Hillon	1
Joplin	1
224E:	
Hillon	4
Joplin	1
225F:	
Hillon	4
Cabbart	4
Yawdim	4
261C:	
Auchard	4
Williams	1
271D:	
Beaverell	3M
Tinsley	4
272C:	
Attewan	3M
Tinsley	4
301C:	
Marvan	2S
Vanda	3S
302B:	
Marvan	2S

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
304B:	
Marvan	3S
Joplin	1
306D:	
Marvan	3S
Yawdim	3M
Cabbart	3M
311B:	
Ferd	1
Creed	2S
Gerdrum	3S
321B:	
Kobase	1
321C:	
Kobase	1
323B:	
Sagedale	1
323C:	
Sagedale	1
331B:	
Phillips	2M
Elloam	3S
351B:	
Kenilworth	2M
Fortbenton	2M
363B:	
Cozberg	2M
Chinook	2M
368C:	
Fortbenton	2M
Hillon	1
385B:	
Ethridge	1
Kobase	1
401C:	
Gerdrum	3S
Yamacall	1
421C:	
Joplin	1
Hillon	1
441C:	
Kevin	1
Hillon	1
442C:	
Kevin	1
Elloam	3S

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
445E:	
Kevin	1
Hillon	4
Nishon	4
471B:	
Marias	2M
Kobase	1
491B:	
Enbar	2W
Nesda	3M
493B:	
Enbar	2W
Bigsandy	3W
Korchea	1
503B:	
Telstad	1
Joplin	1
503C:	
Telstad	1
Joplin	1
512F:	
Elve	--
Rubble land	4
521C:	
Elloam	3S
Absher	4
531C:	
Turner	3M
Beaverton	3M
561B:	
Scobey	1
Kevin	1
561C:	
Scobey	1
Kevin	1
601A:	
Havre	1
Glendive	2M
603B:	
Thibadeau	1
605C:	
Yamacall	1
Havre	1
631B:	
Nunemaker	2M
631C:	
Nunemaker	2M

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
661C:	
Twilight	3M
Blacksheep	3M
671C:	
Bearpaw	1
Vida	1
Nishon	4
673B:	
Bearpaw	1
Daglum	2S
691D:	
Vida	1
Williams	1
692D:	
Vida	1
Bearpaw	1
693D:	
Vida	1
Bearpaw	1
Nishon	4
695C:	
Vida	1
Zahill	1
695E:	
Vida	1
Zahill	1
702F:	
Winspect	4
Winspect	4
Rock outcrop	4
712E:	
Roy	2M
Barkof	3M
712F:	
Roy	4
Barkof	4
Rock outcrop	4
723F:	
Zahill	4
Cabba	4
781C:	
Creed	2S
Weingart	3S
791B:	
Yamacall	2M
801B:	
Williams	1
Vida	1

Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
801C:	
Williams	1
Vida	1
812A:	
Glendive	2M
Havre	--
882F:	
Perma	4
Whitlash	4
892F:	
Whitlash	4
Rock outcrop	4
952F:	
Dast	4
Rock outcrop	4
DA:	
Denied access.	
M-W:	
Miscellaneous water.	
W:	
Water.	

Windbreaks Suitability Group Species List

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the height for that group. Suitability group 4 generally not suited for windbreak development.)

Windbreak suitability group	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1	Western sandcherry, skunkbush sumac	Siberian peashrub, green ash, Rocky Mountain juniper, Tatarian honeysuckle, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---
2M	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Siberian crabapple, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---
2S	Skunkbush sumac	Siberian peashrub, Rocky Mountain juniper, ponderosa pine, common chokecherry, silver buffaloberry	Russian-olive, Siberian elm	---	---
2W	Western sandcherry, purpleosier willow	Redosier dogwood, Siberian crabapple, common chokecherry, lilac	Russian-olive, green ash, ponderosa pine, blue spruce	Golden willow	Plains cottonwood
3M	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Tatarian honeysuckle, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---

Windbreaks Suitability Group Species List--Continued

Windbreak suitability group	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3L	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Siberian crabapple, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---
3S	Skunkbush sumac	Siberian peashrub, silver buffaloberry	Russian-olive, Siberian elm	---	---
3W	Skunkbush sumac	Silver buffaloberry	Russian-olive	Siberian elm	---
4	---	---	---	---	---

Range

Range makes up about 34 percent of the land in Liberty County. The vegetation is mainly native grasses, grasslike plants, forbs, and shrubs.

Most grazing is on native range. The range is used primarily for grazing by domestic livestock; however, it also is used as wildlife habitat, for recreational areas, as watershed, and it has esthetic value.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Range is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Range includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain shrub and forb communities. Range receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazed forest land is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native pasture is defined as land on which the potential (climax) vegetation is forest but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forest land and forest land that has been cleared and is managed for native or naturalized forage plants.

The table "Rangeland Productivity and Characteristic Plant Communities" at the end of this section shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in this table follows.

Range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants.

Many different range sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Field Office Technical Guide," which is available at local offices of the Natural Resources Conservation Service, can provide specific information about range sites.

Total production is the amount of vegetation that can be expected to grow annually on well managed range that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Liberty County Range Sites

The following range site descriptions of the survey area are grouped by their dominant soil and topographic characteristics and are listed in order of natural productivity.

Soil groups that have the potential to be the most productive range sites because they receive more soil moisture than other sites.

Subirrigated range site

This range site consists of very deep, poorly drained or somewhat poorly drained soils on flood plains. Slopes range from 0 to 4 percent. The soils have a loam surface layer. The underlying material is clay loam to fine sandy loam. The water table is rarely above the surface, but an effective ground water table occurs throughout most of the growing season. Permeability is moderate to slow.

Saline lowland range site.

This range site consists of very deep, poorly drained soils on flood plains. Slopes range from 0 to 4 percent. The soils have a loam surface layer. The underlying material is loam, clay loam, or clay. Permeability is moderate. These soils contain enough salts that the majority of the vegetation consists of salt-tolerant plants.

Overflow range site.

This range site consists of very deep, well drained or poorly drained soils on flood plains and in closed depressions. Slopes range from 0 to 2 percent. The soils have a fine sandy loam to clay surface layer. The underlying material is sandy loam to clay. Permeability is moderately rapid to very slow.

Soil groups with no obvious factors limiting soil or moisture. The vegetation can make a normal response to climate.

Sandy range site.

This range site consists of moderately deep or very deep, well drained soils on alluvial fans, stream terraces, relict stream terraces, till plains, and sedimentary plains. Slopes range from 0 to 8 percent. The soils have a fine sandy loam surface layer. The underlying material is gravelly loamy sand to clay loam. Permeability is slow to rapid.

Silty range site.

This range site consists of moderately deep or very deep, well drained soils on till plains, stream terraces, relict stream terraces, alluvial fans, flood plains, outwash plains, eskers, small drainageways, sedimentary plains, hills, and mountains. Slopes range from 0 to 25 percent. The soils have a loam, gravelly loam, silt loam, clay loam, or silty clay loam surface layer. The underlying material is gravelly loam to clay loam. Permeability is moderately rapid to slow.

Clayey range site.

This range site consists of moderately deep or very deep, well drained soils on till plains, stream terraces, relict stream terraces, alluvial fans, lake plains, flood plains, small drainageways, and hills. Slopes range from 0 to 25 percent. The soils have a silty clay loam, silty clay, clay loam, gravelly clay loam, cobbly clay loam, or clay surface layer. The underlying material is clay to extremely gravelly sandy clay loam. Permeability is moderately slow to very slow.

Soil groups with soil properties or topographic features that limit available moisture or that affect infiltration.

Silty, steep phase range site.

This range site is a phase departing from the normal silty range site with up to 20 percent lower production potential. It consists of very deep, well drained soils on mountains. Slopes range from 25 to 70 percent. The soils have a gravelly loam surface layer. The underlying material is gravelly loam to extremely gravelly sandy loam. The soils are typically noncalcareous to depths of 60 inches or more. Permeability is moderate. These soils have a moderate available water capacity, but much of the precipitation runs off because of the steep slopes.

Clayey, steep phase range site.

This range site is a phase departing from the normal clayey range site with up to 20 percent lower production potential. It consists of very deep, well drained soils on alluvial fans, hills, and escarpments. Slopes range from 15 to 60 percent. The soils have a gravelly clay loam surface layer and underlying material. They are typically noncalcareous to depths of 32 inches or more. Permeability is moderately slow. Much of the precipitation runs off because of the slow intake and steep slopes.

Thin sandy range site.

This range site consists of moderately deep and very deep, well drained soils on alluvial fans and hills. Slopes are usually more than 15 percent. The soils have a thin fine sandy loam or sandy loam surface layer and a strongly effervescent underlying material that is fine sandy loam or sandy loam. Permeability is moderately rapid. This range site takes in water less rapidly due to the slope and is considered a droughty range site.

Thin silty range site.

This range site consists of moderately deep, deep, and very deep, well drained soils on hills, escarpments, and mountains. Slopes are usually more than 15 percent. The soils have a thin loam, cobbly loam, clay loam, or silt loam surface layer and a strongly effervescent underlying material that is loam to clay loam. Permeability is moderately slow to slow. Although these soils have moderate or high available water capacity, much of the precipitation runs off because of the steep slopes.

Thin clayey range site.

This range site consists of moderately deep and very deep, well drained soils on hills and escarpments. Slopes are usually more than 15 percent and the site typically adjoins areas with silty or clayey range sites. The soils have a thin clay loam or clay surface layer and the underlying material is clay loam to clay that is strongly effervescent. Permeability is slow or very slow. Although the soils have moderate or high available water capacity, much of the precipitation runs off because of the slow intake and steep slopes.

Shallow to gravel range site.

This range site consists of very deep, well drained soils on relict stream terraces, kames, eskers, and flood plains. Slopes range from 0 to 15 percent. The soils have a loam or gravelly loam surface layer. The underlying material is extremely gravelly loamy sand to very gravelly sand. Permeability is rapid. Available water capacity is low and it is a droughty range site.

Shallow range site.

This range site consists of shallow, well drained soils on sedimentary plains, hills, escarpments, and mountains. Slopes range from 2 to 70 percent. The soils are loam, fine sandy loam, or gravelly loam and are less than 20 inches to nearly impenetrable soft or hard bedrock. Some of the soils have a calcareous root zone. These soils take in water readily, but available water capacity is low.

Shallow clay range site.

This range site consists of shallow, well drained soils on hills and escarpments. Slopes range from 4 to 70 percent. The soils are silty clay and are underlain by shale at depths of 10 to 20 inches. Permeability is slow and much of the precipitation is lost in runoff.

Claypan range site.

This range site consists of moderately deep and very deep, well drained soils on stream terraces, alluvial fans, and till plains. Slopes range from 0 to 8 percent. The soils have a clay loam, loam, or silt loam surface layer 2 to 8 inches thick over a hard, dense, slowly or very slowly permeable clay or silty clay subsoil. The claypan subsoil is usually characterized by strong columnar structure, the result of a high concentration of sodium. This range site is commonly intermingled with silty and dense clay range sites.

Dense clay range site.

This range site consists of very deep, well drained soils on alluvial fans and till plains. Slopes range from 0 to 8 percent. The soils are clay loam, silty clay, or clay throughout and have varying amounts of sodium and soluble salts in the profile. The soils are dispersed and very hard when dry. Some soils have a thin loam surface layer. Permeability is very slow. Because these soils tend to seal over when moistened, they take in water very slowly. This range site is commonly intermingled with claypan range sites.

Gravel range site.

This range site consists of very deep, excessively drained soils on stream terraces, kames, eskers, and outwash plains. Slopes are 2 to 70 percent. The soils

have a gravelly sandy loam surface layer and the underlying material is very gravelly sand. Permeability is rapid. These soils take in water rapidly but are very droughty because of the low water holding capacity.

Saline upland range site.

This range site consists of very deep, well drained soils on alluvial fans. Slopes range from 2 to 8 percent. The soils are clay loam and the profile has high amounts of soluble salts and sodium. Permeability is slow. The majority of the vegetation is salt-tolerant plants.

Range Condition

Range condition is based on a comparison of the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the natural community, the better the range condition.

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed. A very severe disturbance can completely destroy the natural community. Under these conditions the less desirable plants, such as annuals and weedlike plants, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Four range condition classes are used to show the degree of deterioration of the natural plant community.

An area of rangeland is in *excellent condition* if more than 75 percent of the present plant community is the same as the natural plant community. It is in *good condition* if the natural plants make up 51 to 75 percent of the present plant community, in *fair condition* if those plants make up 26 to 50 percent, and in *poor condition* if they make up less than 25 percent.

Knowledge of the range site and condition is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, the potential for recreational uses, and the condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experience of ranchers and research have shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. The plant cover also protects the soil from water erosion and soil blowing, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation, should meet the needs of the individual operator, and should be designed according to the topography, the type of grazing animals, and the resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical brush and weed control, and water spreading. Those in capability classes 7 and 8, however, are not suitable. Many soils in capability classes 1 through 4 are suited to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for the purpose of seeding and as a means of increasing the rate of water intake for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of the desired plants. These practices open up the surface and thus allow the absorption of more moisture and production of the more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of the desired plants.

Seeding may be needed in areas where the less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become established.

Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

Forest Land Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forest land can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

The table "Woodland Understory Vegetation" at the end of this section shows, for each soil suitable for forest land, the potential for producing understory vegetation. The *total production* of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimal part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

The table also lists the common names of the *characteristic vegetation* on each soil and the *composition*, by percentage of air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forest land in which the production of wood crops is highest.

Rangeland Productivity and Characteristic Plant Communities

(Only the soils that support rangeland vegetation suitable for grazing are listed. Ppt means precipitation)

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
5A:					
McKenzie	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
12C:					
Beaverton	Shallow to gravel, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,800	Bluebunch wheatgrass	40
		Normal	1,500	Rough fescue	20
		Unfavorable	1,000	Idaho fescue	10
				Western wheatgrass	5
				Needleandthread	5
14C:					
Brockway	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
15E:					
Lambeth	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
15F:					
Lambeth	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
16B:					
Degrand	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
18E:					
Yawdim	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass	50
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Needleandthread	15
				Plains muhly	5
21E:					
Cabbart	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
21E:					
Delpoint	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
22F:					
Hillon	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
23B:					
Acel	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
24B:					
Farnuf	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
27B:					
Attewan	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
28A:					
Nishon	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
30B:					
Marvan	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
30C:					
Marvan	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Green needlegrass	30
		Normal	1,300	Western wheatgrass	30
		Unfavorable	900	Thickspike wheatgrass	10
				Big sagebrush	5
				Winterfat	5
32B:					
Kobase	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
32C:					
Kobase	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
34A:					
Linnet	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
35B:					
Assinniboine	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
36C:					
Chinook	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
37B:					
Evanston	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
37C:					
Evanston	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
38B:					
Ethridge	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
39C:					
Lisk	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed	25
		Normal	2,300	Bluebunch wheatgrass	20
		Unfavorable	1,700	Idaho fescue	10
				Needleandthread	10
				Rough fescue	10
				Columbia needlegrass	5
39E:					
Lisk	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed	25
		Normal	2,300	Bluebunch wheatgrass	20
		Unfavorable	1,700	Idaho fescue	10
				Needleandthread	10
				Rough fescue	10
				Columbia needlegrass	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
41C:					
Reeder	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
43B:					
Marmarth	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
47B:					
Marias	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
54B:					
Lawther	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
54C:					
Lawther	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
58B:					
Lonna	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
58C:					
Lonna	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
60A:					
Havre	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
63B:					
Nunemaker	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
63C:					
Nunemaker	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
64D:					
Barkof	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
67B:					
Bearpaw	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
67C:					
Bearpaw	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
69C:					
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
71D:					
Roy	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
71D:					
Roy	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
71F:					
Roy	Clayey, steep, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass	30
		Normal	1,600	Rough fescue	25
		Unfavorable	800	Columbia needlegrass	15
				Western wheatgrass	10
				Idaho fescue	5
				Creeping juniper	5
72F:					
Zahill	Thin silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass	35
		Normal	1,700	Rough fescue	20
		Unfavorable	1,200	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
75C:					
Benz	Saline upland, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	600	Western wheatgrass	40
		Normal	500	Alkali sacaton	15
		Unfavorable	350	Inland saltgrass	15
				Nuttail saltbush	5
				Greasewood	5
				Basin wildrye	5
77D:					
Tinsley	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass	35
		Normal	600	Needleandthread	15
		Unfavorable	400	Winterfat	10
				Western wheatgrass	10
				Plains muhly	10
				Yucca	5
77F:					
Tinsley	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass	35
		Normal	600	Needleandthread	15
		Unfavorable	400	Winterfat	10
				Western wheatgrass	10
				Plains muhly	10
				Yucca	5
79B:					
Yamacall	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
82B:					
Savage	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
86C:					
Work	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
87C:					
Tamaneen	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
Tamaneen	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
88C:					
Perma	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
88E:					
Perma	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
90A:					
Harlake	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,200	Green needlegrass	40
		Normal	1,600	Western wheatgrass	35
		Unfavorable	1,200	Silver sagebrush	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
92D:					
Sunburst	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
92F:					
Sunburst	Thin clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,400	Bluebunch wheatgrass	30
		Normal	1,100	Western wheatgrass	15
		Unfavorable	800	Green needlegrass	15
				Plains muhly	5
94C:					
Busby	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
94E:					
Busby	Thin sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,600	Prairie sandreed	30
		Normal	1,300	Needleandthread	20
		Unfavorable	900	Indian ricegrass	10
				Bluebunch wheatgrass	10
98C:					
Kremlin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
115B:					
Thoeny	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
Elloam	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
171C:					
Delpoint	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Cabbart	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
190B:					
Hedstrom	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed	25
		Normal	2,300	Bluebunch wheatgrass	20
		Unfavorable	1,700	Idaho fescue	10
				Needleandthread	10
				Rough fescue	10
				Columbia needlegrass	5
201D:					
Cabba	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
Wayden	Shallow clay, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,600	Green needlegrass	20
		Normal	1,300	Bluebunch wheatgrass	20
		Unfavorable	900	Western wheatgrass	15
				Idaho fescue	10
				Winterfat	5
				Plains muhly	5
201F:					
Cabba	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
Wayden	Shallow clay, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,600	Green needlegrass	20
		Normal	1,300	Bluebunch wheatgrass	20
		Unfavorable	900	Western wheatgrass	15
				Idaho fescue	10
				Winterfat	5
				Plains muhly	5
211E:					
Cabbart	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
Yawdim	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass	50
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Needleandthread	15
				Plains muhly	5
211F:					
Cabbart	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
Yawdim	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass	50
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Needleandthread	15
				Plains muhly	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
221E:					
Hillon	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
Kevin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
224B:					
Hillon	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
224E:					
Hillon	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
225F:					
Hillon	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
Cabbart	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
Yawdim	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass	50
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Needleandthread	15
				Plains muhly	5
261C:					
Auchard	Clay pan, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,600	Western wheatgrass	35
		Normal	1,200	Bluebunch wheatgrass	15
		Unfavorable	700	Green needlegrass	10
				Sedge	5
				Plains reedgrass	5
				Sandberg bluegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
261C:					
Williams	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
271D:					
Beaverell	Shallow to gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Needleandthread	15
		Unfavorable	600	Western wheatgrass	10
				Winterfat	5
				Plains muhly	5
Tinsley	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass	35
		Normal	600	Needleandthread	15
		Unfavorable	400	Winterfat	10
				Western wheatgrass	10
				Plains muhly	10
				Yucca	5
272C:					
Attewan	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Tinsley	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass	35
		Normal	600	Needleandthread	15
		Unfavorable	400	Winterfat	10
				Western wheatgrass	10
				Plains muhly	10
				Yucca	5
301C:					
Marvan	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
301C:					
Vanda	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass	40
		Normal	600	Green needlegrass	20
		Unfavorable	400	Canby bluegrass	10
				Nuttail saltbush	5
				Winterfat	5
				Greasewood	5
302B:					
Marvan	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
304B:					
Marvan	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Western wheatgrass	45
		Normal	900	Bluebunch wheatgrass	20
		Unfavorable	700	Green needlegrass	15
				Nuttail saltbush	5
				Greasewood	5
Joplin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
306D:					
Marvan	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Western wheatgrass	45
		Normal	900	Bluebunch wheatgrass	20
		Unfavorable	700	Green needlegrass	15
				Nuttail saltbush	5
				Greasewood	5
Yawdim	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass	50
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Needleandthread	15
				Plains muhly	5
Cabbart	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
311B:					
Ferd	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
311B:					
Creed	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
Gerdrum	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
321B:					
Kobase	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
321C:					
Kobase	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
323B:					
Sagedale	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
323C:					
Sagedale	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
331B:					
Phillips	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
331B:					
Elloam	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
351B:					
Kenilworth	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Fortbenton	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
363B:					
Cozberg	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
363B:					
Chinook	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
368C:					
Fortbenton	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Hillon	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
385B:					
Ethridge	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
385B:					
Kobase	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
401C:					
Gerdrum	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				----------	5
				Big sagebrush	5
Yamacall	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
421C:					
Joplin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
441C:					
Kevin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
442C:					
Kevin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Elloam	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
445E:					
Kevin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Hillon	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
Nishon	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
471B:					
Marias	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
Kobase	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
491B:					
Enbar	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass	20
		Normal	5,000	Prairie cordgrass	20
		Unfavorable	4,000	Tufted hairgrass	10
				Slender wheatgrass	10
				Western wheatgrass	5
				Sedge	5
				American mannagrass	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
491B:					
Nesda	Overflow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	40
		Normal	2,100	Rough fescue	20
		Unfavorable	1,900	Idaho fescue	10
				Western wheatgrass	5
				Needleandthread	5
493B:					
Enbar	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass	20
		Normal	5,000	Prairie cordgrass	20
		Unfavorable	4,000	Tufted hairgrass	10
				Slender wheatgrass	10
				Western wheatgrass	5
				Sedge	5
				American mannagrass	5
493B:					
Bigsandy	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass	20
		Normal	5,000	Prairie cordgrass	20
		Unfavorable	4,000	Tufted hairgrass	10
				Slender wheatgrass	10
				Western wheatgrass	5
				Sedge	5
				American mannagrass	5
Korchea	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
503B:					
Telstad	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
503C:					
Telstad	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
521C:					
Elloam	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
521C:					
Absher	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass	40
		Normal	600	Green needlegrass	20
		Unfavorable	400	Canby bluegrass	10
				Nuttail saltbush	5
				Winterfat	5
				Greasewood	5
531C:					
Turner	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Beaverton	Shallow to gravel, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,800	Bluebunch wheatgrass	40
		Normal	1,500	Rough fescue	20
		Unfavorable	1,000	Idaho fescue	10
				Western wheatgrass	5
				Needleandthread	5
561B:					
Scobey	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Kevin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
561C:					
Scobey	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Kevin	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
601A:					
Havre	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
Glendive	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
603B:					
Thibadeau	Saline lowland, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Alkali sacaton	30
		Normal	2,400	Western wheatgrass	20
		Unfavorable	1,700	Inland saltgrass	10
				Nuttail saltbush	5
				Sedge	5
				Greasewood	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
605C:					
Yamacall	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Havre	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
631B:					
Nunemaker	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
631C:					
Nunemaker	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
661C:					
Twilight	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Blacksheep	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
671C:					
Bearpaw	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Nishon	Overflow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	3,800	Basin wildrye	25
		Normal	3,300	Western wheatgrass	15
		Unfavorable	2,600	Green needlegrass	15
				Sedge	10
				Columbia needlegrass	10
				Rough fescue	5
				Slender wheatgrass	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
673B:					
Bearpaw	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Daglum	Clay pan, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,600	Western wheatgrass	35
		Normal	1,200	Bluebunch wheatgrass	15
		Unfavorable	700	Green needlegrass	10
				Sedge	5
				Plains reedgrass	5
				Sandberg bluegrass	5
				Needleandthread	5
691D:					
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Western wheatgrass	30
		Normal	2,000	Bluebunch wheatgrass	30
		Unfavorable	1,500	Rough fescue	20
				Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Williams	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
692D:					
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Bearpaw	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
693D:					
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
693D:					
Bearpaw	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Nishon	Overflow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	3,800	Basin wildrye	25
		Normal	3,300	Western wheatgrass	15
		Unfavorable	2,600	Green needlegrass	15
				Willow	10
				Slender wheatgrass	5
				Rough fescue	5
695C:					
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Zahill	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
695E:					
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Zahill	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
702F:					
Winspect	Thin silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass	35
		Normal	1,700	Rough fescue	20
		Unfavorable	1,200	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
712E:					
Roy	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
Barkof	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,400	Western wheatgrass	10
				Idaho fescue	10
				Big sagebrush	5
				Lupine	5
				Columbia needlegrass	5
712F:					
Roy	Clayey, steep, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass	30
		Normal	1,600	Rough fescue	25
		Unfavorable	800	Columbia needlegrass	15
				Western wheatgrass	10
				Idaho fescue	5
				Creeping juniper	5
Barkof	Thin clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,900	Bluebunch wheatgrass	30
		Normal	1,600	Rough fescue	20
		Unfavorable	1,000	Idaho fescue	10
				Western wheatgrass	5
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
723F:					
Zahill	Thin silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass	35
		Normal	1,700	Rough fescue	20
		Unfavorable	1,200	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Cabba	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
781C:					
Creed	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5
Weingart	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttail saltbush	5
				Big sagebrush	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
791B:					
Yamacall	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
801B:					
Williams	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
801C:					
Williams	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
882F:					
Perma	Silty, steep, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,200	Rough fescue	60
		Normal	1,600	Idaho fescue	10
		Unfavorable	1,000	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
Whitlash	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,200	Bluebunch wheatgrass	50
		Normal	1,000	Western wheatgrass	10
		Unfavorable	800	Rough fescue	5
				Columbia needlegrass	5
				Plains muhly	5
892F:					
Whitlash	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,200	Bluebunch wheatgrass	50
		Normal	1,000	Western wheatgrass	10
		Unfavorable	800	Rough fescue	5
				Columbia needlegrass	5
				Plains muhly	5

Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
952F:					
Dast	Thin sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,200	Prairie sandreed	35
		Normal	1,700	Bluebunch wheatgrass	15
		Unfavorable	1,300	Idaho fescue	10
				Rough fescue	10
				Columbia needlegrass	5
				Needleandthread	5
				Common snowberry	5
DA:					
Denied access.					
M-W:					
Miscellaneous water.					
W:					
Water.					

Woodland Understory Vegetation

(Absence of an entry indicates that data were not available)

Map symbol and soil name	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
51F:				
Elve	Favorable	200	Common juniper	10
	Normal	150	Dwarf huckleberry	10
	Unfavorable	50	Pinegrass	10
			White spirea	10
			Dogtooth lily	5
			Twinflower	5
			Woods rose	5
			Kinnikinnick	2
512F:				
Elve	Favorable	200	Grouse whortleberry	40
	Normal	150	Pinegrass	15
	Unfavorable	50	Blue huckleberry	5
			Common juniper	5
			Heartleaf arnica	5
			White spirea	5
			Kinnikinnick	2
			Woods rose	2
702F:				
Winspect	Favorable	1,000	Rough fescue	20
	Normal	800	Arrowleaf balsamroot	15
	Unfavorable	600	Creeping juniper	15
			Kinnikinnick	15
			Bluebunch wheatgrass	10
			Idaho fescue	10
			Columbia needlegrass	5
			Prairie junegrass	5
			Dotted gayfeather	1
			Northern bedstraw	1
812A:				
Glendive	Favorable	700	Western wheatgrass	15
	Normal	500	Common snowberry	10
	Unfavorable	300	Rose	10
			American licorice	5
			Poison ivy	5
			Prairie junegrass	5
Havre	Favorable	800	Western wheatgrass	20
	Normal	600	Common snowberry	15
	Unfavorable	400	Green needlegrass	15
			American licorice	5
			Poison ivy	5
			Prairie junegrass	5
			Rose	5
			Saskatoon serviceberry	5

Forest Land

The tables "Forest Land Productivity" and "Forest Land Management" can be used by forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed.

Woodland Ordination System

The table "Forest Land Management" lists the ordination (woodland suitability) symbol for each soil. The ordination system is a nationwide uniform system of labeling soils or groups of soils that are similar in use and management. The primary factors evaluated in the woodland ordination system are productivity of the forest overstory tree species and the principal soil properties resulting in hazards and limitations that affect forest management. There are three parts of the ordination system: class, subclass, and group. The class and subclass are referred to as the ordination symbol.

Ordination Class Symbol

The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species. The larger the number, the greater the potential productivity. Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, the number 1 indicates a potential production of 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year) and 10 indicates a potential production of 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

Indicator species is a species that is common in the area and is generally, but not necessarily, the most productive on the soil. It is the species that determines the ordination class. It is the first species listed for a particular map unit in the table "Forest Land Productivity." This table shows the productivity for all species where data have been collected.

Site index is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The site indexes shown in the table "Forest Land Productivity" are averages based on measurements made at sites that are representative of the soil series. When the site index and forest land productivity of different soils are compared, the values for the same tree species should be compared. The higher the site index number, the more productive the soil for that species. Site index values are used in conjunction with yield tables to determine average annual yields. Indirectly, they are used to determine the productivity class in the ordination class symbol.

Ordination Subclass Symbol

The second element of the ordination symbol, or subclass, is a capital letter that indicates certain soil or physiographic characteristics that contribute to important hazards or limitations to be considered in management. The subclasses are defined as follows:

Subclass X indicates that forest land use and management are limited by stones or rocks.

Subclass W indicates that forest land use and management are significantly limited by excess water, either seasonally or throughout the year. Restricted drainage, a high water table, or flooding can adversely affect either stand development or management.

Subclass T indicates that the root zone has toxic substances. Excessive alkalinity, acidity, sodium salts, or other toxic substances impede the development of desirable species.

Subclass D indicates that forest land use and management are limited by a restricted rooting depth. The rooting depth is restricted by hard bedrock, a hardpan, or other restrictive layers in the soil.

Subclass C indicates that forest land use and management are limited by the kind or amount of clay in the upper part of the soil.

Subclass S indicates that the soil is sandy, has a low available water capacity, and normally has a low content of available plant nutrients. The use of equipment is limited during dry periods.

Subclass F indicates that forest land use and management are limited by a high content of rock fragments that are larger than 2 millimeters and smaller than 10 inches. This subclass includes flaggy soils.

Subclass R indicates that forest land use and management are limited by excessive slope.

Subclass A indicates that no significant limitations affect forest land use and management.

Forest Land Management and Productivity

Information about the productivity and management of the forested map units in the survey area is given in the tables "Forest Land Management" and "Forest Land Productivity."

Management Concerns

In the table "Forest Land Management," the soils are rated for the erosion hazard, the equipment limitation, seedling mortality, the windthrow hazard, and plant competition.

The *erosion hazard* is *slight* if the expected soil loss is small; *moderate* if some measures are needed to control erosion during logging and road construction; and *severe* if intensive management or special equipment and methods are needed to prevent excessive soil loss.

The *equipment limitation* is *slight* if the use of equipment is not limited to a particular kind of equipment or time of year; *moderate* if there is a short seasonal limitation or a need for some modification in the management of equipment; and *severe* if there is a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings are for seedlings that are from a good planting stock and that are properly planted during a period of average rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Windthrow hazard is *slight* if trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate* if some trees are blown down during periods of excessive soil wetness and strong winds; and *severe* if many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Plant competition is *slight* if there is little or no competition from other plants; *moderate* if plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* if plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

Potential Productivity

The potential productivity of merchantable or *common trees* is expressed as a site index, which is described under the heading "Ordination Class Symbol." Commonly grown trees are those that forest land managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The column *trees that stands are commonly managed for* in the table "Forest Land Productivity" lists trees that are suitable for commercial wood production and that are suited to the soils.

Forest Access Road Limitations and Hazards

The major management concerns affecting the use of the detailed map units in the survey area for forest access roads are listed in the table "Main Forest Access Road Limitations and Hazards." The significance of each limitation or hazard and the criteria used to determine the limitation or hazard are described in this section.

Areas of rock outcrop and *depth to bedrock* can increase the cost of road construction and influence route planning. Constructing the roads is difficult because of the need for rock removal and for additional soil material to provide a suitable road surface.

Boulders increase the cost of road construction and influence route planning. Construction is difficult mainly because of the need for extraction and disposal of the boulders.

Dustiness of the road surface material may cause safety problems and accelerate equipment wear. Dust-abatement measures are needed during dry periods.

The erodibility of the soil material in the roadbed influences the probability of *erosion by water* resulting from the channeling of runoff in the roadway. Erosion can result in the sedimentation of streams. It can be controlled by reducing road grades and controlling runoff onto and off of the road surface through the installation of drainage measures.

Flooding in the area where a road is constructed may restrict use, result in damage to the roadway, and

result in the sedimentation of waterways. The hazard of flooding can be reduced by installing a drainage system, elevating the roadbed, and using riprap and diversions.

Low soil strength of the soil material used to construct the road surface can result in rutting, in drainage problems, and in poor trafficability during wet periods. The road should be used only during dry periods or when the surface is frozen. Surfacing with material of suitable strength and installing a drainage system can help to overcome this limitation.

Roadbed material that has a high *shrink-swell potential* shrinks and swells markedly during dry and wet periods. Excessive shrinking and swelling can damage the road surface or other features, such as bridge abutments, culverts, and erosion-control structures.

A steep *slope* results in increased construction and maintenance costs and increased sedimentation because of the large cuts necessary to create an adequate roadbed. Seeding of the cut slope to suitable vegetation minimizes sedimentation. Large cuts can increase instability of the slope. Where slumping is a hazard, slope failure can become a significant maintenance and environmental problem. Areas where the slope is steep should not be used as sites for roads.

Slumping causes safety problems and increases maintenance costs. Frequent clearing of slumped soil in the roadbed or rebuilding of the roadway may be needed to keep the road serviceable and drainage systems functioning.

Stones cause problems in maintaining a smooth road surface that has good trafficability. Unless the stones are removed, additions of suitable stone-free material may be needed when the road is surfaced.

Roads built across soils that have a *water table* may require substantial ballast, fabric, internal drainage systems, and other measures that maintain a road surface that has good trafficability. Construction and use of the road only during periods when the water table is not near the surface or when the road is frozen help to maintain trafficability and reduce the potential for site damage.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop.—Rock outcrop is a named component of the map unit.

Areas of rubble land.—Rubble land is a named component of the map unit.

Boulders.—The terms describing the texture within a depth of 24 inches include a bouldery modifier, or the soil is a bouldery phase.

Depth to rock.—Hard bedrock is within a depth of 60 inches.

Dustiness.—The surface layer is silt, silt loam, loam, or very fine sandy loam.

Erosion by water.—The surface K factor multiplied by the upper slope limit is more than 10.

Flooding.—The component of the map unit is occasionally flooded or frequently flooded.

Low soil strength.—The component of the map unit has one of the following Unified classifications within the 60-inch profile: ML, CL, MH, CH, OL, PT, or GC.

Shrink-swell potential.—The component of the map unit has a high shrink-swell potential in a layer that is at least 10 inches thick and is within 40 inches of the surface.

Slope.—The upper slope limit is more than 35 percent.

Slumping.—The component of the map unit meets the requirements for low soil strength and has slopes of more than 35 percent.

Stones.—The terms describing the texture within a depth of 24 inches include a very stony or extremely stony modifier, or the soil is a very stony or extremely stony phase.

Water table.—The component of the map unit has a water table within a depth of 60 inches.

Forest Land Management and Productivity In Liberty County

Based on the number of acres of forested soils mapped, about 5,220 acres are forested or have the potential to support forest. About 70 percent of the forested acreage is commercial forest land, capable of producing 20 cubic feet of wood per acre per year or more when yields are computed at the culmination of mean annual increment, (CMAI). The commercial forest land is generally of low productivity, producing less than 45 cubic feet per acre per year when computed at CMAI. The low productivity of the area, the small acreage in forest, the young age of the tree stands (generally less than 100 years), and the small tree diameters limit the sawtimber volume available. Consequently, harvesting of the timber resource is limited.

Soils vary in their ability to support the growth of trees. Depth, fertility, texture, and the available water capacity influence tree growth. Elevation, aspect, soils, and climate determine the kinds of trees that can be expected on any site and their growth rate. The forested soils in the soil survey area range from shallow to very deep, from nongravelly to extremely gravelly, and from loamy textured to sandy textured.

Because of differences among the soils as well as differences in climate, topography, and geology, the forests vary in composition and productivity. Forest lands within the survey area occur mostly on East Butte of the Sweetgrass Hills and along the Marias River.

Plains cottonwood and narrowleaf cottonwood are the major components of the forest overstory on soils developed in alluvium along the Marias River. The rarely flooded phases of Glendive and Havre soils are typically associated with the cottonwood forests.

On the uplands, stands of limber pine or stands of limber pine mixed with Douglas-fir are often the first forests encountered as one moves toward the mountain front. The understory plant community is dominated by bunchgrasses. With increasing precipitation and elevation, there is a narrow zone where Douglas-fir forms the dominant cover type, and limber pine is rare. Common understory species are mountain maple, saskatoon serviceberry, Oregon-grape, common juniper, and white spiraea. Growing on shallow soils within the Douglas-fir zone are mixed stands of Douglas-fir and limber pine. The understory plant community is dominated by rough fescue, kinnikinnick, timber danthonia, and creeping juniper. The soil series most commonly associated with these plant communities is Winspect.

At elevations above about 4,500 feet lodgepole pine becomes the dominant cover type and soils of the Elve series become dominant. Spruce (Engelmann or white) and Douglas-fir are reproducing in the understory of the lodgepole pine. Common understory species are dwarf huckleberry, white spirea, bedstraw, pinegrass, wintergreen, common juniper, and twinflower. Four species of huckleberry are known to occur in the understory plant community: dwarf huckleberry, grouse whortleberry, blue huckleberry, and myrtle whortleberry. The commonly associated soil phase is Elve very cobbly loam, 25 to 60 percent slopes. Within the area dominated by lodgepole pine, scattered small stands of spruce and Douglas-fir do occur. The Douglas-fir seldom occurs at elevations above 5,500 feet. Within the elevational zone where Douglas-fir is potentially associated with lodgepole pine, lodgepole pine is more productive than at higher elevations where Douglas-fir is no longer a stand component. The productivity of lodgepole pine on sites where Douglas-fir is also adapted is about double the productivity estimates presented in the map units containing the Elve soil series. Within the zone dominated by lodgepole pine and the associated Elve soil, there are small areas of soils associated with the Madison Limestone formation. Soils formed in parent materials derived from the Madison Limestone are calcareous to within 20 inches of the soil surface. On these areas, the huckleberries are absent and matted purple clematis are often an understory component.

At the highest elevations, near the summits of Mount Royal and Mount Brown, mixed stands of whitebark, lodgepole, and limber pines, spruce, and subalpine fir occur. The associated soil series is Elve.

To aid those who manage forest land in the soil survey area, soil interpretations relating to woodland use and management have been developed. Items considered for interpretation are: site index, mean annual forest overstory yields in boardfeet and cubic feet per acre, erosion hazard, equipment limitations, plant competition, seedling mortality, windthrow hazard, species suitability, and the kinds and amounts of understory plants.

Definitions, ratings, and assumptions as used in the "Forest Land Management" and "Forest Land Productivity" tables are explained in the following paragraphs.

The ordination symbol is an interpretive grouping made up of the class and subclass. The class, a number, is the mean annual productivity of the most productive tree species adapted to the site expressed in cubic meters per hectare (14.3 cubic feet per acre) when determined at the culmination of mean annual increment (CMAI). The subclass, a letter, represents a significant soil feature affecting use and management. Subclass R (relief or slope steepness) represents soils with restrictions or limitations to forest land use or management because of steepness of slope.

In the "Forest Land Management" table, slight, moderate, and severe indicate the degree of the major soil limitations to be considered in management.

Ratings of the erosion hazard indicate the risk of loss of soil in well managed woodland. The risk is slight if the expected soil loss is small, moderate if measures are needed to control erosion during logging and road construction, and severe if intensive management or special equipment and methods are needed to prevent excessive loss of soil. These ratings were made on the basis of the timber on a soil having been harvested by the clear-cut method and slash burned. It is assumed reasonable care is used in logging so that funneling of skid trails does not occur to concentrate water, that excessive disturbance did not occur, and that some material from slash disposal remained.

Ratings of equipment limitations reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of slight indicates that use of equipment is not limited to a particular kind of equipment or time of year; moderate indicates a

short seasonal limitation or a need for some modification in management or in equipment; and severe indicates a seasonal limitation or a need for special equipment or management, or a hazard in the use of equipment. Equipment limitations in this survey area were related to logging operations. Of prime consideration were difficulties encountered in yarding logs and the influence of logging activities on soil properties. Primary soil features considered in making this rating were slope, soil texture, soil depth, seasonal soil wetness, and stoniness.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during periods of "average" rainfall. A rating of slight indicates that the expected mortality is less than 25 percent; moderate, 25 to 50 percent; and severe, more than 50 percent. As interpreted in this survey, the above criteria apply to planting stock of one or two years of age with the evaluation period beginning at the time of planting. For natural regeneration the evaluation period was considered to begin a year after germination.

Ratings of windthrow hazard consider soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of slight indicates that a few trees may be blown down by normal winds; moderate, that some trees will be blown down during periods of excessive soil wetness and strong winds; and severe, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds. Soils on north slopes that remain moist into the spring and those having a high basal area that limits root development were considered moderately prone to windthrow even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were considered in this category. Soils that have a high water table within 20 inches of the surface long enough to inhibit root development were considered to be severely susceptible to windthrow.

Ratings of plant competition indicate the degree to which understory plants are expected to encroach and affect the establishment of tree seedlings on different kinds of soil when openings are made in the canopy. A rating of slight indicates little or no competition from other plants; moderate indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants. In making ratings for plant competition, if adequate regeneration usually occurs on a soil within five years, the limitation was considered slight.

In the "Forest Land Productivity" table, are the categories "common trees" and "site index." Common trees refers to the trees most commonly encountered on the different soils. For the more common trees, particularly those of commercial value, site index values have been determined. Site index is a value that ranks soil productivity for a specified tree species. It is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The specified number of years (base age) may be different for different species. The site index applies to fully stocked, even-aged, unmanaged stands of trees. The site index base age is 30 years for plains cottonwood, and 100 years for lodgepole pine. Since different base ages are used for different species, site index values are not directly comparable from one species to another (Alexander, 1966). Locally adapted site index curves developed by Natural Resources Conservation Service were used to estimate the site index of plains cottonwood.

The productivity class corresponds to the productivity class in the ordination symbol. A productivity class is listed for the more important species for which soil site correlation data are available.

The "Trees that stands are commonly managed for" column lists trees adapted to the site. The first listed tree is likely the most productive tree species to plant on the site.

Also in the tables are the average annual yield estimates in board feet (Scribner log rule) and cubic feet per acre for selected tree species, and the main soil limitations and hazards for logging access roads.

Overstory yield estimates were determined for most species from average annual yield versus site index curves developed through adjustment of data presented in yield tables published from several different sources. Average annual yield values were computed at the culmination of mean annual increment.

Board-foot volumes in the reference are based on Scribner's log rule and includes all trees larger than 10 inches in diameter breast height to an 8-inch top diameter inside bark (Myers, 1967). Total cubic-foot volume estimates (inside bark) are based on all trees with diameter breast height inside the bark of more than one inch (Dahms, 1964). Yield estimates for plains cottonwood were developed by Natural Resources Conservation Service from stand information collected within the survey area.

Forest Land Management

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Ordination symbol	Management concerns				
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition
51F:						
Elve	1R	Severe	Severe	Moderate	Moderate	Severe
512F:						
Elve	1R	Severe	Moderate	Moderate	Moderate	Severe
702F:						
Winspect	2R	Moderate	Moderate	Severe	Slight	Severe
812A:						
Glendive	2A	Slight	Slight	Moderate	Slight	Moderate
Havre	3A	---	Slight	Moderate	Slight	Severe

Forest Land Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Common trees	Site index	Productivity class	Board feet	Cubic feet	Trees that stands are commonly managed for--
51F:						
Elve	Engelmann spruce	35	2	40	24	Lodgepole pine
	Lodgepole pine	35	1	0	21	
512F:						
Elve	Douglas-fir	28	3	93	36	Lodgepole pine
	Lodgepole pine	35	1	0	21	
	Subalpine fir	---	---	---	---	
702F:						
Winspect	Douglas-fir	24	2	69	33	Douglas-fir
812A:						
Glendive	Plains cottonwood	45	---	---	---	Plains cottonwood
Havre	Plains cottonwood	70	---	---	---	Plains cottonwood

Main Forest Access Road Limitations And Hazards

(Only map units containing a forested component are listed. See text for a description and criteria of the limitations and hazards listed in this table)

Soil name and map symbol	Forest access road limitations or hazards
51F:	
Elve	Slope
512F:	
Elve	Areas of rubble land Slope
Rubble land	Nonsoil material
702F:	
Winspect	Areas of Rock outcrop Erosion by water Low soil strength Slope
Winspect	Areas of Rock outcrop Erosion by water Low soil strength Slope
Rock outcrop	Nonsoil material
812A:	
Glendive	Low soil strength
Havre	Low soil strength

Recreation

The soils of the survey area are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretative ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight.*

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table "Recreational Development" can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table "Building Site Development" and interpretations for septic tank absorption fields in the table "Sanitary Facilities."

Recreational Development

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
5A:					
McKenzie	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
12C:					
Beaverton	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.	Moderate: small stones, large stones, droughty.
14C:					
Brockway	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
15E:					
Lambeth	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
15F:					
Lambeth	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
16B:					
Degrand	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
18E:					
Yawdim	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: too clayey, slope.	Severe: droughty, slope, depth to rock.
21E:					
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: droughty, slope, depth to rock.
Delpoint	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope, depth to rock.
22F:					
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
23B:					
Acel	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
24B:					
Farnuf	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
27B: Attewan	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Moderate: droughty.
28A: Nishon	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
30B: Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
30C: Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
32B: Kobase	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
32C: Kobase	Slight.	Slight.	Severe: slope.	Slight.	Slight.
34A: Linnet	Moderate: too clayey.	Moderate: too clayey.	Moderate: small stones, too clayey.	Moderate: too clayey.	Severe: too clayey.
35B: Assinniboine	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
36C: Chinook	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
37B: Evanston	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
37C: Evanston	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
38B: Ethridge	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
39C: Lisk	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
39E: Lisk	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
41C:					
Reeder	Slight.	Slight.	Moderate: slope, small stones, depth to rock.	Slight.	Moderate: droughty, depth to rock.
43B:					
Marmarth	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.	Moderate: droughty, depth to rock.
47B:					
Marias	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
51F:					
Elve	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
54B:					
Lawther	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
54C:					
Lawther	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
58B:					
Lonna	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
58C:					
Lonna	Slight.	Slight.	Severe: slope.	Slight.	Slight.
60A:					
Havre	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
63B:					
Nunemaker	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.	Slight.
63C:					
Nunemaker	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.	Slight.
64D:					
Barkof	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
67B:					
Bearpaw	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
67C:					
Bearpaw	Slight.	Slight.	Severe: slope.	Slight.	Slight.
69C:					
Vida	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones.
71D:					
Roy	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.	Moderate: small stones, large stones, droughty.
Roy	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Severe: small stones.
71F:					
Roy	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
72F:					
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
75C:					
Benz	Moderate: excess salt.	Moderate: excess salt.	Moderate: slope, excess salt.	Slight.	Moderate: excess salt.
77D:					
Tinsley	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.	Severe: droughty.
77F:					
Tinsley	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
79B:					
Yamacall	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
82B:					
Savage	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
86C:					
Work	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
87C:					
Tamaneen	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
87C:					
Tamaneen	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Moderate: large stones.	Severe: large stones.
88C:					
Perma	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.	Moderate: small stones, large stones, droughty.
88E:					
Perma	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
90A:					
Harlake	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
92D:					
Sunburst	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
92F:					
Sunburst	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
94C:					
Busby	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
94E:					
Busby	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
98C:					
Kremlin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
100F:					
Rubble land.					
115B:					
Thoeny	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
171C:					
Delpoint	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.	Moderate: droughty, depth to rock.
Cabbart	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: dusty.	Severe: droughty, depth to rock.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
190B:					
Hedstrom	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: droughty.
200F:					
Badland.					
201D:					
Cabba	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: droughty, depth to rock.
Wayden	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: too clayey.	Severe: droughty, depth to rock, too clayey.
201F:					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: droughty, slope, depth to rock.
Wayden	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
Rock outcrop.					
211E:					
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: droughty, slope, depth to rock.
Yawdim	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: too clayey, slope.	Severe: droughty, slope, depth to rock.
211F:					
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: droughty, slope, depth to rock.
Yawdim	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
Rock outcrop.					
221E:					
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Kevin	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
224B:					
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Joplin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
224E:					
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Joplin	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
225F:					
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: droughty, slope, depth to rock.
Yawdim	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
261C:					
Auchard	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
Williams	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
271D:					
Beaverell	Moderate: slope, small stones, dusty.	Moderate: slope, small stones, dusty.	Severe: slope, small stones.	Moderate: dusty.	Severe: droughty.
Tinsley	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.	Severe: droughty.
272C:					
Attewan	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Moderate: droughty.
Tinsley	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.	Severe: droughty.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
301C:					
Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
Vanda	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
302B:					
Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
304B:					
Marvan	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
Joplin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
306D:					
Marvan	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
Yawdim	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: too clayey.	Severe: droughty, depth to rock, too clayey.
Cabbart	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: droughty, depth to rock.
311B:					
Ferd	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Creed	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
Gerdrum	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
321B:					
Kobase	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
321C:					
Kobase	Slight.	Slight.	Severe: slope.	Slight.	Slight.
323B:					
Sagedale	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
323C:					
Sagedale	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
331B:					
Phillips	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
351B:					
Kenilworth	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Fortbenton	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
363B:					
Cozberg	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Chinook	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
368C:					
Fortbenton	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
385B:					
Ethridge	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Kobase	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
401C:					
Gerdrum	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
Yamacall	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
421C:					
Joplin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
441C:					
Kevin	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Hillon	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
442C:					
Kevin	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
445E:					
Kevin	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Nishon	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
471B:					
Marias	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
Kobase	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
491B:					
Enbar	Severe: flooding.	Slight.	Moderate: slope, small stones, flooding.	Slight.	Moderate: flooding.
Nesda	Severe: flooding.	Slight.	Moderate: slope, small stones, flooding.	Slight.	Severe: droughty.
493B:					
Enbar	Severe: flooding.	Slight.	Moderate: slope, small stones, flooding.	Slight.	Moderate: flooding.
Bigsandy	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Korchea	Severe: flooding.	Slight.	Moderate: slope.	Slight.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
503B:					
Telstad	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Joplin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
503C:					
Telstad	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
Joplin	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
512F:					
Elve	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, droughty, slope.
Rubble land.					
521C:					
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
Absher	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
531C:					
Turner	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones, droughty.
Beaverton	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.	Moderate: small stones, large stones, droughty.
561B:					
Scobey	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Kevin	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
561C:					
Scobey	Slight.	Slight.	Severe: slope.	Slight.	Slight.
Kevin	Slight.	Slight.	Severe: slope.	Slight.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
601A:					
Havre	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
Glendive	Severe: flooding.	Slight.	Moderate: flooding.	Slight.	Moderate: flooding.
603B:					
Thibadeau	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt.	Slight.	Severe: excess salt.
605C:					
Yamacall	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Havre	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
631B:					
Nunemaker	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.	Slight.
631C:					
Nunemaker	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.	Slight.
661C:					
Twilight	Slight.	Slight.	Moderate: slope, depth to rock.	Slight.	Moderate: depth to rock.
Blacksheep	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.	Severe: depth to rock.
671C:					
Bearpaw	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Vida	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones.
Nishon	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
673B:					
Bearpaw	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Daglum	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
691D:					
Vida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Williams	Slight.	Slight.	Severe: slope.	Slight.	Slight.
692D:					
Vida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Bearpaw	Slight.	Slight.	Severe: slope.	Slight.	Slight.
693D:					
Vida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Bearpaw	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Nishon	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
695C:					
Vida	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones.
Zahill	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones.
695E:					
Vida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
702F:					
Winspect	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Winspect	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Rock outcrop.					
712E:					
Roy	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
712E:					
Barkof	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope, too clayey.
712F:					
Roy	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Barkof	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too clayey.
Rock outcrop.					
723F:					
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: droughty, slope, depth to rock.
781C:					
Creed	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
Weingart	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
791B:					
Yamacall	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
801B:					
Williams	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Vida	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones.
801C:					
Williams	Slight.	Slight.	Severe: slope.	Slight.	Slight.
Vida	Slight.	Slight.	Severe: slope.	Slight.	Moderate: large stones.
812A:					
Glendive	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
Havre	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
882F:					
Perma	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
892F:					
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
Rock outcrop.					
952F:					
Dast	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
DA:					
Denied access.					
M-W:					
Miscellaneous water.					
W:					
Water.					

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples are wheat, rye, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are fescue, bromegrass, timothy, orchardgrass, clover, alfalfa, trefoil, reed canarygrass, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, indiangrass, blueberry, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, fescue, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity or sodicity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, boxelder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are hawthorn, honeysuckle, American plum, redosier dogwood, chokecherry, serviceberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provide habitat or supply food in the form of browse, seed, or fruitlike cones. Examples are pine, spruce, hemlock, fir, yew, cedar, larch, and juniper.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweed, wild millet, rushes, sedges, bulrushes, wild rice, arrowhead, waterplantain, pickerelweed, and cattail.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, pheasant, sharp-tailed grouse, sage grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls,

tree squirrels, porcupine, raccoon, deer, elk, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy, shallow water areas that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrat, otter, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. The wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Wildlife In Liberty County

Most of the soils on the glaciated uplands of Liberty County are under intense cultivation. In this part of the county, nesting areas and woody cover are generally on small acreages along streams and coulees, near farmsteads, along road ditches, and in field windbreaks. Wildlife populations of most species are lower in these cultivated areas as compared to areas that have intermixed range, woodland, and cultivated crops. A few game birds, such as the Hungarian partridge and sharptailed grouse, find cover and food along ditches, fence rows, coulees, or field windbreaks. Land management practices beneficial to Hungarian partridge and sharptailed grouse include proper grazing use of rangelands to ensure that sufficient plant residue is retained as cover for nesting, roosting, and brood rearing; the protection of brushy draws and fence rows; and the establishment of shelterbelts. Lands taken out of cultivation under the Conservation Reserve Program have increased wildlife populations significantly by providing food and cover.

Both white-tailed and mule deer appear throughout the survey area. White-tails generally inhabit the bottomlands of the Marias River and its tributaries, as well as other stream bottoms and lower foothills adjacent to farmlands. Mule deer occur over much of the footslopes of the Sweetgrass Hills, brushy bottoms, and broken rangelands of Liberty County.

Pronghorn antelope are scattered throughout the county. The potential for maintaining pronghorn herds is largely dependent on the proper management of rangelands. If ranges are overgrazed, competition for food between domestic livestock and pronghorns can be serious. There is little competition on well-managed range. Pronghorns utilize forbs and browse that cattle seldom eat unless forced to do so because of overgrazing.

Rocky Mountain elk occur in the Sweetgrass Hills in the extreme northwestern portion of the survey area. Elk spend their summers and falls at relatively high elevations where dense forests intersperse with grassy mountain meadows. Movement to lower elevations begins in mid- to late fall, depending on snowfall. Winter ranges usually consist of south-facing footslopes and low foothills.

Ring-necked pheasants are found mainly along the Marias River in the southern part of the county. Land management practices that are beneficial to pheasants include proper grazing, protection of woody cover from burning or eradication, and the retention of stubble and waste grain in winter through the elimination of fall tillage. Woody plantings in the form of shelterbelts or windbreaks are beneficial to pheasants and other game and nongame species. The Conservation Reserve Program has increased pheasant populations significantly.

Sage grouse inhabit sagebrush-covered rangelands mainly in the northern part of the survey area. Optimum sage grouse habitat is characterized by communities of big sagebrush and silver sagebrush, with a variety of forbs and grasses and with the environmental factors associated with such plant communities.

Migratory waterfowl such as ducks, geese, swans, and other shore birds are on the Marias River, Lake Elwell, and the many ponds and reservoirs throughout the survey area. These areas provide suitable habitat for waterfowl during spring and fall migrations, as well as during the nesting seasons.

Beaver, raccoon, and mink inhabit areas along Willow Creek and the Marias River. Cottontail rabbits, badger, ground squirrels, coyotes, jackrabbits, and other small mammals are common in most of the survey area.

Public fishing is available in the Marias River and Lake Elwell. The most commonly sought fish are trout, walleye, northern pike, sauger, and perch.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight, moderate,* or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good, fair,* and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field

to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The table "Sanitary Facilities" gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of groundwater pollution. The ratings in the table "Sanitary Facilities" are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a

minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service.

Construction Materials

The table "Construction Materials" gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table "Construction Materials," the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The table "Water Management" gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed

across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Building Site Development

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
5A:						
McKenzie	Severe: cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
12C:						
Beaverton	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, large stones, droughty.
14C:						
Brockway	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
15E:						
Lambeth	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
15F:						
Lambeth	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
16B:						
Degrand	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
18E:						
Yawdim	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: droughty, slope, depth to rock.
21E:						
Cabbart	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, depth to rock.
Delpoint	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: droughty, slope, depth to rock.
22F:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
23B:						
Acel	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
24B:						
Farnuf	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
27B:						
Attewan	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
28A:						
Nishon	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
30B:						
Marvan	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
30C:						
Marvan	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
32B:						
Kobase	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
32C:						
Kobase	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
34A:						
Linnet	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
35B:						
Assinniboine	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
36C:						
Chinook	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
37B:						
Evanston	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength, frost action.	Slight.
37C:						
Evanston	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
38B: Ethridge	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
39C: Lisk	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
39E: Lisk	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
41C: Reeder	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: droughty, depth to rock.
43B: Marmarth	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength, frost action.	Moderate: droughty, depth to rock.
47B: Marias	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
51F: Elve	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
54B: Lawther	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
54C: Lawther	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
58B: Lonna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
58C: Lonna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
60A: Havre	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
63B:						
Nunemaker	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
63C:						
Nunemaker	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
64D:						
Barkof	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
67B:						
Bearpaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
67C:						
Bearpaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
69C:						
Vida	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Moderate: large stones
71D:						
Roy	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: small stones, large stones, droughty.
Roy	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Severe: small stones.
71F:						
Roy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
72F:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
75C:						
Benz	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: excess salt.
77D:						
Tinsley	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Severe: droughty.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
77F:						
Tinsley	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
79B:						
Yamacall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
82B:						
Savage	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
86C:						
Work	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
87C:						
Tamaneen	Moderate: too clayey.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Tamaneen	Moderate: too clayey.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: large stones.
88C:						
Perma	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, large stones, droughty.
88E:						
Perma	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
90A:						
Harlake	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
92D:						
Sunburst	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: large stones, slope.
92F:						
Sunburst	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
94C:						
Busby	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
94E:						
Busby	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
98C:						
Kremlin	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
100F:						
Rubble land.						
115B:						
Thoeny	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
Elloam	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
171C:						
Delpoint	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Moderate: droughty, depth to rock.
Cabbart	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, shrink-swell, low strength.	Severe: droughty, depth to rock.
190B:						
Hedstrom	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
200F:						
Badland.						
201D:						
Cabba	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, low strength.	Severe: droughty, depth to rock.
Wayden	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: droughty, depth to rock, too clayey.
201F:						
Cabba	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, depth to rock.
Wayden	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: droughty, slope, depth to rock.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
201F:						
Rock outcrop.						
211E:						
Cabbart	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, depth to rock.
Yawdim	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: droughty, slope, depth to rock.
211F:						
Cabbart	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, depth to rock.
Yawdim	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: droughty, slope, depth to rock.
Rock outcrop.						
221E:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Kevin	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
224B:						
Hillon	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Joplin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
224E:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Joplin	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: slope.
225F:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
225F:						
Cabbart	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, depth to rock.
Yawdim	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: droughty, slope, depth to rock.
261C:						
Auchard	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.
Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
271D:						
Beaverell	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Severe: droughty.
Tinsley	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Severe: droughty.
272C:						
Attewan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
Tinsley	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Severe: droughty.
301C:						
Marvan	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Vanda	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
302B:						
Marvan	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
304B:						
Marvan	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Joplin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
306D:						
Marvan	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Yawdim	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: droughty, depth to rock, too clayey.
Cabbart	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, low strength.	Severe: droughty, depth to rock.
311B:						
Ferd	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Creed	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
Gerdrum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
321B:						
Kobase	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
321C:						
Kobase	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
323B:						
Sagedale	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: too clayey.
323C:						
Sagedale	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: too clayey.
331B:						
Phillips	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Elloam	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
351B:						
Kenilworth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Fortbenton	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
363B:						
Cozberg	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
Chinook	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
368C:						
Fortbenton	Slight	Slight	Moderate: shrink-swell.	Moderate: slope.	Moderate: frost action.	Slight.
Hillon	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
385B:						
Ethridge	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Kobase	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
401C:						
Gerdrum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
Yamacall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
421C:						
Joplin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
Hillon	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
441C:						
Kevin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
441C:						
Hillon	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
442C:						
Kevin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Elloam	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
445E:						
Kevin	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Nishon	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
471B:						
Marias	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Kobase	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
491B:						
Enbar	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Nesda	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
493B:						
Enbar	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Bigsandy	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
493B:						
Korchea	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
503B:						
Telstad	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
Joplin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
503C:						
Telstad	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
503C:						
Joplin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
512F:						
Elve	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Rubble land.						
521C:						
Elloam	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.
Absher	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
531C:						
Turner	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: large stones, droughty.
Beaverton	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, large stones, droughty.
561B:						
Scobey	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
561B:						
Kevin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
561C:						
Scobey	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Kevin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
601A:						
Havre	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
603B:						
Thibadeau	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: excess salt.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
605C:						
Yamacall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
Havre	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
631B:						
Nunemaker	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
631C:						
Nunemaker	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
661C:						
Twilight	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: depth to rock.
Blacksheep	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Severe: depth to rock.
671C:						
Bearpaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Vida	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Moderate: large stones.
Nishon	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
673B:						
Bearpaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Daglum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
691D:						
Vida	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
692D:						
Vida	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
Bearpaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
693D:						
Vida	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
Bearpaw	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
693D:						
Nishon	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
695C:						
Vida	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Moderate: large stones.
Zahill	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Moderate: large stones.
695E:						
Vida	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
702F:						
Winspect	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Winspect	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
712E:						
Roy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
712E:						
Barkof	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
712F:						
Roy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barkof	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
Rock outcrop.						
723F:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cabba	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, depth to rock.
781C:						
Creed	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.
Weingart	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
791B:						
Yamacall	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
801B:						
Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
Vida	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength, frost action.	Moderate: large stones.
801C:						
Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
Vida	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength, frost action.	Moderate: large stones.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
812A:						
Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Havre	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
882F:						
Perma	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope, depth to rock.
892F:						
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope, depth to rock.
Rock outcrop.						
952F:						
Dast	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
DA:						
Denied access.						
M-W:						
Miscellaneous water.						
W:						
Water.						

Sanitary Facilities

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
5A:					
McKenzie	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
12C:					
Beaverton	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
14C:					
Brockway	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
15E:					
Lambeth	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
15F:					
Lambeth	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
16B:					
Degrand	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
18E:					
Yawdim	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
21E:					
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Delpoint	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
22F:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
23B:					
Acel	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
24B:					
Farnuf	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
27B:					
Attewan	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.
28A:					
Nishon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
30B:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
30C:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
32B:					
Kobase	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
32C:					
Kobase	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
34A:					
Linnet	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
35B:					
Assinniboine	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Fair: thin layer.
36C:					
Chinook	Slight	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
37B:					
Evanston	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
37C:					
Evanston	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
38B:					
Ethridge	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
39C:					
Lisk	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
39E:					
Lisk	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
41C:					
Reeder	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
43B:					
Marmarth	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
47B:					
Marias	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
51F:					
Elve	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
54B:					
Lawther	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
54C:					
Lawther	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
58B:					
Lonna	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
58C:					
Lonna	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
60A:					
Havre	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
63B:					
Nunemaker	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
63C:					
Nunemaker	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
64D:					
Barkof	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
67B:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
67C:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
69C:					
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
71D:					
Roy	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
Roy	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
71F:					
Roy	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
72F:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
75C:					
Benz	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
77D:					
Tinsley	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
77F:					
Tinsley	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
79B:					
Yamacall	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
82B:					
Savage	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
86C:					
Work	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
87C:					
Tamaneen	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
Tamaneen	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
88C:					
Perma	Moderate: percs slowly, large stones.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
88E:					
Perma	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
90A:					
Harlake	Severe: percs slowly.	Slight	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
92D:					
Sunburst	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
92F:					
Sunburst	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
94C:					
Busby	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
94E:					
Busby	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: slope.
98C:					
Kremlin	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
100F:					
Rubble land.					
115B:					
Thoeny	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
Elloam	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
171C:					
Delpoint	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
Cabbart	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
190B:					
Hedstrom	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
200F:					
Badland.					
201D:					
Cabba	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Wayden	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
201F:					
Cabba	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Wayden	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Rock outcrop.					
211E:					
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Yawdim	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
211F:					
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Yawdim	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Rock outcrop.					
221E:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Kevin	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
224B:					
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
224E:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Joplin	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
225F:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Yawdim	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
261C:					
Auchard	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey, excess sodium.	Severe: depth to rock.	Poor: depth to rock, too clayey, excess sodium.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
261C:					
Williams	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
271D:					
Beaverell	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy, large stones.	Moderate: slope.	Poor: seepage, too sandy, small stones.
Tinsley	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
272C:					
Attewan	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.
Tinsley	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
301C:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Vanda	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
302B:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
304B:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
306D:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Yawdim	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock, hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
306D:					
Cabbart	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
311B:					
Ferd	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Creed	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
Gerdrum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
321B:					
Kobase	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
321C:					
Kobase	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
323B:					
Sagedale	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
323C:					
Sagedale	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
331B:					
Phillips	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Elloam	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
351B:					
Kenilworth	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
363B:					
Cozberg	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
Chinook	Slight	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
368C:					
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
385B:					
Ethridge	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Kobase	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
401C:					
Gerdrum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
Yamacall	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
421C:					
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
441C:					
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
442C:					
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Elloam	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
445E:					
Kevin	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Nishon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
471B:					
Marias	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Kobase	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
491B:					
Enbar	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Nesda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy, small stones.
493B:					
Enbar	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Bigsandy	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, too sandy, wetness.
Korchea	Moderate: flooding, percs slowly.	Moderate: seepage, slope.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
503B:					
Telstad	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
503C:					
Telstad	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
512F:					
Elve	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Rubble land.					
521C:					
Elloam	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
521C:					
Absher	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium, excess salt.	Slight	Poor: too clayey, hard to pack, excess salt.
531C:					
Turner	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Beaverton	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
561B:					
Scobey	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
561C:					
Scobey	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
601A:					
Havre	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Glendive	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding.	Fair: too sandy.
603B:					
Thibadeau	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
605C:					
Yamacall	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Havre	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
631B:					
Nunemaker	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
631C:					
Nunemaker	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
661C:					
Twilight	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
Blacksheep	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
671C:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Nishon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
673B:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Daglum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
691D:					
Vida	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Williams	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
692D:					
Vida	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
693D:					
Vida	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
693D:					
Nishon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
695C:					
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Zahill	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
695E:					
Vida	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
702F:					
Winspect	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Winspect	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Rock outcrop.					
712E:					
Roy	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Barkof	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
712F:					
Roy	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Barkof	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Rock outcrop.					
723F:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
723F:					
Cabba	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
781C:					
Creed	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
Weingart	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey, excess sodium.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
791B:					
Yamacall	Slight	Severe: seepage.	Slight	Slight	Fair: small stones.
801B:					
Williams	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
801C:					
Williams	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
812A:					
Glendive	Moderate: flooding.	Severe: seepage.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
Havre	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
882F:					
Perma	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Whitlash	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
892F:					
Whitlash	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop.					

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
952F:					
Dast	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop.					
DA:					
Denied access.					
M-W:					
Miscellaneous water.					
W:					
Water.					

Construction Materials

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
5A:				
McKenzie	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
12C:				
Beaverton	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
14C:				
Brockway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
15E:				
Lambeth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
15F:				
Lambeth	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
16B:				
Degrand	Good	Probable	Probable	Poor: small stones.
18E:				
Yawdim	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
21E:				
Cabbart	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Delpoint	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
22F:				
Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
23B:				
Acel	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
24B:				
Farnuf	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
27B: Attewan	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
28A: Nishon	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
30B: Marvan	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
30C: Marvan	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
32B: Kobase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
32C: Kobase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
34A: Linnet	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
35B: Assinniboine	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
36C: Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
37B: Evanston	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
37C: Evanston	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
38B: Ethridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
39C:				
Lisk	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
39E:				
Lisk	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
41C:				
Reeder	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
43B:				
Marmarth	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, thin layer.
47B:				
Marias	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
51F:				
Elve	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
54B:				
Lawther	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
54C:				
Lawther	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
58B:				
Lonna	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
58C:				
Lonna	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
60A:				
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
63B:				
Nunemaker	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
63C:				
Nunemaker	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
64D:				
Barkof	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
67B:				
Bearpaw	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
67C:				
Bearpaw	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
69C:				
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
71D:				
Roy	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
Roy	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
71F:				
Roy	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
72F:				
Zahill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
75C:				
Benz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
77D:				
Tinsley	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
77F:				
Tinsley	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
79B:				
Yamacall	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
82B:				
Savage	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
86C:				
Work	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
87C:				
Tamaneen	Good	Improbable: small stones.	Probable	Poor: too clayey, small stones, area reclaim.
Tamaneen	Good	Improbable: small stones.	Probable	Poor: too clayey, small stones, area reclaim.
88C:				
Perma	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
88E:				
Perma	Fair: large stones, slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.
90A:				
Harlake	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
92D:				
Sunburst	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
92F:				
Sunburst	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
94C:				
Busby	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
94E:				
Busby	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
98C:				
Kremlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
100F:				
Rubble land.				
115B:				
Thoeny	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
171C:				
Delpoint	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
Cabbart	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
190B:				
Hedstrom	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
200F:				
Badland.				
201D:				
Cabba	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
Wayden	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
201F:				
Cabba	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Wayden	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Rock outcrop.				

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
211E:				
Cabbart	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Yawdim	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
211F:				
Cabbart	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Yawdim	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Rock outcrop.				
221E:				
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
224B:				
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
224E:				
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Joplin	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
225F:				
Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cabbart	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Yawdim	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
261C:				
Auchard	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Williams	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
271D:				
Beaverell	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Tinsley	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
272C:				
Attewan	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Tinsley	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
301C:				
Marvan	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vanda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
302B:				
Marvan	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
304B:				
Marvan	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
Joplin	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
306D:				
Marvan	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
306D:				
Yawdim	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
Cabbart	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
311B:				
Ferd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Creed	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Gerdrum	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
321B:				
Kobase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
321C:				
Kobase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
323B:				
Sagedale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
323C:				
Sagedale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
331B:				
Phillips	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
351B:				
Kenilworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
363B:				
Cozberg	Good	Probable	Probable	Poor: small stones.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
363B:				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
368C:				
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
385B:				
Ethridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kobase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
401C:				
Gerdrum	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Yamacall	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
421C:				
Joplin	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
441C:				
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
442C:				
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
445E:				
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
445E:				
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Nishon	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
471B:				
Marias	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kobase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
491B:				
Enbar	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Nesda	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
493B:				
Enbar	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Bigsandy	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
Korchea	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
503B:				
Telstad	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
503C:				
Telstad	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
512F:				
Elve	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
512F:				
Rubble land.				
521C:				
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Absher	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
531C:				
Turner	Good	Improbable: small stones.	Probable	Poor: too sandy, small stones, area reclaim.
Beaverton	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
561B:				
Scobey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
561C:				
Scobey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
601A:				
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
603B:				
Thibadeau	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
605C:				
Yamacall	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
631B:				
Nunemaker	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
631C:				
Nunemaker	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
661C:				
Twilight	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, thin layer.
Blacksheep	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
671C:				
Bearpaw	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Nishon	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
673B:				
Bearpaw	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Daglum	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
691D:				
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Williams	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
692D:				
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Bearpaw	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
693D:				
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
693D:				
Bearpaw	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Nishon	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
695C:				
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Zahill	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
695E:				
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Zahill	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
702F:				
Winspect	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Winspect	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rock outcrop.				
712E:				
Roy	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
Barkof	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
712F:				
Roy	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
712F:				
Barkof	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rock outcrop.				
723F:				
Zahill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cabba	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
781C:				
Creed	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Weingart	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, excess salt.
791B:				
Yamacall	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
801B:				
Williams	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
801C:				
Williams	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vida	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
812A:				
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
882F:				
Perma	Poor: slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
882F:				
Whitlash	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
892F:				
Whitlash	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
952F:				
Dast	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
DA:				
Denied access.				
M-W:				
Miscellaneous water.				
W:				
Water.				

Water Management

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
5A:							
McKenzie	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, excess salt.	Ponding, slow intake, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
12C:							
Beaverton	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones, too sandy.	Large stones, droughty, rooting depth.
14C:							
Brockway	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Erodes easily.
15E:							
Lambeth	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
15F:							
Lambeth	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
16B:							
Degrand	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing.	Too sandy, soil blowing.	Too arid.
18E:							
Yawdim	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
21E:							
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Delpoint	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
22F:							
Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
23B:							
Acel	Slight	Slight	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
24B:							
Farnuf	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Excess salt.	Favorable	Favorable
27B:							
Attewan	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Droughty, erodes easily.	Erodes easily, too sandy.	Too arid, erodes easily, droughty.
28A:							
Nishon	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
30B:							
Marvan	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
30C:							
Marvan	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
32B:							
Kobase	Slight	Slight	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
32C:							
Kobase	Moderate: slope.	Slight	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
34A:							
Linnet	Slight	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly.	Percs slowly.	Percs slowly.
35B:							
Assiniboine	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing.	Soil blowing.	Too arid.
36C:							
Chinook	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Soil blowing.	Too arid.
37B:							
Evanston	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
37C:							
Evanston	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
38B:							
Ethridge	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
39C:							
Lisk	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Too sandy, soil blowing.	Favorable.
39E:							
Lisk	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Slope, too sandy, soil blowing.	Slope.
41C:							
Reeder	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Depth to rock.	Droughty, depth to rock.
43B:							
Marmarth	Moderate: seepage, depth to rock.	Severe: piping.	Severe: no water.	Deep to water.	Droughty, depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
47B:							
Marias	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
51F:							
Elve	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
54B:							
Lawther	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly, excess salt.	Percs slowly.	Percs slowly.
54C:							
Lawther	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Percs slowly.	Percs slowly.
58B:							
Lonna	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Excess salt.	Erodes easily.	Too arid, erodes easily.
58C:							
Lonna	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, excess salt.	Erodes easily.	Too arid, erodes easily.
60A:							
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Favorable	Favorable	Too arid.
63B:							
Nunemaker	Slight	Moderate: hard to pack.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
63C:							
Nunemaker	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
64D:							
Barkof	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
67B:							
Bearpaw	Slight	Moderate: hard to pack.	Severe: no water.	Deep to water.	Percs slowly, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
67C:							
Bearpaw	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
69C:							
Vida	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
71D:							
Roy	Severe: slope.	Slight	Severe: no water.	Deep to water.	Slope, droughty.	Slope.	Slope, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
71D:							
Roy	Severe: slope.	Moderate: large stones.	Severe: no water.	Deep to water.	Slope, droughty.	Slope, large stones.	Large stones, slope, droughty.
71F:							
Roy	Severe: slope.	Slight	Severe: no water.	Deep to water.	Slope, droughty.	Slope.	Slope, droughty.
72F:							
Zahill	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
75C:							
Benz	Moderate: slope.	Moderate: piping, excess salt.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
77D:							
Tinsley	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
77F:							
Tinsley	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
79B:							
Yamacall	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
82B:							
Savage	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly.	Percs slowly.	Percs slowly.
86C:							
Work	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope.	Favorable	Favorable.
87C:							
Tamaneen	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope.	Favorable	Favorable.
Tamaneen	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope.	Large stones.	Large stones.
88C:							
Perma	Severe: seepage.	Moderate: thin layer, seepage, piping.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones.	Large stones, droughty.
88E:							
Perma	Severe: seepage, slope.	Moderate: thin layer, seepage, piping.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
90A:							
Harlake	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly, excess salt.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
92D:							
Sunburst	Severe: slope.	Slight	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
92F:							
Sunburst	Severe: slope.	Slight	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
94C:							
Busby	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Too sandy, soil blowing.	Too arid.
94E:							
Busby	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Slope, too sandy, soil blowing.	Too arid, slope.
98C:							
Kremlin	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
100F:							
Rubble land.							
115B:							
Thoeny	Slight	Severe: excess sodium.	Severe: no water.	Deep to water.	Percs slowly, erodes easily, excess sodium.	Erodes easily, percs slowly.	Excess sodium, erodes easily, percs slowly.
Elloam	Slight	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
171C:							
Delpoint	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily, droughty.
Cabbart	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily, droughty.
190B:							
Hedstrom	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
200F:							
Badland.							
201D:							
Cabba	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Wayden	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
201F:							
Cabba	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
201F:							
Wayden	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop.							

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
211E:							
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Yawdim	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
211F:							
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Yawdim	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
Rock outcrop.							
221E:							
Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
221E:							
Kevin	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
224B:							
Hillon	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Joplin	Slight	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
224E:							
Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Joplin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
225F:							
Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
225F:							
Yawdim	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
261C:							
Auchard	Moderate: depth to rock, slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Depth to rock, erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
261C:							
Williams	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
271D:							
Beaverell	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones, too sandy.	Too arid, large stones, slope.
Tinsley	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
272C:							
Attewan	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, droughty, erodes easily.	Erodes easily, too sandy.	Too arid, erodes easily, droughty.
Tinsley	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones, too sandy, soil blowing.	Large stones, droughty.
301C:							
Marvan	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Vanda	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
302B:							
Marvan	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
304B:							
Marvan	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
Joplin	Slight	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
306D:							
Marvan	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
Yawdim	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
311B:							
Ferd	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Creed	Slight	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
311B:							
Gerdrum	Slight	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
321B:							
Kobase	Slight	Slight	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
321C:							
Kobase	Moderate: slope.	Slight	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
323B:							
Sagedale	Slight	Slight	Severe: no water.	Deep to water.	Slow intake, percs slowly.	Percs slowly.	Percs slowly.
323C:							
Sagedale	Moderate: slope.	Slight	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Percs slowly.	Percs slowly.
331B:							
Phillips	Slight	Moderate: thin layer, piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Elloam	Slight	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
351B:							
Kenilworth	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
Fortbenton	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
363B:							
Cozberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing.	Too sandy, soil blowing.	Too arid.
Chinook	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing.	Soil blowing.	Too arid.
368C:							
Fortbenton	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
Hillon	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
385B:							
Ethridge	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Kobase	Slight	Slight	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
401C:							
Gerdrum	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
Yamacall	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
421C:							
Joplin	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Hillon	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
441C:							
Kevin	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Hillon	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
442C:							
Kevin	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Elloam	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
445E:							
Kevin	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Nishon	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
471B:							
Marias	Slight	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Kobase	Slight	Slight	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
491B:							
Enbar	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action	Wetness, flooding	Erodes easily, wetness.	Erodes easily.
Nesda	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Droughty, flooding	Large stones, too sandy.	Large stones, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
493B:							
Enbar	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action	Wetness, flooding	Erodes easily, wetness.	Erodes easily.
Bigsandy	Slight	Severe: piping, wetness, excess salt.	Severe: slow refill, salty water, cutbanks cave	Percs slowly, flooding, frost action	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, percs slowly.
Korchea	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Erodes easily.
503B:							
Telstad	Slight	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Joplin	Slight	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
503C:							
Telstad	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
503C:							
Joplin	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
512F:							
Elve	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Rubble land.							
521C:							
Elloam	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
Absher	Moderate: slope.	Severe: excess sodium, excess salt.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
531C:							
Turner	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, droughty.	Large stones, too sandy.	Large stones, droughty.
Beaverton	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones, too sandy.	Large stones, droughty, rooting depth.
561B:							
Scobey	Slight	Slight	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
561B:							
Kevin	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
561C:							
Scobey	Moderate: slope.	Slight	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Kevin	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
601A:							
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, flooding	Erodes easily.	Too arid, erodes easily.
Glendive	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing, flooding, excess salt.	Soil blowing.	Too arid.
603B:							
Thibadeau	Slight	Severe: piping.	Severe: slow refill.	Percs slowly, flooding, excess salt.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Excess salt, erodes easily, percs slowly.
605C:							
Yamacall	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, flooding	Erodes easily.	Too arid, erodes easily.
631B:							
Nunemaker	Slight	Moderate: hard to pack.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
631C:							
Nunemaker	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
661C:							
Twilight	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Depth to rock, soil blowing.	Too arid, depth to rock.
Blacksheep	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, soil blowing.	Depth to rock, soil blowing.	Too arid, droughty, depth to rock.
671C:							
Bearpaw	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Vida	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Nishon	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
673B:							
Bearpaw	Slight	Moderate: hard to pack.	Severe: no water.	Deep to water.	Percs slowly, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
673B:							
Daglum	Slight	Severe: excess sodium.	Severe: no water.	Deep to water.	Percs slowly, excess sodium, excess salt.	Percs slowly.	Excess sodium, percs slowly.
691D:							
Vida	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Williams	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
692D:							
Vida	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Bearpaw	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
693D:							
Vida	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Bearpaw	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, excess salt.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Nishon	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
695C:							
Vida	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Zahill	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
695E:							
Vida	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Zahill	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
702F:							
Winspect	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Winspect	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop.							
712E:							
Roy	Severe: slope.	Slight	Severe: no water.	Deep to water.	Slope, droughty.	Slope.	Slope, droughty.

Water Management--Continued

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Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
712E:							
Barkof	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
712F:							
Roy	Severe: slope.	Slight	Severe: no water.	Deep to water.	Slope, droughty.	Slope.	Slope, droughty.
Barkof	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Rock outcrop.							
723F:							
Zahill	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Cabba	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
781C:							
Creed	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
Weingart	Moderate: depth to rock, slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Depth to rock, erodes easily, percs slowly.	Excess sodium, erodes easily, droughty.
791B:							
Yamacall	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
801B:							
Williams	Slight	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Vida	Slight	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
801C:							
Williams	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Vida	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
812A:							
Glendive	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing, excess salt.	Soil blowing.	Too arid.
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
882F:							
Perma	Severe: seepage, slope.	Moderate: thin layer, seepage, piping.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
882F:							
Whitlash	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
892F:							
Whitlash	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.							
952F:							
Dast	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Rock outcrop.							
DA:							
Denied access.							
M-W:							
Miscellaneous water.							
W:							
Water.							

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986) and the Unified soil classification system (ASTM, 1993).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than

3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables "Physical Properties of the Soils" and "Chemical Properties of the Soils" show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table "Physical Properties of the Soils," the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility of soil to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Cation-exchange capacity is 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of

gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extract from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

The table "Water Features" gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table "Water Features" gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is 50 percent in any year). The term *common* includes both frequent and occasional flooding.

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each

soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table "Water Features" are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or by evaporation.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Properties

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
5A:												
McKenzie	0-6	Clay	CH	A-7	0	0	100	100	90-100	75-95	50-75	25-50
	6-27	Clay, silty clay	CH	A-7	0	0	100	100	95-100	75-95	50-75	25-50
	27-60	Clay, silty clay	CH	A-7	0	0	100	100	95-100	75-95	50-75	25-50
12C:												
Beaverton	0-5	Gravelly loam	CL-ML, SC-SM, GM-GC	A-4, A-2	0	0-10	65-80	60-75	50-70	30-60	25-30	5-10
	5-15	Very gravelly clay loam, very gravelly sandy clay loam	GM-GC, GC	A-4, A-2, A-6	0	0-25	40-55	35-50	30-45	20-40	25-35	5-15
	15-60	Extremely gravelly loamy sand, extremely gravelly sand, very gravelly loamy sand	GM, GP, GP-GM, SM	A-1	0	0-30	25-60	15-50	10-35	0-15	---	NP
14C:												
Brockway	0-4	Silt loam	CL-ML	A-4	0	0	100	100	95-100	85-95	25-30	5-10
	4-8	Silt loam, loam	CL-ML	A-4	0	0	100	100	95-100	85-95	25-30	5-10
	8-60	Silt loam, silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-95	25-40	5-15
15E:												
Lambeth	0-4	Silt loam	CL-ML	A-4	0	0	100	100	90-100	75-90	20-30	5-10
	4-60	Silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	75-90	20-40	5-20
15F:												
Lambeth	0-4	Silt loam	CL-ML	A-4	0	0	100	100	90-100	75-90	20-30	5-10
	4-60	Silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	75-90	20-40	5-20
16B:												
Degrand	0-5	Fine sandy loam	SM	A-2, A-4	0	0-5	85-100	80-100	50-80	25-50	20-30	NP-5
	5-18	Sandy clay loam, clay loam	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-5	85-100	80-100	50-90	35-80	25-40	5-15
	18-35	Clay loam, loam, sandy loam	ML, SM	A-4	0	0-5	85-100	80-100	55-85	40-70	20-35	NP-10
	35-60	Sand, gravelly sand, loamy sand	SP, SP-SM, SM	A-1, A-3, A-2	0	0-5	65-100	55-100	25-70	0-15	---	NP
18E:												
Yawdim	0-3	Silty clay	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	3-12	Silty clay loam, clay loam, clay	CL, CH	A-7	0	0	100	100	90-100	70-95	40-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
21E:												
Cabbart	0-3	Loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	3-6	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-12	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
21E:												
Delpoint--------	0-5	Loam	CL-ML	A-4	0	0	95-100	90-100	75-90	55-75	20-30	5-10
	5-13	Loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	80-95	65-85	20-40	5-20
	13-25	Loam, clay loam, silt loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	75-90	60-80	20-40	5-20
	25-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
22F:												
Hillon----------	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
23B:												
Acel----------	0-5	Silty clay loam	CL	A-6	0	0	95-100	95-100	85-100	80-95	30-40	10-15
	5-19	Silty clay, clay	CL, CH	A-7	0	0	95-100	95-100	85-100	75-95	40-60	20-40
	19-60	Silty clay loam, silty clay, clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	35-50	15-30
24B:												
Farnuf----------	0-6	Loam	ML, CL-ML	A-4	0	0	80-100	75-100	60-100	55-80	20-30	NP-10
	6-11	Clay loam, loam, silty clay loam	CL	A-6	0	0	80-100	75-100	65-95	50-90	25-40	10-20
	11-30	Loam, clay loam, silt loam	CL, CL-ML	A-6, A-4	0	0	80-100	75-100	65-95	50-80	25-35	5-15
	30-60	Stratified gravelly sandy loam to silty clay loam	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-15	75-90	65-85	50-80	45-60	20-30	5-15
27B:												
Attewan---------	0-5	Loam	ML, CL-ML	A-4	0	0-5	85-100	80-100	70-90	55-75	20-30	NP-10
	5-13	Clay loam, sandy clay loam, gravelly loam	CL, SC	A-6	0	0-5	75-100	70-100	55-85	35-70	30-40	10-20
	13-21	Clay loam, gravelly clay loam, sandy clay loam	CL, SC, GC	A-6	0	0-5	70-100	65-100	50-85	35-65	30-40	10-20
	21-60	Very gravelly loamy sand, extremely gravelly loamy sand, very gravelly sand	GP, GP-GM, GM, SM	A-1	0	0-15	25-55	15-50	5-20	0-15	---	NP
28A:												
Nishon----------	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20
	4-16	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45
	16-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40
30B:												
Marvan----------	0-4	Silty clay	CL, CH	A-7	0	0	100	100	95-100	85-100	40-65	20-45
	4-25	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	25-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
30C:												
Marvan	0-4	Silty clay	CL, CH	A-7	0	0	100	100	95-100	85-100	40-65	20-45
	4-25	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	25-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
32B:												
Kobase	0-5	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	5-15	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
	15-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
32C:												
Kobase	0-5	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	5-15	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
	15-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
34A:												
Linnet	0-6	Clay	CL	A-7	0	0	90-100	85-100	80-100	75-95	40-50	15-25
	6-18	Silty clay, clay	CL, CH	A-7	0	0	90-100	85-100	75-100	60-90	45-65	25-45
	18-46	Silty clay, clay, silty clay loam	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-90	35-55	15-35
	46-60	Clay loam, silty clay loam, silty clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	65-95	50-85	35-55	15-35
35B:												
Assinniboine	0-7	Fine sandy loam	SM	A-4, A-2	0	0	85-100	75-100	55-80	25-45	15-25	NP-5
	7-15	Sandy clay loam, fine sandy loam	CL-ML, SC-SM, CL, SC	A-4, A-6	0	0	80-100	75-100	65-95	40-65	25-35	5-15
	15-43	Fine sandy loam, sandy loam, sandy clay loam	ML, SM, SC-SM, CL-ML	A-4	0	0	85-100	75-100	60-85	35-60	15-30	NP-10
	43-60	Stratified fine sandy loam to fine sand	SM	A-4, A-2	0	0	85-100	75-100	55-80	10-40	---	NP
36C:												
Chinook	0-6	Fine sandy loam	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	6-17	Fine sandy loam, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	17-60	Fine sandy loam, loamy fine sand, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
37B:												
Evanston	0-6	Loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	6-13	Clay loam, loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	13-33	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	33-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
37C:												
Evanston	0-6	Loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	6-13	Clay loam, loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	13-33	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	33-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
38B:												
Ethridge	0-5	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	25-45	10-20
	5-13	Silty clay, silty clay loam, clay	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	13-30	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	30-60	Silty clay loam, clay loam, silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
39C:												
Lisk	0-5	Sandy loam	SM	A-4	0	0	100	100	60-75	35-50	20-30	NP-5
	5-14	Sandy loam, fine sandy loam	ML, SM	A-4	0	0	100	100	60-85	35-60	20-30	NP-5
	14-36	Sandy loam, fine sandy loam	ML, SM	A-4, A-2	0	0	100	100	55-80	30-55	20-30	NP-5
	36-60	Loamy sand, loamy fine sand	SM	A-1, A-2	0	0	100	100	45-80	15-30	---	NP
39E:												
Lisk	0-5	Sandy loam	SM	A-4	0	0	100	100	60-75	35-50	20-30	NP-5
	5-14	Sandy loam, fine sandy loam	ML, SM	A-4	0	0	100	100	60-85	35-60	20-30	NP-5
	14-36	Sandy loam, fine sandy loam	ML, SM	A-4, A-2	0	0	100	100	55-80	30-55	20-30	NP-5
	36-60	Loamy sand, loamy fine sand	SM	A-1, A-2	0	0	100	100	45-80	15-30	---	NP
41C:												
Reeder	0-6	Loam	CL-ML	A-4	0	0	90-100	85-100	70-95	55-80	25-30	5-10
	6-12	Clay loam, sandy clay loam, loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	70-95	50-75	25-40	5-15
	12-23	Loam, sandy clay loam, clay loam	CL-ML, SC-SM	A-4	0	0-5	85-100	80-100	65-90	45-65	25-30	5-10
	23-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
43B:												
Marmarth	0-6	Loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-80	25-30	5-10
	6-11	Clay loam, loam, sandy clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	60-80	25-40	5-20
	11-22	Loam, fine sandy loam, clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	60-80	25-35	5-15
	22-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
47B:												
Marias	0-7	Silty clay	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-40
	7-28	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	28-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
51F:												
Elve	0-19	Very cobbly loam	GM, SM	A-2, A-4	5-15	20-30	50-75	40-65	35-50	30-45	15-25	NP-5
	19-60	Extremely cobbly sandy loam, extremely cobbly loam	GM, GP-GM	A-1	5-10	40-45	25-55	15-45	10-30	5-25	15-25	NP-5
54B:												
Lawther	0-6	Clay	CL, CH	A-7	0	0	100	100	90-100	85-95	40-55	20-35
	6-19	Silty clay, clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	90-100	80-95	35-65	20-45
	19-60	Silty clay, clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	90-100	80-95	35-65	20-45
54C:												
Lawther	0-6	Clay	CL, CH	A-7	0	0	100	100	90-100	85-95	40-55	20-35
	6-19	Silty clay, clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	90-100	80-95	35-65	20-45
	19-60	Silty clay, clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	90-100	80-95	35-65	20-45
58B:												
Lonna	0-6	Silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-35	10-15
	6-12	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	12-48	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	48-60	Silty clay loam, silt loam, very fine sandy loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
58C:												
Lonna	0-6	Silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-35	10-15
	6-12	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	12-48	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	48-60	Silty clay loam, silt loam, very fine sandy loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
60A:												
Havre	0-5	Clay loam	CL	A-6	0	0	100	100	85-100	75-95	30-40	10-20
	5-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
63B:												
Nunemaker	0-6	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	85-95	40-45	20-25
	6-12	Silty clay	CH, CL	A-7	0	0	95-100	95-100	95-100	85-95	40-60	20-35
	12-29	Silty clay, clay loam	CH, CL	A-7	0	0	95-100	95-100	85-100	80-90	40-60	20-35
	29-60	Clay, clay loam	CL, CH	A-7	0	0	95-100	90-100	80-100	70-90	40-55	20-30
63C:												
Nunemaker	0-6	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	85-95	40-45	20-25
	6-12	Silty clay	CH, CL	A-7	0	0	95-100	95-100	95-100	85-95	40-60	20-35
	12-29	Silty clay, clay loam	CH, CL	A-7	0	0	95-100	95-100	85-100	80-90	40-60	20-35
	29-60	Clay, clay loam	CL, CH	A-7	0	0	95-100	90-100	80-100	70-90	40-55	20-30
64D:												
Barkof	0-10	Clay	CL, CH	A-7	0	0	100	100	90-100	75-90	45-60	20-30
	10-26	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-90	45-65	25-45
	26-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
67B:												
Bearpaw	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-12	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	12-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
67C:												
Bearpaw	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-12	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	12-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
69C:												
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
71D:												
Roy	0-7	Gravelly clay loam	CL-ML, CL, GC, GM-GC	A-4, A-6	0-5	0-10	65-80	60-75	55-70	40-60	25-35	5-15
	7-32	Very gravelly clay loam, very gravelly clay	GC	A-2, A-6, A-7	0-5	0-15	40-55	35-50	30-50	25-45	30-50	15-30
	32-60	Extremely gravelly sandy clay loam, extremely gravelly clay loam	GC, GM-GC	A-2	0-5	0-15	20-30	15-25	10-25	5-20	25-35	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
71D:												
Roy	0-7	Very cobbly clay loam	GC, GM-GC	A-4, A-6	0-5	20-30	50-70	45-65	40-60	35-50	25-35	5-15
	7-32	Very gravelly clay loam, very gravelly clay	GC	A-2, A-6, A-7	0-5	0-15	40-55	35-50	30-50	25-45	30-50	15-30
	32-60	Extremely gravelly sandy clay loam, extremely gravelly clay loam	GC, GM-GC	A-2	0-5	0-15	20-30	15-25	10-25	5-20	25-35	5-15
71F:												
Roy	0-7	Gravelly clay loam	CL-ML, CL, GC, GM-GC	A-4, A-6	0-5	0-10	65-80	60-75	55-70	40-60	25-35	5-15
	7-32	Very gravelly clay loam, very gravelly clay	GC	A-2, A-6, A-7	0-5	0-15	40-55	35-50	30-50	25-45	30-50	15-30
	32-60	Extremely gravelly sandy clay loam, extremely gravelly clay loam	GC, GM-GC	A-2	0-5	0-15	20-30	15-25	10-25	5-20	25-35	5-15
72F:												
Zahill	0-6	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	6-16	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	16-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
75C:												
Benz	0-3	Clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	3-60	Stratified clay loam to sandy loam	CL	A-6	0	0	100	100	90-95	65-80	30-40	10-20
77D:												
Tinsley	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP
77F:												
Tinsley	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP
79B:												
Yamacall	0-5	Loam	CL-ML	A-4	0	0-5	85-100	80-100	60-85	55-75	25-30	5-10
	5-12	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	65-90	60-80	25-35	5-15
	12-60	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
82B:												
Savage	0-3	Silty clay loam	CL, CL-ML	A-6, A-4	0	0	95-100	95-100	90-100	75-95	25-40	5-15
	3-16	Clay, silty clay, silty clay loam	CL	A-7, A-6	0	0	95-100	95-100	85-100	75-95	35-50	15-30
	16-60	Silty clay, silty clay loam, clay	CL	A-7, A-6	0	0-5	90-100	85-100	75-100	65-95	30-50	10-30
86C:												
Work	0-4	Clay loam	CL	A-6	0	0-5	90-100	80-100	70-90	60-80	30-40	10-20
	4-12	Clay, clay loam	CL, CH	A-7, A-6	0	0-5	90-100	80-100	70-95	60-85	30-55	10-30
	12-22	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	90-100	80-100	65-90	55-80	25-45	5-20
	22-60	Gravelly clay loam, gravelly clay loam, loam	CL, CL-ML, GC, SC	A-4, A-6, A-7	0	0-10	60-100	55-100	50-95	35-75	25-45	5-20
87C:												
Tamaneen	0-7	Clay loam	CL	A-6	0	0-5	85-100	85-100	70-95	65-90	30-40	10-20
	7-14	Silty clay, silty clay loam, clay loam	CL	A-6, A-7	0	0-5	85-100	85-100	75-95	70-90	35-50	15-30
	14-26	Clay loam, silty clay, gravelly silty clay loam	CL	A-6, A-7	0	0-5	75-95	70-90	55-80	50-75	30-50	10-25
	26-31	Very gravelly loam, gravelly clay loam	GM-GC, GC	A-2, A-4, A-6	0	0-15	50-60	45-55	30-50	25-45	25-40	5-15
	31-60	Extremely gravelly sandy loam, extremely gravelly loam	GM, GM-GC, GP-GM	A-1, A-2	0	10-30	25-40	15-30	10-25	5-20	20-30	NP-10
Tamaneen	0-7	Cobbly clay loam	CL	A-6	0	15-35	85-95	75-90	70-85	65-80	30-40	10-20
	7-14	Silty clay, silty clay loam, clay loam	CL	A-6, A-7	0	0-5	85-100	85-100	75-95	70-90	35-50	15-30
	14-26	Clay loam, silty clay, gravelly silty clay loam	CL	A-6, A-7	0	0-5	75-95	70-90	55-80	50-75	30-50	10-25
	26-31	Very gravelly loam, gravelly clay loam	GM-GC, GC	A-2, A-4, A-6	0	0-15	50-60	45-55	30-50	25-45	25-40	5-15
	31-60	Extremely gravelly sandy loam, extremely gravelly loam	GM, GM-GC, GP-GM	A-1, A-2	0	10-30	25-40	15-30	10-25	5-20	20-30	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
88C:												
Perma	0-12	Gravelly loam	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	12-36	Very gravelly loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0	10-40	50-70	40-60	30-50	20-40	20-30	NP-10
	36-60	Extremely gravelly sandy loam, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0	15-40	20-40	10-30	5-25	0-15	15-25	NP-5
88E:												
Perma	0-12	Gravelly loam	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	12-36	Very gravelly loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0	10-40	50-70	40-60	30-50	20-40	20-30	NP-10
	36-60	Extremely gravelly sandy loam, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0	15-40	20-40	10-30	5-25	0-15	15-25	NP-5
90A:												
Harlake	0-7	Silty clay	CL, CH	A-7	0	0	100	100	90-100	75-90	40-65	20-40
	7-38	Stratified clay to silt loam	CL, CH	A-7	0	0	100	100	95-100	85-95	40-70	15-45
	38-60	Stratified silty clay loam to fine sandy loam	CL, CL-ML	A-6, A-4	0	0	100	100	85-95	60-75	20-40	5-15
92D:												
Sunburst	0-4	Clay loam	CL	A-6	0	0-10	95-100	85-95	85-95	75-85	30-40	10-20
	4-23	Clay, clay loam, silty clay loam	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30
	23-60	Clay, clay loam, silty clay	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30
92F:												
Sunburst	0-4	Clay loam	CL	A-6	0	0-10	95-100	85-95	85-95	75-85	30-40	10-20
	4-23	Clay, clay loam, silty clay loam	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30
	23-60	Clay, clay loam, silty clay	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
94C:												
Busby	0-7	Fine sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	7-14	Fine sandy loam, sandy loam, loam	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	14-29	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	29-60	Loamy fine sand, loamy sand, fine sandy loam	SM	A-2, A-4	0	0	100	100	60-85	20-50	15-25	NP-5
94E:												
Busby	0-7	Fine sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	7-14	Fine sandy loam, sandy loam, loam	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	14-29	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	29-60	Loamy fine sand, loamy sand, fine sandy loam	SM	A-2, A-4	0	0	100	100	60-85	20-50	15-25	NP-5
98C:												
Kremlin	0-6	Loam	CL-ML	A-4	0	0	95-100	90-100	75-95	50-75	25-30	5-10
	6-22	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-95	55-80	25-35	5-15
	22-36	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-95	55-80	25-35	5-15
	36-60	Stratified sandy loam to silt loam	ML, CL-ML	A-4	0	0	90-100	85-100	70-90	50-75	20-30	NP-10
100F:												
Rubble land.												
115B:												
Thoeny	0-6	Loam	CL	A-6	0	0-5	95-100	85-95	85-95	65-75	25-35	10-15
	6-18	Clay, clay loam	CL, CH	A-6, A-7	0	0-5	95-100	85-95	85-95	75-95	35-55	15-30
	18-28	Clay loam, clay	CL, CH	A-6, A-7	0	0-5	95-100	85-95	85-95	70-80	35-55	15-30
	28-41	Clay loam	CL	A-6	0	0-5	95-100	85-95	85-95	70-80	35-55	15-30
	41-60	Clay loam	CL	A-6, A-7	0	0-5	95-100	85-95	85-95	70-80	30-45	15-25
Elloam	0-2	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	2-9	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	9-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	15-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
171C:												
Delpoint	0-5	Loam	CL-ML	A-4	0	0	95-100	90-100	75-90	55-75	20-30	5-10
	5-13	Loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	80-95	65-85	20-40	5-20
	13-25	Loam, clay loam, silt loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	75-90	60-80	20-40	5-20
	25-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Cabbart	0-3	Loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	3-6	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-12	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
190B:												
Hedstrom	0-6	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	90-100	85-100	60-85	35-60	20-25	5-10
	6-16	Sandy clay loam, clay loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	70-85	50-65	25-35	5-15
	16-22	Sandy clay loam, loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	70-90	50-65	25-35	5-15
	22-60	Fine sand, sand, loamy fine sand	SM	A-2	0	0	80-100	75-100	50-80	15-35	---	NP
200F:												
Badland.												
201D:												
Cabba	0-4	Loam	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	4-12	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Wayden	0-5	Silty clay	CH, CL	A-7	0	0	100	100	90-100	80-95	40-60	20-35
	5-12	Clay loam, silty clay, silty clay loam	CH, CL	A-7, A-6	0	0	100	100	90-100	80-95	35-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
201F:												
Cabba	0-4	Loam	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	4-12	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Wayden	0-5	Silty clay	CH, CL	A-7	0	0	100	100	90-100	80-95	40-60	20-35
	5-12	Clay loam, silty clay, silty clay loam	CH, CL	A-7, A-6	0	0	100	100	90-100	80-95	35-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
211E:												
Cabbart	0-3	Loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	3-6	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-12	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Yawdim	0-3	Silty clay	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	3-12	Silty clay loam, clay loam, clay	CL, CH	A-7	0	0	100	100	90-100	70-95	40-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
211F:												
Cabbart	0-3	Loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	3-6	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-12	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
211F:												
Yawdim	0-3	Silty clay	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	3-12	Silty clay loam, clay loam	CL, CH	A-7	0	0	100	100	90-100	70-95	40-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
221E:												
Hillon	0-6	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Kevin	0-3	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-8	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	8-25	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	25-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
224B:												
Hillon	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Joplin	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-20	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	20-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
224E:												
Hillon	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Joplin	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-20	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	20-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
225F:												
Hillon	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Cabbart	0-3	Loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	3-6	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-12	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Yawdim	0-3	Silty clay	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	3-12	Silty clay loam, clay loam	CL, CH	A-7	0	0	100	100	90-100	70-95	40-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
261C:												
Auchard	0-2	Clay loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	75-95	60-80	25-40	5-15
	2-6	Clay, silty clay	CL, CH	A-6, A-7	0	0	90-100	85-100	75-100	70-95	35-55	15-30
	6-11	Silty clay loam, silty clay, clay	CL, CH	A-6, A-7	0	0	90-100	85-100	75-100	70-95	30-55	10-30
	11-22	Silty clay loam, clay loam, silty clay	CL	A-6, A-7	0	0	90-100	85-100	75-100	65-95	30-50	10-25
	22-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Williams	0-5	Loam	CL-ML, CL	A-4	0	0-5	95-100	85-100	85-95	75-90	20-30	5-10
	5-17	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	17-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
271D:												
Beaverell	0-5	Gravelly loam	SM, GM, ML, CL-ML	A-4	0	0-15	70-85	60-75	45-65	40-60	20-30	NP-10
	5-13	Very gravelly clay loam, very gravelly sandy clay loam, very gravelly loam	GC, GM-GC	A-2	0	0-25	40-60	30-50	20-45	15-35	25-40	5-15
	13-60	Stratified very gravelly loamy sand to extremely gravelly sand	GM, SM, GP-GM, SP-SM	A-1	0	10-40	35-65	25-55	10-45	5-15	---	NP
Tinsley	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP
272C:												
Attewan	0-5	Loam	ML, CL-ML	A-4	0	0-5	85-100	80-100	70-90	55-75	20-30	NP-10
	5-13	Clay loam, sandy clay loam, gravelly loam	CL, SC	A-6	0	0-5	75-100	70-100	55-85	35-70	30-40	10-20
	13-21	Clay loam, gravelly clay loam, sandy clay loam	CL, SC, GC	A-6	0	0-5	70-100	65-100	50-85	35-65	30-40	10-20
	21-60	Very gravelly loamy sand, extremely gravelly loamy sand, very gravelly sand	GP, GP-GM, GM, SM	A-1	0	0-15	25-55	15-50	5-20	0-15	---	NP
Tinsley	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
301C:												
Marvan	0-4	Silty clay	CL, CH	A-7	0	0	100	100	95-100	85-100	40-65	20-45
	4-25	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	25-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
Vanda	0-4	Silty clay	CL, CH	A-7	0	0	100	100	95-100	75-95	40-65	20-45
	4-60	Clay, silty clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	95-100	80-95	35-65	15-45
302B:												
Marvan	0-4	Clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-25	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	25-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
304B:												
Marvan	0-4	Silty clay	CL, CH	A-7	0	0	100	100	95-100	85-100	40-65	20-45
	4-11	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	11-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
Joplin	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-20	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	20-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
306D:												
Marvan	0-4	Clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-11	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	11-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
Yawdim	0-3	Silty clay	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	3-12	Silty clay loam, clay loam, clay loam	CL, CH	A-7	0	0	100	100	90-100	70-95	40-60	15-35
	12-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
Cabbart	0-3	Loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	3-6	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-12	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
311B:												
Ferd	0-5	Loam	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	5-9	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-95	70-90	25-40	5-15
	9-16	Clay loam, silty clay loam, clay loam	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	16-22	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	22-60	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
311B:												
Creed	0-6	Loam	CL-ML, SC-SM	A-4	0	0	90-100	75-100	65-95	45-75	20-30	5-10
	6-12	Silty clay, clay, silty clay loam	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	12-31	Silty clay loam, clay loam, clay	CL, SC	A-6, A-7	0	0	90-100	75-100	60-100	35-90	30-50	15-25
	31-60	Stratified loam to silty clay loam	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20
Gerdrum	0-3	Clay loam	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	3-11	Clay, silty clay, silty clay loam	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	11-38	Clay loam, sandy clay loam, clay	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
	38-60	Clay loam, sandy clay loam, clay	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
321B:												
Kobase	0-5	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	5-15	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	15-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
321C:												
Kobase	0-5	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	5-15	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	15-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
323B:												
Sagedale	0-5	Silty clay	CL	A-7	0	0	100	100	95-100	90-100	40-45	20-25
	5-12	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
	12-25	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
	25-60	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
323C:												
Sagedale	0-5	Silty clay	CL	A-7	0	0	100	100	95-100	90-100	40-45	20-25
	5-12	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
	12-25	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
	25-60	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
331B:												
Phillips	0-7	Loam	CL-ML	A-4	0	0-5	85-100	80-100	75-100	55-80	20-30	5-10
	7-16	Clay, clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	16-50	Clay loam, loam	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	50-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15
Elloam	0-2	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	2-9	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	9-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	15-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
351B:												
Kenilworth	0-5	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	15-25	NP-5
	5-10	Fine sandy loam, sandy clay loam	CL-ML, SC-SM	A-4	0	0	100	100	75-90	35-55	20-30	5-10
	10-21	Sandy clay loam, clay loam	CL, SC	A-6	0	0	100	100	85-95	45-75	25-35	10-15
	21-40	Clay loam, silty clay loam	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20
	40-60	Clay loam, silty clay loam	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20
Fortbenton	0-7	Fine sandy loam	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	7-28	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	28-60	Silty clay loam, clay loam	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15
363B:												
Cozberg	0-4	Fine sandy loam	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	4-16	Fine sandy loam, very fine sandy loam, sandy loam	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	16-30	Fine sandy loam, very fine sandy loam, sandy loam	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	30-60	Loamy sand, sand, gravelly loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
Chinook	0-6	Fine sandy loam	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	6-17	Fine sandy loam, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	17-60	Fine sandy loam, loamy fine sand, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
368C:												
Fortbenton	0-7	Fine sandy loam	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	7-28	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	28-60	Silty clay loam, clay loam	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
368C:												
Hillon	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
385B:												
Ethridge	0-5	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	25-45	10-20
	5-13	Silty clay, silty clay loam, clay	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	13-30	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	30-60	Silty clay loam, clay loam, silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
Kobase	0-5	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	5-15	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	15-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
401C:												
Gerdrum	0-3	Clay loam	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	3-11	Clay, silty clay, silty clay loam	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	11-38	Clay loam, sandy clay loam, clay	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
	38-60	Clay loam, sandy clay loam, clay	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
Yamacall	0-5	Loam	CL-ML	A-4	0	0-5	85-100	80-100	60-85	55-75	25-30	5-10
	5-12	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	65-90	60-80	25-35	5-15
	12-60	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
421C:												
Joplin	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-20	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	20-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Hillon	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
441C:												
Kevin	0-3	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-8	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	8-25	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	25-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Hillon	0-6	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
442C:												
Kevin	0-3	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-8	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	8-25	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	25-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
442C:												
Elloam	0-2	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	2-9	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	9-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	15-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
445E:												
Kevin	0-3	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-8	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	8-25	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	25-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Hillon	0-6	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	6-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Nishon	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20
	4-16	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45
	16-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40
471B:												
Marias	0-7	Silty clay	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-40
	7-28	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	28-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
Kobase	0-5	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	5-15	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	15-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
491B:												
Enbar	0-21	Loam	CL-ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	5-10
	21-42	Loam, clay loam	CL-ML	A-4	0	0	80-100	75-100	65-90	55-80	20-30	5-10
	42-60	Loam, sandy loam	CL-ML, ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	NP-10
Nesda	0-5	Loam	ML, SM	A-4	0	0-5	90-100	85-100	70-95	50-75	15-25	NP-5
	5-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand	GP, GM, GP-GM, SP-SM	A-1	0	0-25	25-60	15-50	5-35	0-15	---	NP
493B:												
Enbar	0-21	Loam	CL-ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	5-10
	21-42	Loam, clay loam	CL-ML	A-4	0	0	80-100	75-100	65-90	55-80	20-30	5-10
	42-60	Loam, sandy loam	CL-ML, ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	NP-10
493B:												
Bigsandy	0-3	Loam	CL-ML, ML	A-4	0	0	100	100	85-95	60-75	25-35	5-10
	3-11	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	11-29	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	29-60	Stratified fine sand to clay	CL-ML, CL	A-4, A-6	0	0	100	100	75-95	50-85	25-40	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
493B:												
Korchea	0-6	Loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
	6-60	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
503B:												
Telstad	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	6-14	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	14-28	Clay loam, loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	28-60	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Joplin	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-20	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	20-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
503C:												
Telstad	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	6-14	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	14-28	Clay loam, loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	28-60	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Joplin	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-20	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	20-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
512F:												
Elve	0-19	Very cobbly loam	GM, SM	A-2, A-4	5-15	20-30	50-75	40-65	35-50	30-45	15-25	NP-5
	19-60	Extremely cobbly sandy loam, extremely cobbly loam	GM, GP-GM	A-1	5-10	40-45	25-55	15-45	10-30	5-25	15-25	NP-5
Rubble land.												
521C:												
Elloam	0-2	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	2-9	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	9-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	15-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
521C:												
Absher	0-1	Clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	1-7	Silty clay, clay, clay loam	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	7-60	Clay loam, clay, silty clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
531C:												
Turner	0-8	Loam	CL-ML	A-4	0	0-10	80-100	75-100	65-95	50-75	25-30	5-10
	8-17	Clay loam, sandy clay loam, gravelly loam	CL, GC, SC	A-6	0	0-10	65-100	60-100	55-90	35-70	30-40	10-20
	17-23	Loam, clay loam, gravelly loam	CL, GC, SC	A-6	0	0-10	65-100	60-100	55-95	40-75	30-40	10-15
	23-60	Very gravelly loamy sand, very gravelly sand, extremely gravelly sand	GP, GM, GP-GM	A-1	0	10-30	25-40	15-50	10-35	0-15	---	NP
Beaverton	0-5	Gravelly loam	CL-ML, SC-SM, GM-GC	A-4, A-2	0	0-10	65-80	60-75	50-70	30-60	25-30	5-10
	5-15	Very gravelly clay loam, very gravelly sandy clay loam	GM-GC, GC	A-4, A-2, A-6	0	0-25	40-55	35-50	30-45	20-40	25-35	5-15
	15-60	Extremely gravelly loamy sand, extremely gravelly sand, very gravelly loamy sand	GM, GP, GP-GM, SM	A-1	0	0-30	25-60	15-50	10-35	0-15	---	NP
561B:												
Scobey	0-6	Clay loam	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-12	Clay, clay loam	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	12-60	Clay loam	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Kevin	0-3	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-8	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	8-25	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	25-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
561C:												
Scobey	0-6	Clay loam	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-12	Clay, clay loam	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	12-60	Clay loam	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Kevin	0-3	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-8	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	8-25	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	25-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
601A:												
Havre	0-5	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	5-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	70-95	60-80	20-35	5-15
Glendive	0-6	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4, A-2	0	0	100	100	65-85	30-55	20-30	NP-10
	6-32	Loam, fine sandy loam, sandy loam	ML, CL-ML, SM, SC-SM	A-4	0	0	100	100	65-95	40-70	15-30	NP-10
	32-60	Stratified loamy fine sand to silt loam	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-80	25-50	15-25	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
603B:												
Thibadeau	0-2	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	2-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	70-95	60-80	20-35	5-15
605C:												
Yamacall	0-5	Loam	CL-ML	A-4	0	0-5	85-100	80-100	60-85	55-75	25-30	5-10
	5-12	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	65-90	60-80	25-35	5-15
	12-60	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
Havre	0-5	Loam	ML, CL-ML	A-4	0	0	100	100	80-95	60-75	20-30	NP-10
	5-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	50-70	20-35	5-15
631B:												
Nunemaker	0-6	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	85-95	40-45	20-25
	6-19	Silty clay	CH	A-7	0	0	95-100	95-100	95-100	85-95	50-65	25-35
	19-60	Clay loam, clay	CL, CH	A-7	0	0	95-100	90-100	80-100	70-90	40-55	20-30
631C:												
Nunemaker	0-6	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	85-95	40-45	20-25
	6-19	Silty clay	CH	A-7	0	0	95-100	95-100	95-100	85-95	50-65	25-35
	19-60	Clay loam, clay	CL, CH	A-7	0	0	95-100	90-100	80-100	70-90	40-55	20-30
661C:												
Twilight	0-6	Fine sandy loam	SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-5
	6-13	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-5
	13-35	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-5
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
Blacksheep	0-4	Fine sandy loam	SM, ML	A-4	0	0-5	90-100	85-100	60-85	35-55	15-25	NP-5
	4-18	Fine sandy loam, sandy loam, very fine sandy loam	SM	A-4	0	0-5	90-100	85-100	60-80	35-50	15-25	NP-5
	18-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
671C:												
Bearpaw	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-12	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	12-20	Clay loam, silty clay loam, clay loam	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Nishon	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20
	4-16	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45
	16-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
673B:												
Bearpaw	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-12	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	12-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Daglum	0-14	Clay loam	CL	A-6	0	0-5	85-100	80-100	70-100	55-80	30-40	10-20
	14-29	Clay, clay loam	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	20-40
	29-60	Clay, clay loam	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	20-40
691D:												
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Williams	0-5	Loam	CL-ML, CL	A-4	0	0-5	95-100	85-100	85-95	75-90	20-30	5-10
	5-17	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	17-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
692D:												
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Bearpaw	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-12	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	12-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
693D:												
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Bearpaw	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-12	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	12-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Nishon	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20
	4-16	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45
	16-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40
695C:												
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Zahill	0-6	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	6-16	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	16-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
695E:												
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Zahill	0-6	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	6-16	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	16-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
702F:												
Winspect	0-3	Cobbly loam	CL-ML, SC-SM, GM-GC	A-4	0	15-25	70-95	65-90	55-85	35-65	25-30	5-10
	3-8	Cobbly loam, very cobbly loam, stony clay loam	GM-GC, GC, CL-ML, CL	A-4, A-6	0	20-30	65-90	60-80	55-75	45-65	25-35	5-15
	8-18	Cobbly clay loam, very cobbly loam, very cobbly sandy clay loam	GM-GC, GC, SC, GM-GC	A-4, A-6, A-2	0	30-45	60-75	50-65	35-55	25-45	25-35	5-15
	18-60	Very cobbly clay loam, very cobbly clay loam, very cobbly loam	GM-GC, GC, SC, SC-SM	A-4, A-6, A-2	0	30-45	55-70	45-60	35-50	25-40	25-35	5-15
Winspect	0-3	Cobbly loam	CL-ML, SC-SM, GM-GC	A-4	0	15-25	70-95	65-90	55-85	35-65	25-30	5-10
	3-8	Cobbly loam, very cobbly loam, stony clay loam	GM-GC, GC, CL-ML, CL	A-4, A-6	0	20-30	65-90	60-80	55-75	45-65	25-35	5-15
	8-18	Cobbly clay loam, very cobbly loam, very cobbly sandy clay loam	GM-GC, GC, SC, GM-GC	A-4, A-6, A-2	0	30-45	60-75	50-65	35-55	25-45	25-35	5-15
	18-60	Very cobbly clay loam, very cobbly clay loam, very cobbly loam	GM-GC, GC, SC, SC-SM	A-4, A-6, A-2	0	30-45	55-70	45-60	35-50	25-40	25-35	5-15
Rock outcrop.												
712E:												
Roy	0-7	Gravelly clay loam	CL-ML, CL, GC, GM-GC	A-4, A-6	0-5	0-10	65-80	60-75	55-70	40-60	25-35	5-15
	7-32	Very gravelly clay loam, very gravelly clay	GC	A-2, A-6, A-7	0-5	0-15	40-55	35-50	30-50	25-45	30-50	15-30
	32-60	Extremely gravelly sandy clay loam, extremely gravelly clay loam	GC, GM-GC	A-2	0-5	0-15	20-30	15-25	10-25	5-20	25-35	5-15
712E:												
Barkof	0-10	Clay	CL, CH	A-7	0	0	100	100	90-100	75-90	45-60	20-30
	10-26	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-90	45-65	25-45
	26-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
712F:												
Roy	0-7	Gravelly clay loam	CL-ML, CL, GC, GM-GC	A-4, A-6	0-5	0-10	65-80	60-75	55-70	40-60	25-35	5-15
	7-32	Very gravelly clay loam, very gravelly clay	GC	A-2, A-6, A-7	0-5	0-15	40-55	35-50	30-50	25-45	30-50	15-30
	32-60	Extremely gravelly sandy clay loam, extremely gravelly clay loam	GC, GM-GC	A-2	0-5	0-15	20-30	15-25	10-25	5-20	25-35	5-15
Barkof	0-10	Clay	CL, CH	A-7	0	0	100	100	90-100	75-90	45-60	20-30
	10-26	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-90	45-65	25-45
	26-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
723F:												
Zahill	0-6	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	6-16	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	16-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Cabba	0-4	Loam	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	4-12	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	12-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
781C:												
Creed	0-6	Loam	CL-ML, SC-SM	A-4	0	0	90-100	75-100	65-95	45-75	20-30	5-10
	6-12	Silty clay, clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	12-31	Silty clay loam, clay loam, clay loam	CL, SC	A-6, A-7	0	0	90-100	75-100	60-100	35-90	30-50	15-25
	31-60	Stratified loam to silty clay loam	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20
Weingart	0-2	Clay loam	CL	A-6, A-7	0	0	90-100	90-100	65-90	60-85	30-45	10-25
	2-5	Clay, silty clay	CL, CH	A-7	0	0	90-100	90-100	80-100	75-95	40-65	20-40
	5-10	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	75-100	70-90	35-60	15-35
	10-25	Clay, silty clay, clay loam	CL, CH, SC, GC	A-6, A-7	0	0	60-95	55-90	50-85	45-80	35-60	15-35
	25-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
791B:												
Yamacall	0-5	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-85	55-75	25-30	5-10
	5-12	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	12-60	Loam, fine sandy loam, silt loam	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
801B:												
Williams	0-5	Loam	CL-ML, CL	A-4	0	0-5	95-100	85-100	85-95	75-90	20-30	5-10
	5-17	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	17-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
801C:												
Williams	0-5	Loam	CL-ML, CL	A-4	0	0-5	95-100	85-100	85-95	75-90	20-30	5-10
	5-17	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	17-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
Vida	0-5	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
812A:												
Glendive	0-6	Fine sandy loam	SM, ML	A-2, A-4	0	0	100	100	65-85	30-55	15-20	NP-5
	6-32	Loam, fine sandy loam, sandy loam	ML, CL-ML, SM, SC-SM	A-4	0	0	100	100	65-95	40-70	15-25	NP-10
	32-60	Stratified loamy fine sand to clay loam	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-90	25-50	15-25	NP-10
Havre	0-5	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	5-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15
882F:												
Perma	0-11	Gravelly loam	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	11-37	Very gravelly loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0-5	10-35	50-70	40-60	30-50	20-40	20-30	NP-10
	37-60	Extremely gravelly sandy loam, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0-5	15-35	20-40	10-30	5-25	0-15	15-25	NP-5
Whitlash	0-9	Gravelly loam	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	9-16	Very cobbly loam, extremely channery loam, very gravelly sandy loam	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	16-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
892F:												
Whitlash	0-9	Gravelly loam	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	9-16	Very cobbly loam, extremely channery loam, very gravelly sandy loam	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	16-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
952F:												
Dast	0-3	Sandy loam	SM, ML	A-4, A-2	0	0	80-100	75-100	50-80	30-55	15-25	NP-5
	3-18	Fine sandy loam, sandy loam, loam	SM, ML	A-4, A-2	0	0	80-100	75-100	55-85	30-55	15-25	NP-5
	18-26	Fine sandy loam, sandy loam, loam	SM, ML	A-4, A-2	0	0	80-100	75-100	55-85	30-55	15-25	NP-5
	26-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
DA:												
Denied access.												
M-W:												
Miscellaneous water.												
W:												
Water.												

Physical Properties of Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
5A:											
McKenzie	0-6	40-60	1.00-1.40	0.00-0.06	0.13-0.17	High	2.0-4.0	0.37	0.37	5	4
	6-27	40-60	1.20-1.60	0.00-0.06	0.13-0.17	High	0.5-1.0	0.37	---		
	27-60	40-60	1.20-1.60	0.00-0.06	0.13-0.17	High	0.0-0.5	0.37	---		
12C:											
Beaverton	0-5	15-27	1.15-1.35	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.17	0.37	2	6
	5-15	25-35	1.50-1.70	0.60-2.00	0.08-0.10	Low	0.5-1.0	0.10	0.32		
	15-60	0-10	1.50-1.75	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.02	0.10		
14C:											
Brockway	0-4	18-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	1.0-2.0	0.37	0.37	5	4L
	4-8	18-27	1.25-1.45	0.60-2.00	0.18-0.20	Low	0.5-1.0	0.37	0.37		
	8-60	18-35	1.25-1.45	0.20-0.60	0.14-0.17	Low	0.0-0.5	0.37	0.37		
15E:											
Lambeth	0-4	20-27	1.20-1.40	0.20-0.60	0.18-0.22	Low	1.0-2.0	0.43	0.43	5	4L
	4-60	20-35	1.25-1.50	0.20-0.60	0.17-0.21	Moderate	0.0-1.0	0.37	0.37		
15F:											
Lambeth	0-4	20-27	1.20-1.40	0.20-0.60	0.18-0.22	Low	1.0-2.0	0.43	0.43	5	4L
	4-66	20-35	1.25-1.50	0.20-0.60	0.17-0.21	Moderate	0.0-1.0	0.37	0.37		
16B:											
Degrand	0-5	10-20	1.25-1.45	2.00-6.00	0.13-0.16	Low	2.0-3.0	0.24	0.24	3	3
	5-18	20-35	1.40-1.60	0.60-2.00	0.13-0.16	Moderate	1.0-2.0	0.32	0.32		
	18-35	15-30	1.35-1.60	0.60-2.00	0.13-0.16	Low	0.5-1.0	0.32	0.32		
	35-60	0-5	1.50-1.70	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.10	0.15		
18E:											
Yawdim	0-3	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	0.5-1.0	0.32	0.32	1	4
	3-12	35-50	1.20-1.40	0.06-0.20	0.15-0.18	High	0.0-0.5	0.32	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
21E:											
Cabbart	0-3	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	3-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	6-12	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
Delpoint	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	4L
	5-13	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	13-25	18-35	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	25-60	---	---	---	---	---	---	---	---		
22F:											
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
23B:											
Acel	0-5	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	7
	5-19	40-55	1.25-1.45	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	19-60	35-45	1.35-1.60	0.06-0.20	0.14-0.17	High	0.0-0.5	0.37	0.37		
24B:											
Farnuf	0-6	20-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.32	0.32	5	6
	6-11	25-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32		
	11-30	20-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
	30-60	15-30	1.30-1.50	0.60-2.00	0.12-0.16	Low	0.0-0.5	0.20	0.32		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
27B:											
Attewan	0-5	10-20	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	5
	5-13	20-35	1.40-1.60	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	13-21	15-30	1.40-1.60	0.60-2.00	0.13-0.15	Moderate	0.5-1.0	0.32	0.32		
	21-60	0-10	1.40-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.24		
28A:											
Nishon	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-16	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	16-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		
30B:											
Marvan	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37	5	4
	4-25	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	25-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
30C:											
Marvan	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37	5	4
	4-25	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	25-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
32B:											
Kobase	0-5	35-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37	5	4
	5-15	35-45	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	15-60	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	---	0.37	0.37		
32C:											
Kobase	0-5	35-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37	5	4
	5-15	35-45	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	15-60	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	---	0.37	0.37		
34A:											
Linnet	0-6	40-45	1.15-1.35	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	5	4
	6-18	45-60	1.30-1.50	0.06-0.20	0.13-0.16	High	0.5-1.0	0.32	0.32		
	18-46	35-50	1.30-1.50	0.06-0.20	0.13-0.16	High	0.0-0.5	0.32	0.32		
	46-60	35-50	1.30-1.55	0.06-0.20	0.12-0.15	High	0.0-0.5	0.32	0.32		
35B:											
Assinniboine	0-7	5-15	1.30-1.50	0.60-2.00	0.13-0.16	Low	1.0-2.0	0.24	0.24	5	3
	7-15	18-30	1.40-1.60	0.60-2.00	0.14-0.17	Low	0.5-1.0	0.32	0.32		
	15-43	10-27	1.45-1.65	0.60-2.00	0.12-0.15	Low	0.5-1.0	0.24	0.24		
	43-60	0-15	1.50-1.70	2.00-6.00	0.07-0.09	Low	0.0-0.5	0.20	0.20		
36C:											
Chinook	0-6	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	6-17	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	17-60	5-18	1.40-1.60	2.00-6.00	0.11-0.12	Low	0.0-1.0	0.20	0.20		
37B:											
Evanston	0-6	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-13	25-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	13-33	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	33-60	20-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
37C:											
Evanston	0-6	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-13	25-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	13-33	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	33-60	20-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
38B:											
Ethridge	0-5	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	7
	5-13	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	13-30	25-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	30-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
39C:											
Lisk	0-5	5-18	1.25-1.45	2.00-6.00	0.12-0.16	Low	1.0-3.0	0.20	0.20	5	3
	5-14	5-18	1.35-1.55	2.00-6.00	0.11-0.15	Low	1.0-2.0	0.20	0.20		
	14-36	5-18	1.35-1.60	2.00-6.00	0.10-0.14	Low	0.5-1.0	0.20	0.20		
	36-60	0-10	1.40-1.60	2.00-6.00	0.07-0.09	Low	0.0-0.5	0.17	0.17		
39E:											
Lisk	0-5	5-18	1.25-1.45	2.00-6.00	0.12-0.16	Low	1.0-3.0	0.20	0.20	5	3
	5-14	5-18	1.35-1.55	2.00-6.00	0.11-0.15	Low	1.0-2.0	0.20	0.20		
	14-36	5-18	1.35-1.60	2.00-6.00	0.10-0.14	Low	0.5-1.0	0.20	0.20		
	36-60	0-10	1.40-1.60	2.00-6.00	0.07-0.09	Low	0.0-0.5	0.17	0.17		
41C:											
Reeder	0-6	20-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	2.0-4.0	0.32	0.32	2	6
	6-12	18-35	1.30-1.50	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.17	---		
	12-23	15-30	1.30-1.50	0.60-2.00	0.14-0.17	Low	0.5-1.0	0.32	---		
	23-60	---	---	0.06-0.60	---	---	---	---	---		
43B:											
Marmarth	0-6	20-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	1.0-3.0	0.37	0.37	3	6
	6-11	18-35	1.35-1.60	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	---		
	11-22	15-30	1.35-1.60	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.32	---		
	22-60	---	---	0.20-2.00	---	---	---	---	---		
47B:											
Marias	0-7	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	7-28	40-60	1.30-1.50	0.00-0.06	0.12-0.16	High	0.5-1.0	0.37	0.37		
	28-60	40-60	1.30-1.55	0.00-0.06	0.12-0.16	High	0.0-0.5	0.37	0.37		
51F:											
Elve	0-19	10-20	1.20-1.40	2.00-6.00	0.08-0.10	Low	0.5-2.0	0.10	0.32	2	5
	19-60	10-20	1.40-1.60	2.00-6.00	0.02-0.03	Low	0.0-0.5	0.05	---		
54B:											
Lawther	0-6	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	2.0-5.0	0.32	0.32	5	4
	6-19	40-60	1.25-1.50	0.06-0.20	0.14-0.17	High	1.0-2.0	0.32	---		
	19-60	40-60	1.25-1.50	0.06-0.20	0.12-0.15	High	0.0-1.0	0.32	---		
54C:											
Lawther	0-6	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	2.0-5.0	0.32	0.32	5	4
	6-19	40-60	1.25-1.50	0.06-0.20	0.14-0.17	High	1.0-2.0	0.32	---		
	19-60	40-60	1.25-1.50	0.06-0.20	0.12-0.15	High	0.0-1.0	0.32	---		
58B:											
Lonna	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.20	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-12	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	12-48	18-35	1.25-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	48-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		
58C:											
Lonna	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.20	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-12	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	12-48	18-35	1.25-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	48-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
60A:											
Havre	0-5	27-40	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	0.5-2.0	0.32	0.32	5	6
	5-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
63B:											
Nunemaker	0-6	35-40	1.15-1.35	0.20-0.60	0.15-0.19	Moderate	1.0-3.0	0.32	0.32	5	4
	6-12	35-55	1.30-1.60	0.00-0.06	0.12-0.15	High	0.5-1.0	0.43	0.43		
	12-29	35-55	1.35-1.65	0.00-0.06	0.12-0.15	High	0.0-0.5	0.43	0.43		
	29-60	35-50	1.45-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.43	0.43		
63C:											
Nunemaker	0-6	35-40	1.15-1.35	0.20-0.60	0.15-0.19	Moderate	1.0-3.0	0.32	0.32	5	4
	6-12	35-55	1.30-1.60	0.00-0.06	0.12-0.15	High	0.5-1.0	0.43	0.43		
	12-29	35-55	1.35-1.65	0.00-0.06	0.12-0.15	High	0.0-0.5	0.43	0.43		
	29-60	35-50	1.45-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.43	0.43		
64D:											
Barkof	0-10	40-60	1.10-1.35	0.06-0.20	0.14-0.18	High	3.0-6.0	0.32	0.32	2	4
	10-26	45-60	1.30-1.50	0.01-0.06	0.13-0.17	High	0.5-1.0	0.32	0.32		
	26-60	---	---	---	---	---	---	---	---		
67B:											
Bearpaw	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-12	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	12-20	30-50	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
67C:											
Bearpaw	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-12	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	12-20	30-50	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
69C:											
Vida	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
71D:											
Roy	0-7	27-40	1.15-1.35	0.60-2.00	0.13-0.15	Low	2.0-4.0	0.15	0.32	3	6
	7-32	35-50	1.35-1.55	0.20-0.60	0.08-0.10	Moderate	0.5-1.0	0.10	0.32		
	32-60	27-40	1.45-1.65	0.20-0.60	0.04-0.06	Low	---	0.05	0.32		
Roy	0-7	27-40	1.15-1.35	0.60-2.00	0.09-0.11	Low	2.0-4.0	0.10	0.32	3	6
	7-32	35-50	1.35-1.55	0.20-0.60	0.08-0.10	Moderate	0.5-1.0	0.10	0.32		
	32-60	27-40	1.45-1.65	0.20-0.60	0.04-0.06	Low	---	0.05	0.32		
71F:											
Roy	0-7	27-40	1.15-1.35	0.60-2.00	0.13-0.15	Low	2.0-4.0	0.15	0.32	3	6
	7-32	35-50	1.35-1.55	0.20-0.60	0.08-0.10	Moderate	0.5-1.0	0.10	0.32		
	32-60	27-40	1.45-1.65	0.20-0.60	0.04-0.06	Low	---	0.05	0.32		
72F:											
Zahill	0-6	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	6-16	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	16-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
75C:											
Benz	0-3	27-35	1.20-1.40	0.06-0.20	0.13-0.15	Moderate	1.0-2.0	0.43	0.37	5	4L
	3-60	18-35	1.30-1.55	0.06-0.20	0.10-0.12	Moderate	0.0-0.5	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
77D:											
Tinsley	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	2	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
77F:											
Tinsley	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	2	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
79B:											
Yamacall	0-5	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37	5	6
	5-12	18-30	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	12-60	18-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
82B:											
Savage	0-3	27-35	1.20-1.40	0.60-2.00	0.16-0.20	Moderate	2.0-4.0	0.32	0.37	5	7
	3-16	35-50	1.30-1.50	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32		
	16-60	30-45	1.35-1.55	0.06-0.20	0.13-0.16	High	0.5-1.0	0.32	0.32		
86C:											
Work	0-4	27-40	1.15-1.35	0.60-2.00	0.15-0.18	Moderate	2.0-4.0	0.32	0.32	5	6
	4-12	35-50	1.25-1.50	0.20-0.60	0.14-0.17	High	1.0-2.0	0.28	0.28		
	12-22	20-40	1.30-1.50	0.20-0.60	0.14-0.17	Moderate	0.5-1.0	0.32	0.32		
	22-60	15-40	1.30-1.55	0.20-0.60	0.11-0.15	Moderate	0.0-0.5	0.17	0.24		
87C:											
Tamaneen	0-7	27-35	1.15-1.35	0.60-2.00	0.15-0.17	Moderate	2.0-5.0	0.32	0.32	3	6
	7-14	35-50	1.20-1.40	0.20-0.60	0.14-0.16	High	1.0-3.0	0.32	0.32		
	14-26	30-45	1.25-1.45	0.20-0.60	0.14-0.16	Moderate	1.0-2.0	0.32	0.32		
	26-31	18-35	1.30-1.50	0.60-2.00	0.10-0.12	Low	0.5-1.0	0.10	0.28		
	31-60	8-25	1.40-1.60	2.00-6.00	0.04-0.05	Low	0.0-0.5	0.05	0.32		
Tamaneen	0-7	27-35	1.15-1.35	0.60-2.00	0.12-0.14	Moderate	2.0-5.0	0.17	0.37	3	6
	7-14	35-50	1.20-1.40	0.20-0.60	0.14-0.16	High	1.0-2.0	0.32	0.32		
	14-26	30-45	1.30-1.50	0.20-0.60	0.14-0.16	Moderate	0.5-1.0	0.32	0.32		
	26-31	18-35	1.40-1.60	0.60-2.00	0.10-0.12	Low	0.0-0.5	0.10	0.28		
	31-60	8-25	---	2.00-6.00	0.04-0.05	Low	---	0.05	0.32		
88C:											
Perma	0-12	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.15	0.32	2	5
	12-36	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	36-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	---		
88E:											
Perma	0-12	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.15	0.32	2	5
	12-36	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	36-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	---		
90A:											
Harlake	0-7	40-55	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.32	0.32	5	4
	7-38	35-60	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	38-60	15-35	1.30-1.55	0.06-0.20	0.12-0.14	Low	0.5-1.0	0.37	0.37		
92D:											
Sunburst	0-4	27-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-23	35-50	1.25-1.45	0.06-0.20	0.12-0.15	High	0.5-1.0	0.37	0.37		
	23-60	35-50	1.35-1.60	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
92F:											
Sunburst	0-4	27-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-23	35-50	1.25-1.45	0.06-0.20	0.12-0.15	High	0.5-1.0	0.37	0.37		
	23-60	35-50	1.35-1.60	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
94C:											
Busby	0-7	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	5	3
	7-14	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	14-29	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-0.5	0.20	0.20		
	29-60	10-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
94E:											
Busby	0-7	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	5	3
	7-14	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	14-29	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-0.5	0.20	0.20		
	29-60	10-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
98C:											
Kremlin	0-6	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-22	18-30	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	1.0-2.0	0.37	0.37		
	22-36	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	36-60	10-25	1.30-1.55	0.60-2.00	0.14-0.18	Low	0.0-0.5	0.37	0.37		
100F:											
Rubble land.											
115B:											
Thoeny	0-6	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.49	0.49	5	6
	6-18	35-50	1.30-1.50	0.00-0.06	0.12-0.14	High	0.5-1.0	0.37	0.37		
	18-28	35-50	1.30-1.50	0.00-0.06	0.12-0.14	Moderate	0.5-1.0	0.43	0.43		
	28-41	35-50	1.30-1.50	0.00-0.06	0.11-0.13	Moderate	0.0-0.5	0.43	0.43		
	41-60	35-50	1.50-1.75	0.00-0.06	0.10-0.12	Moderate	0.0-0.5	0.43	0.43		
Elloam	0-2	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	2-9	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	9-15	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	15-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
171C:											
Delpoint	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	4L
	5-13	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	13-25	18-35	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	25-60	---	---	---	---	---	---	---	---		
Cabbart	0-3	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	3-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	6-12	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
190B:											
Hedstrom	0-6	15-20	1.25-1.45	2.00-6.00	0.12-0.15	Low	2.0-3.0	0.24	0.24	3	3
	6-16	20-35	1.35-1.60	0.60-2.00	0.13-0.16	Moderate	1.0-2.0	0.32	0.32		
	16-22	20-30	1.35-1.60	0.60-2.00	0.13-0.16	Moderate	0.5-1.0	0.32	0.32		
	22-60	0-5	1.45-1.65	6.00-20.00	0.04-0.05	Low	0.0-0.5	0.17	0.17		
200F:											
Badland.											

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
201D:											
Cabba	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	2	4L
	4-12	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
Wayden	0-5	40-50	1.10-1.50	0.06-0.20	0.14-0.18	High	0.5-2.0	0.32	0.32	1	4
	5-12	35-50	1.10-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
201F:											
Cabba	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	2	4L
	4-12	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
Wayden	0-5	40-50	1.10-1.50	0.06-0.20	0.14-0.18	High	0.5-2.0	0.32	0.32	1	4
	5-12	35-50	1.10-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
Rock outcrop.											
211E:											
Cabbart	0-3	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	3-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	6-12	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
Yawdim	0-3	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	0.5-1.0	0.32	0.32	1	4
	3-12	35-50	1.20-1.40	0.06-0.20	0.15-0.18	High	0.0-0.5	0.32	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
211F:											
Cabbart	0-3	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	3-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	6-12	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
Yawdim	0-3	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	0.5-1.0	0.32	0.32	1	4
	3-12	35-50	1.20-1.40	0.06-0.20	0.15-0.18	High	0.0-0.5	0.32	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
Rock outcrop.											
221E:											
Hillon	0-6	27-35	1.25-1.35	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Kevin	0-3	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	3-8	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	8-25	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	25-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
224B:											
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Joplin	0-4	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	4L
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-20	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	20-60	18-32	1.50-1.75	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
224E:											
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Joplin	0-4	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-20	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	20-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
225F:											
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Cabbart	0-3	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	3-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	6-12	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
Yawdim	0-3	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	0.5-1.0	0.32	0.32	1	4
	3-12	35-50	1.20-1.40	0.06-0.20	0.15-0.18	High	0.0-0.5	0.32	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
261C:											
Auchard	0-2	27-35	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	6
	2-6	40-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	6-11	35-50	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
	11-22	30-45	1.30-1.50	0.06-0.20	0.11-0.15	Moderate	0.0-0.5	0.43	0.43		
	22-60	---	---	---	---	---	---	---	---		
Williams	0-5	15-27	1.15-1.35	0.60-2.00	0.19-0.21	Low	2.0-5.0	0.37	0.37	5	6
	5-17	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	---		
	17-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	---		
271D:											
Beaverell	0-5	10-27	1.15-1.35	0.60-2.00	0.12-0.16	Low	1.0-3.0	0.20	0.37	2	6
	5-13	20-35	1.30-1.55	0.60-2.00	0.06-0.10	Moderate	0.5-1.0	0.10	0.37		
	13-60	0-15	1.45-1.65	>20.00	0.02-0.04	Low	0.0-0.5	0.05	0.24		
Tinsley	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	2	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
272C:											
Attewan	0-5	10-20	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	5
	5-13	20-35	1.40-1.60	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	13-21	15-30	1.40-1.60	0.60-2.00	0.13-0.15	Moderate	0.5-1.0	0.32	0.32		
	21-60	0-10	1.40-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.24		
Tinsley	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	2	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
301C:											
Marvan	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37	5	4
	4-25	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	25-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
Vanda	0-4	40-60	1.25-1.45	0.00-0.06	0.08-0.12	High	0.5-2.0	0.37	0.37	5	4
	4-60	35-60	1.30-1.50	0.00-0.06	0.08-0.12	High	0.0-0.5	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
302B:											
Marvan	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	4-25	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	25-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
304B:											
Marvan	0-4	40-60	1.25-1.45	0.06-0.20	0.11-0.15	High	0.5-1.0	0.37	0.37	5	4
	4-11	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	11-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	---	0.37	0.37		
Joplin	0-4	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-20	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	20-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
306D:											
Marvan	0-4	40-60	1.25-1.45	0.06-0.20	0.11-0.15	High	0.5-1.0	0.37	0.37	5	4
	4-11	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	11-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	---	0.37	0.37		
Yawdim	0-3	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	0.5-1.0	0.32	0.32	1	4
	3-12	35-50	1.20-1.40	0.06-0.20	0.15-0.18	High	0.0-0.5	0.32	---		
	12-60	---	---	0.01-0.20	---	---	---	---	---		
Cabbart	0-3	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	3-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	6-12	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
311B:											
Ferd	0-5	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	5-9	22-35	1.30-1.50	0.20-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	9-16	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	16-22	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	22-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Creed	0-6	20-35	1.15-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.43	0.43	5	6
	6-12	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	12-31	27-45	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
	31-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
311B:											
Gerdrum	0-3	20-27	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	5	6
	3-11	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	11-38	30-50	1.30-1.55	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
	38-60	30-50	1.40-1.65	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
321B:											
Kobase	0-5	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4L
	5-15	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	15-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
321C:											
Kobase	0-5	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4L
	5-15	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	15-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
323B:											
Sagedale	0-5	40-45	1.20-1.40	0.06-0.20	0.15-0.18	Moderate	1.0-2.0	0.32	0.32	5	4
	5-12	35-45	1.30-1.50	0.06-0.20	0.15-0.18	Moderate	1.0-2.0	0.32	0.37		
	12-25	35-45	1.30-1.50	0.06-0.20	0.15-0.17	Moderate	0.5-1.0	0.32	0.37		
	25-60	35-45	1.30-1.55	0.06-0.20	0.14-0.16	Moderate	0.0-0.5	0.32	0.37		
323C:											
Sagedale	0-5	40-45	1.20-1.40	0.06-0.20	0.15-0.18	Moderate	1.0-2.0	0.32	0.32	5	4
	5-12	35-45	1.30-1.50	0.06-0.20	0.15-0.18	Moderate	1.0-2.0	0.32	0.37		
	12-25	35-45	1.30-1.50	0.06-0.20	0.15-0.17	Moderate	0.5-1.0	0.32	0.37		
	25-60	35-45	1.30-1.55	0.06-0.20	0.14-0.16	Moderate	0.0-0.5	0.32	0.37		
331B:											
Phillips	0-7	20-27	1.15-1.35	0.20-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	5
	7-16	35-45	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	16-50	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	50-60	20-40	1.50-1.75	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Elloam	0-2	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	2-9	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	9-15	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	15-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
351B:											
Kenilworth	0-5	5-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.32	0.32	5	3
	5-10	15-25	1.40-1.60	0.60-2.00	0.13-0.17	Low	1.0	0.37	0.37		
	10-21	18-35	1.40-1.60	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	21-40	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
	40-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
Fortbenton	0-7	10-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	7-28	10-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	28-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
363B:											
Cozberg	0-4	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	3	3
	4-16	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	16-30	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-1.0	0.20	0.20		
	30-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
Chinook	0-6	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	6-17	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	17-60	5-18	1.40-1.60	2.00-6.00	0.11-0.12	Low	0.0-1.0	0.20	0.20		
368C:											
Fortbenton	0-7	10-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	7-28	10-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	28-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
385B:											
Ethridge	0-5	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	7
	5-13	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	13-30	25-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	30-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
385B:											
Kobase	0-5	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4L
	5-15	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	15-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
401C:											
Gerdrum	0-3	20-27	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	5	6
	3-11	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	11-38	30-50	1.30-1.55	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
	38-60	30-50	1.40-1.65	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
Yamacall	0-5	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37	5	6
	5-12	18-30	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	12-60	18-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
421C:											
Joplin	0-4	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-20	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	20-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
441C:											
Kevin	0-3	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	3-8	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	8-25	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	25-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Hillon	0-6	27-35	1.25-1.35	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
442C:											
Kevin	0-3	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	3-8	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	8-25	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	25-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Elloam	0-2	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	2-9	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	9-15	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	15-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
445E:											
Kevin	0-3	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	3-8	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	8-25	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	25-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Hillon	0-6	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	6-60	20-35	1.50-1.75	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Nishon	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-16	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	16-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
471B:											
Marias	0-7	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	7-28	40-60	1.30-1.50	0.00-0.06	0.12-0.16	High	0.5-1.0	0.37	0.37		
	28-60	40-60	1.30-1.55	0.00-0.06	0.12-0.16	High	0.0-0.5	0.37	0.37		
Kobase	0-5	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4L
	5-15	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	15-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
491B:											
Enbar	0-21	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.28	0.28	5	6
	21-42	18-30	1.30-1.50	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.37	0.37		
	42-60	18-27	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.37	0.37		
Nesda	0-5	10-20	1.10-1.30	0.60-2.00	0.14-0.18	Low	2.0-4.0	0.32	0.32	2	5
	5-60	0-10	1.55-1.70	6.00-20.00	0.03-0.04	Low	0.5-1.0	0.02	0.10		
493B:											
Enbar	0-21	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.28	0.28	5	6
	21-42	18-30	1.30-1.50	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.37	0.37		
	42-60	18-27	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.37	0.37		
Bigsandy	0-3	15-27	1.07-1.36	0.60-2.00	0.14-0.18	Low	1.0-2.0	0.43	0.43	5	6
	3-11	18-35	1.30-1.50	0.20-0.60	0.13-0.17	Low	0.5-1.0	0.37	0.37		
	11-29	18-35	1.30-1.50	0.20-0.60	0.12-0.16	Low	0.0-0.5	0.05	0.05		
	29-60	15-35	1.30-1.50	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
Korchea	0-6	18-27	1.20-1.50	0.60-2.00	0.17-0.21	Low	1.0-3.0	0.37	0.37	5	6
	6-60	18-35	1.30-1.60	0.60-2.00	0.15-0.18	Low	0.5-1.0	0.37	---		
503B:											
Telstad	0-6	20-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	6-14	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	14-28	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin	0-4	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-20	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	20-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
503C:											
Telstad	0-6	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	6-14	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	14-28	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-20	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	20-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
512F:											
Elve	0-19	10-20	1.20-1.40	2.00-6.00	0.08-0.10	Low	0.5-2.0	0.10	0.32	2	5
	19-60	10-20	1.40-1.60	2.00-6.00	0.02-0.03	Low	0.0-0.5	0.05	---		
Rubble land.											

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
521C:											
Elloam	0-2	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	2-9	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	9-15	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	15-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
Absher	0-1	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	5	4
	1-7	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	7-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
531C:											
Turner	0-8	18-25	1.10-1.30	0.60-2.00	0.15-0.19	Low	2.0-4.0	0.32	0.32	3	6
	8-17	25-35	1.30-1.50	0.60-2.00	0.12-0.18	Moderate	0.5-2.0	0.24	---		
	17-23	25-35	1.35-1.50	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.24	---		
	23-60	0-5	1.35-1.50	6.00-20.00	0.01-0.06	Low	0.0-0.5	0.05	---		
Beaverton	0-5	15-27	1.15-1.35	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.17	0.37	2	6
	5-15	25-35	1.50-1.70	0.60-2.00	0.08-0.10	Low	0.5-1.0	0.10	0.32		
	15-60	0-10	1.50-1.75	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.02	0.10		
561B:											
Scobey	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-12	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	12-60	30-40	1.35-1.65	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin	0-3	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	3-8	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	8-25	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	25-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
561C:											
Scobey	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-12	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	12-60	30-40	1.35-1.65	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin	0-3	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	3-8	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	8-25	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	25-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
601A:											
Havre	0-5	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	5
	5-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
Glendive	0-6	5-15	1.40-1.60	2.00-6.00	0.10-0.13	Low	0.5-2.0	0.20	0.20	5	3
	6-32	5-18	1.35-1.60	2.00-6.00	0.15-0.19	Low	0.5-1.0	0.32	0.32		
	32-60	5-18	1.35-1.60	2.00-6.00	0.10-0.13	Low	0.5-1.0	0.20	0.20		
603B:											
Thibadeau	0-2	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	5
	2-60	18-35	1.35-1.55	0.06-0.20	0.14-0.18	Low	0.5-1.0	0.28	0.28		
605C:											
Yamacall	0-5	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37	5	6
	5-12	18-30	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	12-60	18-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Havre	0-5	10-22	1.15-1.35	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	5
	5-60	18-30	1.30-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
631B:											
Nunemaker-------	0-6	35-40	1.30-1.40	0.20-0.60	0.14-0.17	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-19	45-55	1.30-1.50	0.00-0.06	0.12-0.15	High	0.5-1.0	0.43	0.43		
	19-60	35-50	1.45-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.43	0.43		
631C:											
Nunemaker-------	0-6	35-40	1.30-1.40	0.20-0.60	0.14-0.17	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-19	45-55	1.30-1.50	0.00-0.06	0.12-0.15	High	0.5-1.0	0.43	0.43		
	19-60	35-50	1.45-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.43	0.43		
661C:											
Twilight--------	0-6	5-18	1.15-1.40	2.00-6.00	0.13-0.16	Low	1.0-3.0	0.20	0.20	3	3
	6-13	5-18	1.25-1.50	2.00-6.00	0.13-0.16	Low	0.5-1.0	0.20	---		
	13-35	5-18	1.25-1.50	2.00-6.00	0.12-0.15	Low	0.0-0.5	0.20	---		
	35-60	---	---	---	---	---	---	---	---		
Blacksheep------	0-4	5-15	1.20-1.40	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	2	3
	4-18	5-15	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-1.0	0.20	0.20		
	18-60	---	---	---	---	---	---	---	---		
671C:											
Bearpaw---------	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-12	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	12-20	30-50	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Nishon----------	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-16	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	16-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		
673B:											
Bearpaw---------	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-12	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	12-20	30-50	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Daglum----------	0-14	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	2.0-4.0	0.32	0.32	5	6
	14-29	35-60	1.30-1.50	0.06-0.20	0.12-0.15	High	0.5-1.0	0.28	---		
	29-60	35-60	1.50-1.70	0.06-0.20	0.09-0.12	High	0.0-0.5	0.28	---		
691D:											
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Williams--------	0-5	20-27	1.15-1.35	0.60-2.00	0.19-0.21	Low	2.0-5.0	0.37	0.37	5	6
	5-17	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	---		
	17-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	---		
692D:											
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
692D:											
Bearpaw	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-12	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	12-20	30-50	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
693D:											
Vida	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Bearpaw	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-12	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	12-20	30-50	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Nishon	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-16	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	16-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		
695C:											
Vida	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Zahill	0-6	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	6-16	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	16-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
695E:											
Vida	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Zahill	0-6	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	6-16	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	16-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
702F:											
Winspect	0-3	20-25	1.15-1.35	0.60-2.00	0.12-0.15	Low	2.0-4.0	0.20	0.37	3	4L
	3-8	20-30	1.20-1.45	0.60-2.00	0.11-0.14	Low	2.0-3.0	0.17	0.37		
	8-18	20-35	1.30-1.55	0.60-2.00	0.09-0.10	Low	1.0-2.0	0.15	---		
	18-60	20-35	1.35-1.60	0.20-0.60	0.09-0.10	Low	0.0-1.0	0.15	---		
Winspect	0-3	20-25	1.15-1.35	0.60-2.00	0.12-0.15	Low	2.0-4.0	0.20	0.37	3	4L
	3-8	20-30	1.20-1.45	0.60-2.00	0.11-0.14	Low	2.0-3.0	0.17	0.37		
	8-18	20-35	1.30-1.55	0.60-2.00	0.09-0.10	Low	1.0-2.0	0.15	---		
	18-60	20-35	1.35-1.60	0.20-0.60	0.09-0.10	Low	0.0-1.0	0.15	---		
Rock outcrop.											
712E:											
Roy	0-7	27-40	1.15-1.35	0.60-2.00	0.13-0.15	Low	2.0-4.0	0.15	0.32	3	6
	7-32	35-50	1.35-1.55	0.20-0.60	0.08-0.10	Moderate	0.5-1.0	0.10	0.32		
	32-60	27-40	1.45-1.65	0.20-0.60	0.04-0.06	Low	---	0.05	0.32		
Barkof	0-10	40-60	1.10-1.35	0.06-0.20	0.14-0.18	High	3.0-6.0	0.32	0.32	2	4
	10-26	45-60	1.30-1.50	0.01-0.06	0.13-0.17	High	0.5-1.0	0.32	0.32		
	26-60	---	---	---	---	---	---	---	---		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
712F:											
Roy	0-7	27-40	1.15-1.35	0.60-2.00	0.13-0.15	Low	2.0-4.0	0.17	0.32	3	6
	7-32	35-50	1.35-1.55	0.20-0.60	0.08-0.10	Moderate	0.5-1.0	0.10	0.32		
	32-60	27-40	1.45-1.65	0.20-0.60	0.04-0.06	Low	---	0.05	0.32		
Barkof	0-10	40-60	1.10-1.35	0.06-0.20	0.14-0.18	High	3.0-6.0	0.32	0.32	2	4
	10-26	45-60	1.30-1.50	0.01-0.06	0.13-0.17	High	0.5-1.0	0.32	0.32		
	26-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
723F:											
Zahill	0-6	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	6-16	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	16-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Cabba	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	2	4L
	4-12	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	12-60	---	---	---	---	---	---	---	---		
781C:											
Creed	0-6	20-35	1.15-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.43	0.43	5	6
	6-12	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	12-31	27-45	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
	31-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
Weingart	0-2	27-40	1.20-1.40	0.06-0.20	0.16-0.19	Moderate	1.0-2.0	0.43	0.43	2	4
	2-5	40-60	1.30-1.55	0.00-0.06	0.12-0.15	High	0.5-1.0	0.37	0.37		
	5-10	35-55	1.30-1.55	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
	10-25	35-55	1.30-1.55	0.00-0.06	0.08-0.10	High	0.0-0.5	0.37	0.37		
	25-60	---	---	---	---	---	---	---	---		
791B:											
Yamacall	0-5	16-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.37	0.37	5	4L
	5-12	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	12-60	10-30	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
801B:											
Williams	0-5	20-27	1.15-1.35	0.60-2.00	0.19-0.21	Low	2.0-5.0	0.37	0.37	5	6
	5-17	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	---		
	17-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	---		
Vida	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
801C:											
Williams	0-5	15-27	1.15-1.35	0.60-2.00	0.19-0.21	Low	2.0-5.0	0.37	0.37	5	6
	5-17	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	---		
	17-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	---		
Vida	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
812A:											
Glendive	0-6	5-15	1.30-1.50	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20	5	3
	6-32	5-18	1.30-1.50	2.00-6.00	0.15-0.18	Low	0.5-1.0	0.32	0.32		
	32-60	5-18	1.35-1.60	2.00-6.00	0.10-0.14	Low	0.5-1.0	0.20	0.20		

Physical Properties of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
812A:											
Havre	0-5	15-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	5
	5-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
882F:											
Perma	0-11	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	2	5
	11-37	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	37-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
Whitlash	0-9	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	9-16	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	16-60	---	---	---	---	---	---	---	---		
892F:											
Whitlash	0-9	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	9-16	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	16-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
952F:											
Dast	0-3	2-18	1.30-1.50	2.00-6.00	0.12-0.15	Low	1.0-2.0	0.20	0.20	3	3
	3-18	2-18	1.40-1.60	2.00-6.00	0.11-0.14	Low	0.5-1.0	0.20	0.20		
	18-26	2-18	1.40-1.60	2.00-6.00	0.11-0.14	Low	0.5-1.0	0.20	0.20		
	26-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
DA:											
Denied access.											
M-W:											
Miscellaneous water.											
W:											
Water.											

Chemical Properties of the Soils

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
5A:								
McKenzie	0-6	40-60	20.0-25.0	7.4-9.0	5-10	---	2-8	---
	6-27	40-60	15.0-20.0	7.4-9.0	5-10	---	2-8	---
	27-60	40-60	15.0-20.0	7.9-9.0	5-15	1-5	2-16	---
12C:								
Beaverton	0-5	15-27	15.0-20.0	6.6-7.8	---	---	---	---
	5-15	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	15-60	0-10	1.0-5.0	7.4-8.4	5-15	---	0-2	---
14C:								
Brockway	0-4	18-27	20.0-25.0	7.4-8.4	5-10	---	---	---
	4-8	18-27	15.0-20.0	7.4-8.4	5-15	---	---	---
	8-60	18-35	15.0-25.0	7.4-8.4	15-40	---	---	---
15E:								
Lambeth	0-4	20-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	4-60	20-35	15.0-20.0	7.9-9.0	10-15	1-6	0-4	1-5
15F:								
Lambeth	0-4	20-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	4-66	20-35	15.0-20.0	7.9-9.0	10-15	1-6	0-4	1-5
16B:								
Degrand	0-5	10-20	5.0-10.0	6.6-7.8	---	---	---	---
	5-18	20-35	15.0-20.0	6.6-8.4	---	---	---	---
	18-35	15-30	10.0-15.0	7.4-9.0	15-40	---	0-4	---
	35-60	0-5	1.0-5.0	7.9-8.4	8-15	---	0-2	---
18E:								
Yawdim	0-3	40-50	25.0-30.0	6.6-7.8	---	---	---	---
	3-12	35-50	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	12-60	---	---	---	---	---	---	---
21E:								
Cabbart	0-3	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-6	18-27	5.0-10.0	7.4-9.0	10-15	---	0-4	1-5
	6-12	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	12-60	---	---	---	---	---	---	---
Delpoint	0-5	18-27	15.0-20.0	7.4-8.4	0-10	---	0-4	---
	5-13	18-35	15.0-20.0	7.9-8.4	0-10	---	0-4	---
	13-25	18-35	10.0-15.0	7.9-8.4	5-15	---	0-4	---
	25-60	---	---	---	---	---	---	---
22F:								
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
23B:								
Acel	0-5	27-35	15.0-20.0	6.6-7.8	---	---	---	---
	5-19	40-55	25.0-30.0	6.6-7.8	---	---	---	---
	19-60	35-45	15.0-20.0	7.9-9.0	5-15	---	0-2	---
24B:								
Farnuf	0-6	20-27	10.0-15.0	6.1-7.8	---	---	---	---
	6-11	25-35	15.0-20.0	6.1-7.8	---	---	---	---
	11-30	20-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	30-60	15-30	10.0-15.0	7.4-8.4	5-10	---	2-4	5-10

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
27B:								
Attewan	0-5	10-20	5.0-10.0	6.1-7.8	---	---	---	---
	5-13	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-21	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	21-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
28A:								
Nishon	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-16	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	16-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---
30B:								
Marvan	0-4	40-60	30.0-40.0	7.4-8.4	5-10	---	0-4	0-4
	4-25	45-60	30.0-40.0	7.9-9.0	5-10	---	2-8	4-13
	25-60	45-60	25.0-35.0	7.9-9.0	5-10	1-5	8-16	13-38
30C:								
Marvan	0-4	40-60	30.0-40.0	7.4-8.4	5-10	---	0-4	0-4
	4-25	45-60	30.0-40.0	7.9-9.0	5-10	---	2-8	4-13
	25-60	45-60	25.0-35.0	7.9-9.0	5-10	1-5	8-16	13-38
32B:								
Kobase	0-5	35-40	20.0-25.0	6.6-8.4	1-5	---	0-2	---
	5-15	35-45	20.0-25.0	7.4-8.4	1-5	---	0-2	---
	15-60	35-45	15.0-20.0	7.9-9.0	5-15	1-5	0-4	5-10
32C:								
Kobase	0-5	35-40	20.0-25.0	6.6-8.4	1-5	---	0-2	---
	5-15	35-45	20.0-25.0	7.4-8.4	1-5	---	0-2	---
	15-60	35-45	15.0-20.0	7.9-9.0	5-15	1-5	0-4	5-10
34A:								
Linnet	0-6	40-45	20.0-30.0	6.1-7.3	---	---	---	---
	6-18	45-60	20.0-30.0	6.6-7.8	---	---	---	---
	18-46	35-50	20.0-25.0	7.4-8.4	5-10	---	0-4	---
	46-60	35-50	20.0-25.0	7.9-9.0	1-5	1-5	0-4	2-13
35B:								
Assinniboine	0-7	5-15	10.0-15.0	6.1-7.8	---	---	---	---
	7-15	18-30	15.0-20.0	6.6-7.8	---	---	0-2	---
	15-43	10-27	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	43-60	0-15	5.0-10.0	7.4-8.4	5-10	---	0-2	---
36C:								
Chinook	0-6	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	6-17	5-18	5.0-10.0	6.6-9.0	---	---	0-2	---
	17-60	5-18	5.0-10.0	7.4-9.0	3-15	---	0-2	---
37B:								
Evanston	0-6	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-13	25-35	20.0-25.0	6.6-7.8	---	---	---	---
	13-33	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	33-60	20-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
37C:								
Evanston	0-6	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-13	25-35	20.0-25.0	6.6-7.8	---	---	---	---
	13-33	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	33-60	20-30	10.0-15.0	7.9-9.0	5-15	0-2	0-4	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
38B:								
Ethridge	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	13-30	25-45	20.0-25.0	7.4-8.4	5-15	---	---	1-5
	30-60	25-40	20.0-25.0	7.4-8.4	5-15	0-3	2-4	1-5
39C:								
Lisk	0-5	5-18	10.0-15.0	7.4-8.4	---	---	0-2	---
	5-14	5-18	10.0-15.0	7.9-8.4	---	---	0-2	---
	14-36	5-18	5.0-10.0	7.9-8.4	5-8	---	0-2	---
	36-60	0-10	0.0-5.0	7.9-8.4	---	---	0-2	---
39E:								
Lisk	0-5	5-18	10.0-15.0	7.4-8.4	---	---	0-2	---
	5-14	5-18	10.0-15.0	7.9-8.4	---	---	0-2	---
	14-36	5-18	5.0-10.0	7.9-8.4	5-8	---	0-2	---
	36-60	0-10	0.0-5.0	7.9-8.4	---	---	0-2	---
41C:								
Reeder	0-6	20-27	15.0-20.0	6.1-7.3	---	---	---	---
	6-12	18-35	15.0-25.0	6.6-7.8	---	---	---	---
	12-23	15-30	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	23-60	---	---	---	---	---	---	---
43B:								
Marmarth	0-6	20-27	15.0-20.0	6.1-7.3	---	---	---	---
	6-11	18-35	15.0-20.0	6.1-7.8	---	---	---	---
	11-22	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	22-60	---	---	---	---	---	---	---
47B:								
Marias	0-7	40-60	30.0-35.0	7.4-8.4	5-10	---	0-4	1-4
	7-28	40-60	25.0-30.0	7.9-9.0	5-10	---	2-4	1-4
	28-60	40-60	25.0-30.0	7.9-9.0	5-10	1-6	2-8	4-13
51F:								
Elve	0-19	10-20	10.0-15.0	5.1-6.5	---	---	---	---
	19-60	10-20	5.0-10.0	5.1-6.5	---	---	---	---
54B:								
Lawther	0-6	40-50	30.0-35.0	6.6-8.4	---	---	0-2	---
	6-19	40-60	30.0-35.0	7.4-8.4	---	---	0-2	---
	19-60	40-60	25.0-30.0	7.4-9.0	5-15	---	4-8	---
54C:								
Lawther	0-6	40-50	30.0-35.0	6.6-8.4	---	---	0-2	---
	6-19	40-60	30.0-35.0	7.4-8.4	---	---	0-2	---
	19-60	40-60	25.0-30.0	7.9-9.0	5-15	---	4-8	---
58B:								
Lonna	0-6	27-35	15.0-20.0	7.4-8.4	0-5	---	0-2	---
	6-12	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	12-48	18-35	10.0-15.0	7.9-9.0	5-15	---	0-8	0-13
	48-60	10-35	5.0-15.0	7.9-9.0	5-15	---	2-16	10-20
58C:								
Lonna	0-6	27-35	15.0-20.0	7.4-8.4	0-5	---	0-2	---
	6-12	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	12-48	18-35	10.0-15.0	7.9-9.0	5-15	---	0-8	0-13
	48-60	10-35	5.0-15.0	7.9-9.0	5-15	---	2-16	10-30

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
60A:								
Havre	0-5	27-40	20.0-25.0	7.4-8.4	1-5	---	0-2	---
	5-60	18-35	15.0-25.0	7.4-8.4	1-5	---	0-4	---
63B:								
Nunemaker	0-6	35-40	20.0-25.0	6.6-8.4	1-5	---	---	---
	6-12	35-55	20.0-30.0	6.6-8.4	1-5	---	---	---
	12-29	35-55	20.0-25.0	7.4-8.4	5-15	---	2-4	---
	29-60	35-50	20.0-25.0	7.4-8.4	5-10	---	2-4	---
63C:								
Nunemaker	0-6	35-40	20.0-25.0	6.6-8.4	1-5	---	---	---
	6-12	35-55	20.0-30.0	6.6-8.4	1-5	---	---	---
	12-29	35-55	20.0-25.0	7.4-8.4	5-15	---	2-4	---
	29-60	35-50	20.0-25.0	7.4-8.4	5-10	---	2-4	---
64D:								
Barkof	0-10	40-60	30.0-40.0	6.6-8.4	0-5	---	0-4	---
	10-26	45-60	30.0-35.0	7.4-9.0	5-10	---	2-4	1-5
	26-60	---	---	---	---	---	---	---
67B:								
Bearpaw	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-50	25.0-30.0	6.1-7.8	---	---	---	---
	12-20	30-50	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-8.4	5-10	0-2	2-4	5-8
67C:								
Bearpaw	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-50	25.0-30.0	6.1-7.8	---	---	---	---
	12-20	30-50	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-10	0-2	2-8	5-8
69C:								
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
71D:								
Roy	0-7	27-40	11.0-24.0	6.1-7.8	---	---	---	---
	7-32	35-50	14.0-30.0	6.6-7.8	---	---	---	---
	32-60	27-40	11.0-24.0	7.4-8.4	1-5	---	0-4	---
Roy	0-7	27-40	11.0-24.0	6.1-7.8	---	---	---	---
	7-32	35-50	14.0-30.0	6.6-7.8	---	---	---	---
	32-60	27-40	11.0-24.0	7.4-8.4	1-5	---	0-4	---
71F:								
Roy	0-7	27-40	11.0-24.0	6.1-7.8	---	---	---	---
	7-32	35-50	14.0-30.0	6.6-7.8	---	---	---	---
	32-60	27-40	11.0-24.0	7.4-8.4	1-5	---	0-4	---
72F:								
Zahill	0-6	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-16	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	16-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
75C:								
Benz	0-3	27-35	10.0-25.0	7.4-9.0	1-5	---	4-8	4-13
	3-60	18-35	10.0-20.0	8.5-9.6	5-15	2-5	8-16	13-30

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
77D:								
Tinsley	0-4	5-10	5.0-10.0	6.6-7.8	---	---	---	---
	4-60	0-10	1.0-5.0	6.6-8.4	---	---	0-2	---
77F:								
Tinsley	0-4	5-10	5.0-10.0	6.6-7.8	---	---	---	---
	4-60	0-10	1.0-5.0	6.6-8.4	---	---	0-2	---
79B:								
Yamacall	0-5	18-27	15.0-20.0	6.6-8.4	---	---	---	---
	5-12	18-30	10.0-15.0	6.6-8.4	---	---	---	---
	12-60	18-30	10.0-15.0	7.9-8.4	5-15	0-1	0-4	1-5
82B:								
Savage	0-3	27-35	25.0-30.0	6.1-7.8	---	---	---	---
	3-16	35-50	30.0-35.0	6.1-8.4	---	---	0-4	---
	16-60	30-45	25.0-30.0	7.4-8.4	5-15	---	0-4	---
86C:								
Work	0-4	27-40	20.0-25.0	6.1-7.8	---	---	---	---
	4-12	35-50	20.0-25.0	6.6-7.8	---	---	---	---
	12-22	20-40	15.0-20.0	7.4-8.4	5-15	---	0-4	---
	22-60	15-40	10.0-15.0	7.4-8.4	5-10	---	0-4	---
87C:								
Tamaneen	0-7	27-35	25.0-30.0	6.6-7.8	---	---	---	---
	7-14	35-50	30.0-35.0	6.6-7.8	---	---	---	---
	14-26	30-45	25.0-30.0	7.4-8.4	20-30	---	0-2	---
	26-31	18-35	20.0-25.0	7.9-8.4	25-40	---	0-2	---
	31-60	8-25	5.0-10.0	7.9-8.4	25-40	---	0-2	---
Tamaneen	0-7	27-35	25.0-30.0	6.6-7.8	---	---	---	---
	7-14	35-50	25.0-30.0	6.6-7.8	---	---	0-2	---
	14-26	30-45	20.0-25.0	7.4-8.4	20-30	---	0-2	---
	26-31	18-35	5.0-10.0	7.9-8.4	25-40	---	0-2	---
	31-60	8-25	5.0-10.0	7.9-8.4	25-40	---	0-2	---
88C:								
Perma	0-12	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	12-36	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	36-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
88E:								
Perma	0-12	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	12-36	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	36-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
90A:								
Harlake	0-7	40-55	30.0-35.0	6.6-8.4	1-5	---	0-4	0-4
	7-38	35-60	25.0-35.0	7.4-8.4	5-10	---	0-4	4-10
	38-60	15-35	15.0-20.0	7.9-9.0	5-10	---	0-8	4-10
92D:								
Sunburst	0-4	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	4-23	35-50	20.0-25.0	7.9-8.4	5-15	---	2-4	---
	23-60	35-50	20.0-25.0	7.9-9.0	5-15	1-3	2-8	---
92F:								
Sunburst	0-4	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	4-23	35-50	20.0-25.0	7.9-8.4	5-15	---	2-4	---
	23-60	35-50	20.0-25.0	7.9-9.0	5-15	1-3	2-8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
94C:								
Busby	0-7	10-18	10.0-15.0	7.4-8.4	---	---	---	---
	7-14	10-18	10.0-15.0	7.4-8.4	---	---	---	---
	14-29	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	29-60	10-18	5.0-10.0	7.9-8.4	5-15	---	0-4	---
94E:								
Busby	0-7	10-18	10.0-15.0	7.4-8.4	---	---	---	---
	7-14	10-18	10.0-15.0	7.4-8.4	---	---	---	---
	14-29	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	29-60	10-18	5.0-10.0	7.9-8.4	5-15	---	0-4	---
98C:								
Kremlin	0-6	18-27	15.0-20.0	6.1-7.8	---	---	---	---
	6-22	18-30	10.0-15.0	6.6-7.8	---	---	---	---
	22-36	18-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	36-60	10-25	5.0-10.0	7.4-9.0	3-12	---	0-4	---
100F:								
Rubble land.								
115B:								
Thoeny	0-6	15-27	15.0-20.0	5.6-7.8	---	---	0-4	---
	6-18	35-50	25.0-30.0	7.4-9.0	---	---	4-8	5-20
	18-28	35-50	25.0-30.0	7.4-9.0	5-10	---	4-8	13-25
	28-41	35-50	10.0-25.0	7.9-9.0	5-15	---	4-16	13-25
	41-60	35-50	15.0-20.0	7.8-9.6	5-15	---	4-16	31-25
Elloam	0-2	20-27	20.0-25.0	6.1-7.8	---	---	0-2	5-10
	2-9	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	9-15	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	15-60	25-40	15.0-20.0	7.9-9.0	2-10	---	8-16	13-25
171C:								
Delpoint	0-5	18-27	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	5-13	18-35	15.0-20.0	7.9-8.4	0-10	---	0-4	---
	13-25	18-35	10.0-15.0	7.9-8.4	0-15	---	0-4	---
	25-60	---	---	---	---	---	---	---
Cabbart	0-3	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-6	18-27	5.0-10.0	7.4-9.0	10-15	---	0-4	1-5
	6-12	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	12-60	---	---	---	---	---	---	---
190B:								
Hedstrom	0-6	15-20	10.0-15.0	6.6-7.3	---	---	---	---
	6-16	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	16-22	20-30	10.0-15.0	7.9-9.0	8-15	---	0-4	---
	22-60	0-5	1.0-5.0	7.4-8.4	5-10	---	0-4	---
200F:								
Badland.								
201D:								
Cabba	0-4	10-27	10.0-15.0	7.4-9.0	0-10	---	0-4	---
	4-12	20-35	5.0-10.0	7.4-9.0	2-15	---	0-8	---
	12-60	---	---	---	---	---	---	---
Wayden	0-5	40-50	30.0-35.0	7.4-8.4	2-10	---	0-4	---
	5-12	35-50	25.0-30.0	7.4-8.4	5-15	---	0-8	---
	12-60	---	---	---	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
201F:								
Cabba	0-4	10-27	10.0-15.0	7.4-9.0	0-10	---	0-4	---
	4-12	20-35	5.0-10.0	7.4-9.0	2-15	---	0-8	---
	12-60	---	---	---	---	---	---	---
Wayden	0-5	40-50	30.0-35.0	7.4-8.4	2-10	---	0-4	---
	5-12	35-50	25.0-30.0	7.4-8.4	5-15	---	0-8	---
	12-60	---	---	---	---	---	---	---
Rock outcrop.								
211E:								
Cabbart	0-3	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-6	18-27	5.0-10.0	7.4-9.0	10-15	---	0-4	1-5
	6-12	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	12-60	---	---	---	---	---	---	---
Yawdim	0-3	40-50	25.0-30.0	6.6-7.8	---	---	---	---
	3-12	35-50	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	12-60	---	---	---	---	---	---	---
211F:								
Cabbart	0-3	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-6	18-27	5.0-10.0	7.4-9.0	10-15	---	0-4	1-5
	6-12	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	12-60	---	---	---	---	---	---	---
Yawdim	0-3	40-50	25.0-30.0	6.6-7.8	---	---	---	---
	3-12	35-50	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	12-60	---	---	---	---	---	---	---
Rock outcrop.								
221E:								
Hillon	0-6	27-35	15.0-20.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
Kevin	0-3	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	3-8	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	8-25	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	25-60	27-35	10.0-15.0	7.9-9.0	5-15	---	0-2	---
224B:								
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
Joplin	0-4	20-27	10.0-15.0	7.4-8.4	5-10	---	0-4	---
	4-9	25-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	9-20	18-32	10.0-15.0	7.4-8.4	10-15	---	0-4	---
	20-60	18-32	10.0-15.0	7.4-8.4	5-10	1-2	2-8	5-10
224E:								
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
Joplin	0-4	20-27	10.0-15.0	6.6-7.8	---	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-20	18-32	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	20-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
225F:								
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
Cabbart	0-3	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-6	18-27	5.0-10.0	7.4-9.0	10-15	---	0-4	1-5
	6-12	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	12-60	---	---	---	---	---	---	---
Yawdim	0-3	40-50	25.0-30.0	6.6-7.8	---	---	---	---
	3-12	35-50	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	12-60	---	---	---	---	---	---	---
261C:								
Auchard	0-2	27-35	20.0-25.0	6.1-7.3	---	---	---	---
	2-6	40-50	25.0-30.0	7.9-8.4	---	---	0-2	8-13
	6-11	35-50	20.0-25.0	7.9-9.0	5-15	---	2-4	13-30
	11-22	30-45	15.0-20.0	7.9-9.0	5-15	---	4-16	13-30
	22-60	---	---	---	---	---	---	---
Williams	0-5	15-27	15.0-20.0	6.6-7.3	---	---	---	---
	5-17	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	17-60	22-35	15.0-20.0	7.9-9.0	5-15	---	---	---
271D:								
Beaverell	0-5	10-27	10.0-20.0	6.6-7.8	---	---	---	---
	5-13	20-35	15.0-25.0	6.6-7.8	---	---	---	---
	13-60	0-15	0.0-5.0	7.4-8.4	2-15	---	0-2	---
Tinsley	0-4	5-10	5.0-10.0	6.6-7.8	---	---	---	---
	4-60	0-10	1.0-5.0	6.6-8.4	---	---	0-2	---
272C:								
Attewan	0-5	10-20	5.0-10.0	6.1-7.8	---	---	---	---
	5-13	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-21	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	21-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
Tinsley	0-4	5-10	5.0-10.0	6.6-7.8	---	---	---	---
	4-60	0-10	1.0-5.0	6.6-8.4	---	---	0-2	---
301C:								
Marvan	0-4	40-60	30.0-40.0	7.4-8.4	5-10	---	0-4	0-4
	4-25	45-60	30.0-40.0	7.9-9.0	5-10	---	2-8	4-13
	25-60	45-60	25.0-35.0	7.9-9.0	5-10	1-5	8-16	13-38
Vanda	0-4	40-60	25.0-35.0	7.9-9.6	1-5	---	2-8	20-30
	4-60	35-60	20.0-30.0	7.9-9.6	1-5	1-5	8-16	13-30
302B:								
Marvan	0-4	40-60	25.0-30.0	7.4-8.4	1-5	---	0-4	0-4
	4-25	45-60	25.0-30.0	7.9-9.0	5-10	---	2-4	4-13
	25-60	45-60	25.0-30.0	7.9-9.0	5-10	1-5	4-16	13-38
304B:								
Marvan	0-4	40-60	30.0-35.0	7.9-9.0	1-5	---	2-8	8-18
	4-11	45-60	30.0-35.0	7.9-9.0	5-10	---	2-8	13-38
	11-60	45-60	25.0-30.0	7.9-9.0	5-10	1-5	8-16	13-38

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
304B:								
Joplin	0-4	20-27	10.0-15.0	6.6-7.8	---	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-20	18-32	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	20-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
306D:								
Marvan	0-4	40-60	30.0-35.0	7.9-9.0	1-5	---	2-8	8-18
	4-11	45-60	30.0-35.0	7.9-9.0	5-10	---	2-8	13-38
	11-60	45-60	25.0-30.0	7.9-9.0	5-10	1-5	8-16	13-38
Yawdim	0-3	40-50	25.0-30.0	6.6-7.8	---	---	---	---
	3-12	35-50	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	12-60	---	---	---	---	---	---	---
Cabbart	0-3	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-6	18-27	5.0-10.0	7.4-9.0	10-15	---	0-4	1-5
	6-12	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	12-60	---	---	---	---	---	---	---
311B:								
Ferd	0-5	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	5-9	22-35	10.0-25.0	6.6-7.8	---	---	---	---
	9-16	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	16-22	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	22-60	27-40	10.0-25.0	8.5-9.0	5-15	1-3	4-8	8-13
Creed	0-6	20-35	15.0-20.0	6.1-8.4	---	---	0-4	---
	6-12	35-55	25.0-35.0	7.4-9.0	---	---	2-4	8-13
	12-31	27-45	20.0-30.0	7.9-9.0	5-15	---	4-8	13-20
	31-60	25-35	15.0-20.0	7.9-9.0	5-10	---	4-16	13-20
Gerdrum	0-3	20-27	20.0-25.0	6.6-7.8	---	---	0-2	---
	3-11	35-55	25.0-35.0	7.4-9.0	---	---	1-8	10-20
	11-38	30-50	20.0-25.0	7.9-9.0	5-15	---	2-16	13-30
	38-60	30-50	15.0-20.0	7.9-9.0	5-15	1-5	8-16	13-30
321B:								
Kobase	0-5	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	5-15	35-45	20.0-25.0	7.4-8.4	5-15	---	0-2	5-10
	15-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
321C:								
Kobase	0-5	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	5-15	35-45	20.0-25.0	7.4-8.4	5-15	---	0-2	5-10
	15-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
323B:								
Sagedale	0-5	40-45	25.0-30.0	7.4-8.4	---	---	---	---
	5-12	35-45	20.0-25.0	7.4-8.4	---	---	0-2	---
	12-25	35-45	20.0-25.0	7.4-8.4	5-15	---	0-4	---
	25-60	35-45	20.0-25.0	7.4-9.0	5-10	1-7	0-4	---
323C:								
Sagedale	0-5	40-45	25.0-30.0	7.4-8.4	---	---	---	---
	5-12	35-45	20.0-25.0	7.4-8.4	---	---	0-2	---
	12-25	35-45	20.0-25.0	7.4-8.4	5-15	---	0-4	---
	25-60	35-45	20.0-25.0	7.4-9.0	5-10	1-7	0-4	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
331B:								
Phillips	0-7	20-27	10.0-15.0	6.1-7.3	---	---	0-2	---
	7-16	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	16-50	25-40	15.0-20.0	7.4-8.4	5-15	---	2-4	0-13
	50-60	20-40	15.0-20.0	7.4-8.4	5-10	1-3	4-8	0-13
Elloam	0-2	20-27	20.0-25.0	6.1-7.8	---	---	0-2	5-10
	2-9	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	9-15	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	15-60	25-40	15.0-20.0	7.8-9.0	2-10	---	8-16	13-25
351B:								
Kenilworth	0-5	5-18	15.0-20.0	6.6-7.8	---	---	---	---
	5-10	15-25	15.0-25.0	6.6-7.8	---	---	---	---
	10-21	18-35	20.0-30.0	6.6-7.8	---	---	---	---
	21-40	27-35	20.0-30.0	7.4-8.4	5-15	---	0-2	---
	40-60	27-35	20.0-30.0	7.9-9.0	5-15	1-3	0-4	---
Fortbenton	0-7	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	7-28	10-18	5.0-10.0	6.6-7.8	---	---	---	---
	28-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	0-4
363B:								
Cozberg	0-4	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	4-16	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	16-30	10-18	10.0-15.0	7.4-8.4	5-15	---	---	---
	30-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
Chinook	0-6	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	6-17	5-18	5.0-10.0	6.6-9.0	---	---	0-2	---
	17-60	5-18	5.0-10.0	7.4-9.0	3-15	---	0-2	---
368C:								
Fortbenton	0-7	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	7-28	10-18	5.0-10.0	6.6-7.8	---	---	---	---
	28-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	0-4
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
385B:								
Ethridge	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	13-30	25-45	20.0-25.0	7.4-9.0	5-15	---	---	1-5
	30-60	25-40	20.0-25.0	7.4-9.0	5-15	0-3	2-4	1-5
Kobase	0-5	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	5-15	35-45	20.0-25.0	7.4-8.4	5-15	---	0-2	5-10
	15-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
401C:								
Gerdrum	0-3	20-27	20.0-25.0	6.6-7.8	---	---	0-2	---
	3-11	35-55	25.0-35.0	7.4-9.0	---	---	1-8	10-20
	11-38	30-50	20.0-25.0	7.9-9.0	5-15	---	2-16	13-30
	38-60	30-50	15.0-20.0	7.9-9.0	5-15	1-5	8-16	13-30
Yamacall	0-5	18-27	15.0-20.0	6.6-8.4	---	---	---	---
	5-12	18-30	10.0-15.0	6.6-8.4	---	---	---	---
	12-60	18-30	10.0-15.0	7.9-9.0	5-15	0-1	0-4	1-5

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
421C:								
Joplin	0-4	20-27	10.0-15.0	6.6-7.8	---	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-20	18-32	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	20-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
441C:								
Kevin	0-3	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	3-8	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	8-25	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	25-60	27-35	10.0-15.0	7.9-9.0	5-15	---	0-2	---
Hillon	0-6	27-35	15.0-20.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
442C:								
Kevin	0-3	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	3-8	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	8-25	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	25-60	27-35	10.0-15.0	7.9-9.0	1-5	---	0-2	---
Elloam	0-2	20-27	20.0-25.0	6.1-7.8	---	---	0-2	5-10
	2-9	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	9-15	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	15-60	25-40	15.0-20.0	7.8-9.6	2-10	---	8-16	13-25
445E:								
Kevin	0-3	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	3-8	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	8-25	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	25-60	27-35	10.0-15.0	7.9-9.0	5-15	---	0-2	---
Hillon	0-6	20-27	20.0-25.0	7.4-8.4	0-10	---	0-2	---
	6-60	20-35	15.0-20.0	7.9-9.0	2-15	---	0-2	---
Nishon	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-16	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	16-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---
471B:								
Marias	0-7	40-60	30.0-35.0	7.4-8.4	5-10	---	0-4	1-4
	7-28	40-60	25.0-30.0	7.9-9.0	5-10	---	2-4	1-4
	28-60	40-60	25.0-30.0	7.9-9.0	5-10	1-6	2-8	4-13
Kobase	0-5	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	5-15	35-45	20.0-25.0	7.4-8.4	5-15	---	0-2	5-10
	15-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
491B:								
Enbar	0-21	18-27	20.0-25.0	6.6-8.4	0-5	---	---	---
	21-42	18-30	15.0-20.0	7.9-8.4	5-10	---	---	---
	42-60	18-27	10.0-15.0	7.9-8.4	5-10	---	0-2	---
Nesda	0-5	10-20	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
493B:								
Enbar	0-21	18-27	20.0-25.0	6.6-8.4	0-5	---	---	---
	21-42	18-30	15.0-20.0	7.9-8.4	5-10	---	---	---
	42-60	18-27	10.0-15.0	7.9-8.4	5-10	---	0-2	---
Bigsandy	0-3	15-27	20.0-25.0	7.4-9.0	---	---	2-4	0-4
	3-11	18-35	20.0-25.0	7.9-9.0	---	---	2-4	0-4
	11-29	18-35	15.0-20.0	8.5-9.0	5-15	---	4-25	5-13
	29-60	15-35	15.0-20.0	8.5-9.0	5-15	1-3	8-24	5-13
Korchea	0-6	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	6-60	18-35	15.0-20.0	7.4-9.0	5-10	---	0-4	---
503B:								
Telstad	0-6	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-14	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	14-28	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	28-60	20-32	15.0-20.0	7.9-8.4	3-12	0-3	2-4	---
Joplin	0-4	20-27	10.0-15.0	6.6-7.8	---	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-20	18-22	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	20-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-4	---
503C:								
Telstad	0-6	18-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-14	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	14-28	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	28-60	20-32	15.0-20.0	7.9-9.0	3-12	0-3	2-4	---
Joplin	0-4	10-27	10.0-15.0	6.6-7.8	---	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-20	18-22	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	20-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
512F:								
Elve	0-19	10-20	10.0-15.0	5.1-6.5	---	---	---	---
	19-60	10-20	5.0-10.0	5.1-6.5	---	---	---	---
Rubble land.								
521C:								
Elloam	0-2	20-27	20.0-25.0	6.1-7.8	---	---	0-2	5-10
	2-9	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	9-15	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	15-60	25-40	15.0-20.0	7.9-9.0	2-10	---	8-16	13-25
Absher	0-1	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	1-7	35-60	25.0-30.0	6.6-9.0	---	1-5	8-16	18-70
	7-60	35-50	20.0-25.0	7.9-9.0	4-15	1-5	16-30	18-70
531C:								
Turner	0-8	18-25	10.0-20.0	6.1-7.8	---	---	---	---
	8-17	25-35	10.0-25.0	6.6-8.4	---	---	---	---
	17-23	25-35	10.0-20.0	7.4-8.4	5-15	---	---	---
	23-60	0-5	1.0-5.0	7.4-8.4	2-12	---	---	---
Beaverton	0-5	15-27	15.0-20.0	6.6-7.8	---	---	---	---
	5-15	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	15-60	0-10	1.0-5.0	7.4-8.4	5-15	---	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
561B:								
Scobey	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	12-60	30-40	15.0-20.0	7.4-8.4	5-15	0-6	0-2	0-8
Kevin	0-3	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	3-8	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	8-25	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	25-60	27-35	10.0-15.0	7.9-8.4	5-15	---	0-2	---
561C:								
Scobey	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	12-60	30-40	15.0-20.0	7.4-9.0	5-15	0-6	0-2	0-8
Kevin	0-3	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	3-8	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	8-25	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	25-60	27-35	10.0-15.0	7.9-9.0	5-15	---	0-2	---
601A:								
Havre	0-5	15-27	15.0-20.0	7.4-8.4	1-5	---	0-2	---
	5-60	18-35	15.0-25.0	7.4-9.0	1-5	---	0-4	---
Glendive	0-6	5-15	10.0-15.0	6.6-9.0	0-5	---	0-4	---
	6-32	5-18	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	32-60	5-18	10.0-15.0	7.4-9.0	5-10	---	2-8	---
603B:								
Thibadeau	0-2	15-27	15.0-20.0	7.4-9.6	1-5	---	8-16	---
	2-60	18-35	15.0-25.0	7.4-9.0	1-5	---	8-16	---
605C:								
Yamacall	0-5	18-27	15.0-20.0	6.6-8.4	---	---	---	---
	5-12	18-30	10.0-15.0	6.6-8.4	---	---	---	---
	12-60	18-30	10.0-15.0	7.9-9.0	5-15	0-1	0-4	1-5
Havre	0-5	10-22	15.0-20.0	7.4-8.4	1-5	---	0-2	---
	5-60	18-30	15.0-25.0	7.4-8.4	1-5	---	0-4	---
631B:								
Nunemaker	0-6	35-40	25.0-30.0	7.4-8.4	5-10	---	---	---
	6-19	45-55	25.0-30.0	7.4-8.4	5-15	---	0-4	---
	19-60	35-50	20.0-25.0	7.9-9.0	5-10	---	2-4	---
631C:								
Nunemaker	0-6	35-40	25.0-30.0	7.4-8.4	5-10	---	---	---
	6-19	45-55	25.0-30.0	7.4-8.4	5-15	---	0-4	---
	19-60	35-50	20.0-25.0	7.9-9.0	5-10	---	2-4	---
661C:								
Twilight	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-13	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	13-35	5-18	5.0-10.0	7.4-8.4	5-10	---	0-4	---
	35-60	---	---	---	---	---	---	---
Blacksheep	0-4	5-15	5.0-10.0	7.4-8.4	---	---	---	---
	4-18	5-15	5.0-10.0	7.9-8.4	5-10	---	0-2	---
	18-60	---	---	---	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
671C:								
Bearpaw	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-50	25.0-30.0	6.1-7.8	---	---	---	---
	12-20	30-50	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-10	0-2	2-8	5-8
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
Nishon	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-16	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	16-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---
673B:								
Bearpaw	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-50	25.0-30.0	6.1-7.8	---	---	---	---
	12-20	30-50	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-10	0-2	2-8	5-8
Daglum	0-14	27-35	15.0-30.0	6.1-7.8	---	---	---	---
	14-29	35-60	20.0-40.0	6.6-9.0	0-5	---	2-8	8-20
	29-60	35-60	20.0-35.0	7.9-9.0	5-15	2-5	8-16	13-30
691D:								
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
Williams	0-5	20-27	15.0-20.0	6.6-7.3	---	---	---	---
	5-17	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	17-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
692D:								
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
Bearpaw	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-50	25.0-30.0	6.1-7.8	---	---	---	---
	12-20	30-50	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-10	0-2	2-8	5-8
693D:								
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
Bearpaw	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-12	35-50	25.0-30.0	6.1-7.8	---	---	---	---
	12-20	30-50	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-10	0-2	2-8	5-8
Nishon	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-16	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	16-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---
695C:								
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
695C:								
Zahill	0-6	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-16	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	16-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
695E:								
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
Zahill	0-6	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-16	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	16-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
702F:								
Winspect	0-3	20-25	15.0-20.0	7.4-8.4	5-10	---	---	---
	3-8	20-30	15.0-20.0	7.4-8.4	10-40	---	---	---
	8-18	20-35	15.0-20.0	7.4-8.4	15-40	---	---	---
	18-60	20-35	10.0-15.0	7.4-8.4	15-40	---	0-2	---
Winspect	0-3	20-25	15.0-20.0	7.4-8.4	5-10	---	---	---
	3-8	20-30	15.0-20.0	7.4-8.4	10-40	---	---	---
	8-18	20-35	15.0-20.0	7.4-8.4	15-40	---	---	---
	18-60	20-35	10.0-15.0	7.4-8.4	15-40	---	0-2	---
Rock outcrop.								
712E:								
Roy	0-7	27-40	11.0-24.0	6.1-7.8	---	---	---	---
	7-32	35-50	14.0-30.0	6.6-7.8	---	---	---	---
	32-60	27-40	11.0-24.0	7.4-8.4	1-5	---	0-4	---
Barkof	0-10	40-60	30.0-40.0	6.6-8.4	0-5	---	0-4	---
	10-26	45-60	30.0-35.0	7.4-9.0	5-10	---	2-4	1-5
	26-60	---	---	---	---	---	---	---
712F:								
Roy	0-7	27-40	11.0-24.0	6.1-7.8	---	---	---	---
	7-32	35-50	14.0-30.0	6.6-7.8	---	---	---	---
	32-60	27-40	11.0-24.0	7.4-8.4	1-5	---	0-4	---
Barkof	0-10	40-60	30.0-40.0	6.6-8.4	0-5	---	0-4	---
	10-26	45-60	30.0-35.0	7.4-9.0	5-10	---	2-4	1-5
	26-60	---	---	---	---	---	---	---
Rock outcrop.								
723F:								
Zahill	0-6	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-16	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	16-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Cabba	0-4	10-27	10.0-15.0	7.4-9.0	0-10	---	0-4	---
	4-12	20-35	5.0-10.0	7.4-9.0	2-15	---	0-8	---
	12-60	---	---	---	---	---	---	---
781C:								
Creed	0-6	20-35	15.0-20.0	6.1-8.4	---	---	0-4	---
	6-12	35-55	25.0-35.0	7.4-9.0	---	---	2-4	8-13
	12-31	27-45	20.0-30.0	7.9-9.0	5-15	---	4-8	13-20
	31-60	25-35	15.0-20.0	7.9-9.0	5-10	---	4-16	13-20

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
781C:								
Weingart	0-2	27-40	30.0-35.0	5.6-7.8	---	---	0-2	10-20
	2-5	40-60	30.0-35.0	6.6-9.0	---	---	2-8	10-30
	5-10	35-55	30.0-35.0	6.6-9.0	---	0-1	2-8	10-30
	10-25	35-55	30.0-35.0	7.8-9.6	5-15	1-5	4-16	13-30
	25-60	---	---	---	---	---	---	---
791B:								
Yamacall	0-5	16-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	5-12	18-30	10.0-15.0	7.9-9.0	10-15	0-1	0-4	1-5
	12-60	10-30	10.0-15.0	7.9-9.0	5-10	---	0-4	1-5
801B:								
Williams	0-5	20-27	15.0-20.0	6.6-7.3	---	---	---	---
	5-17	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	17-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	0-5	0-2	---
801C:								
Williams	0-5	15-27	15.0-20.0	6.6-7.3	---	---	---	---
	5-17	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	17-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
Vida	0-5	27-30	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-9.0	5-15	0-5	0-2	---
812A:								
Glendive	0-6	5-15	10.0-15.0	6.6-9.0	---	---	0-4	---
	6-32	5-18	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	32-60	5-18	10.0-15.0	7.4-9.0	5-10	---	2-8	---
Havre	0-5	15-27	15.0-20.0	6.1-8.4	1-5	---	0-2	---
	5-60	18-35	15.0-25.0	7.4-9.0	1-5	---	0-4	---
882F:								
Perma	0-11	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	11-37	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	37-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
Whitlash	0-9	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	9-16	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	16-60	---	---	---	---	---	---	---
892F:								
Whitlash	0-9	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	9-16	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	16-60	---	---	---	---	---	---	---
Rock outcrop.								
952F:								
Dast	0-3	2-18	10.0-15.0	7.4-8.4	1-5	---	---	---
	3-18	2-18	10.0-15.0	7.4-8.4	1-5	---	---	---
	18-26	2-18	5.0-10.0	7.4-8.4	5-10	---	---	---
	26-60	---	---	---	---	---	---	---
Rock outcrop.								

Water Features

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
5A:									
McKenzie	D	None	---	---	---	---	Jan-Dec	Long	0.5
12C:									
Beaverton	B	None	---	---	>6.0	---	---	---	---
14C:									
Brockway	B	None	---	---	>6.0	---	---	---	---
15E:									
Lambeth	B	None	---	---	>6.0	---	---	---	---
15F:									
Lambeth	B	None	---	---	>6.0	---	---	---	---
16B:									
Degrand	B	None	---	---	>6.0	---	---	---	---
18E:									
Yawdim	D	None	---	---	>6.0	---	---	---	---
21E:									
Cabbart	D	None	---	---	>6.0	---	---	---	---
Delpoint	C	None	---	---	>6.0	---	---	---	---
22F:									
Hillon	C	None	---	---	>6.0	---	---	---	---
23B:									
Acel	C	None	---	---	>6.0	---	---	---	---
24B:									
Farnuf	B	None	---	---	>6.0	---	---	---	---
27B:									
Attewan	B	None	---	---	>6.0	---	---	---	---
28A:									
Nishon	D	None	---	---	---	---	Apr-Aug	Long	1.0
30B:									
Marvan	D	None	---	---	>6.0	---	---	---	---
30C:									
Marvan	D	None	---	---	>6.0	---	---	---	---
32B:									
Kobase	C	None	---	---	>6.0	---	---	---	---
32C:									
Kobase	C	None	---	---	>6.0	---	---	---	---
34A:									
Linnet	C	None	---	---	>6.0	---	---	---	---
35B:									
Assinniboine	B	None	---	---	>6.0	---	---	---	---
36C:									
Chinook	B	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
37B:									
Evanston	B	None	---	---	>6.0	---	---	---	---
37C:									
Evanston	B	None	---	---	>6.0	---	---	---	---
38B:									
Ethridge	C	None	---	---	>6.0	---	---	---	---
39C:									
Lisk	B	None	---	---	>6.0	---	---	---	---
39E:									
Lisk	B	None	---	---	>6.0	---	---	---	---
41C:									
Reeder	C	None	---	---	>6.0	---	---	---	---
43B:									
Marmarth	C	None	---	---	>6.0	---	---	---	---
47B:									
Marias	D	None	---	---	>6.0	---	---	---	---
51F:									
Elve	B	None	---	---	>6.0	---	---	---	---
54B:									
Lawther	D	None	---	---	>6.0	---	---	---	---
54C:									
Lawther	D	None	---	---	>6.0	---	---	---	---
58B:									
Lonna	B	None	---	---	>6.0	---	---	---	---
58C:									
Lonna	B	None	---	---	>6.0	---	---	---	---
60A:									
Havre	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
63B:									
Nunemaker	D	None	---	---	>6.0	---	---	---	---
63C:									
Nunemaker	D	None	---	---	>6.0	---	---	---	---
64D:									
Barkof	D	None	---	---	>6.0	---	---	---	---
67B:									
Bearpaw	C	None	---	---	>6.0	---	---	---	---
67C:									
Bearpaw	C	None	---	---	>6.0	---	---	---	---
69C:									
Vida	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
71D:									
Roy	B	None	---	---	>6.0	---	---	---	---
Roy	B	None	---	---	>6.0	---	---	---	---
71F:									
Roy	B	None	---	---	>6.0	---	---	---	---
72F:									
Zahill	C	None	---	---	>6.0	---	---	---	---
75C:									
Benz	D	None	---	---	>6.0	---	---	---	---
77D:									
Tinsley	A	None	---	---	>6.0	---	---	---	---
77F:									
Tinsley	A	None	---	---	>6.0	---	---	---	---
79B:									
Yamacall	B	None	---	---	>6.0	---	---	---	---
82B:									
Savage	C	None	---	---	>6.0	---	---	---	---
86C:									
Work	C	None	---	---	>6.0	---	---	---	---
87C:									
Tamaneen	B	None	---	---	>6.0	---	---	---	---
Tamaneen	B	None	---	---	>6.0	---	---	---	---
88C:									
Perma	B	None	---	---	>6.0	---	---	---	---
88E:									
Perma	B	None	---	---	>6.0	---	---	---	---
90A:									
Harlake	C	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
92D:									
Sunburst	C	None	---	---	>6.0	---	---	---	---
92F:									
Sunburst	C	None	---	---	>6.0	---	---	---	---
94C:									
Busby	B	None	---	---	>6.0	---	---	---	---
94E:									
Busby	B	None	---	---	>6.0	---	---	---	---
98C:									
Kremlin	B	None	---	---	>6.0	---	---	---	---
100F:									
Rubble land.									

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				Maximum ponding depth
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	
					Ft				Ft
115B:									
Thoeny	D	None	---	---	>6.0	---	---	---	---
Elloam	D	None	---	---	>6.0	---	---	---	---
171C:									
Delpoint	C	None	---	---	>6.0	---	---	---	---
Cabbart	D	None	---	---	>6.0	---	---	---	---
190B:									
Hedstrom	B	None	---	---	>6.0	---	---	---	---
200F:									
Badland.									
201D:									
Cabba	D	None	---	---	>6.0	---	---	---	---
Wayden	D	None	---	---	>6.0	---	---	---	---
201F:									
Cabba	D	None	---	---	>6.0	---	---	---	---
Wayden	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
211E:									
Cabbart	D	None	---	---	>6.0	---	---	---	---
Yawdim	D	None	---	---	>6.0	---	---	---	---
211F:									
Cabbart	D	None	---	---	>6.0	---	---	---	---
Yawdim	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
221E:									
Hillon	C	None	---	---	>6.0	---	---	---	---
Kevin	C	None	---	---	>6.0	---	---	---	---
224B:									
Hillon	C	None	---	---	>6.0	---	---	---	---
Joplin	C	None	---	---	>6.0	---	---	---	---
224E:									
Hillon	C	None	---	---	>6.0	---	---	---	---
Joplin	C	None	---	---	>6.0	---	---	---	---
225F:									
Hillon	C	None	---	---	>6.0	---	---	---	---
Cabbart	D	None	---	---	>6.0	---	---	---	---
Yawdim	D	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
261C:									
Auchard	C	None	---	---	>6.0	---	---	---	---
Williams	B	None	---	---	>6.0	---	---	---	---
271D:									
Beaverell	B	None	---	---	>6.0	---	---	---	---
Tinsley	A	None	---	---	>6.0	---	---	---	---
272C:									
Attewan	B	None	---	---	>6.0	---	---	---	---
Tinsley	A	None	---	---	>6.0	---	---	---	---
301C:									
Marvan	D	None	---	---	>6.0	---	---	---	---
Vanda	D	None	---	---	>6.0	---	---	---	---
302B:									
Marvan	D	None	---	---	>6.0	---	---	---	---
304B:									
Marvan	D	None	---	---	>6.0	---	---	---	---
Joplin	C	None	---	---	>6.0	---	---	---	---
306D:									
Marvan	D	None	---	---	>6.0	---	---	---	---
Yawdim	D	None	---	---	>6.0	---	---	---	---
Cabbart	D	None	---	---	>6.0	---	---	---	---
311B:									
Ferd	C	None	---	---	>6.0	---	---	---	---
Creed	C	None	---	---	>6.0	---	---	---	---
Gerdrum	D	None	---	---	>6.0	---	---	---	---
321B:									
Kobase	C	None	---	---	>6.0	---	---	---	---
321C:									
Kobase	C	None	---	---	>6.0	---	---	---	---
323B:									
Sagedale	C	None	---	---	>6.0	---	---	---	---
323C:									
Sagedale	C	None	---	---	>6.0	---	---	---	---
331B:									
Phillips	C	None	---	---	>6.0	---	---	---	---
Elloam	D	None	---	---	>6.0	---	---	---	---
351B:									
Kenilworth	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
351B:									
Fortbenton	C	None	---	---	>6.0	---	---	---	---
363B:									
Cozberg	B	None	---	---	>6.0	---	---	---	---
Chinook	B	None	---	---	>6.0	---	---	---	---
368C:									
Fortbenton	C	None	---	---	>6.0	---	---	---	---
Hillon	C	None	---	---	>6.0	---	---	---	---
385B:									
Ethridge	C	None	---	---	>6.0	---	---	---	---
Kobase	C	None	---	---	>6.0	---	---	---	---
401C:									
Gerdrum	D	None	---	---	>6.0	---	---	---	---
Yamacall	B	None	---	---	>6.0	---	---	---	---
421C:									
Joplin	C	None	---	---	>6.0	---	---	---	---
Hillon	C	None	---	---	>6.0	---	---	---	---
441C:									
Kevin	C	None	---	---	>6.0	---	---	---	---
Hillon	C	None	---	---	>6.0	---	---	---	---
442C:									
Kevin	C	None	---	---	>6.0	---	---	---	---
Elloam	D	None	---	---	>6.0	---	---	---	---
445E:									
Kevin	C	None	---	---	>6.0	---	---	---	---
Hillon	C	None	---	---	>6.0	---	---	---	---
Nishon	D	None	---	---	---	---	Apr-Aug	Long	1.0
471B:									
Marias	D	None	---	---	>6.0	---	---	---	---
Kobase	C	None	---	---	>6.0	---	---	---	---
491B:									
Enbar	B	Occasional	Brief	Mar-Jun	2.5-5.0	Apparent	Apr-Jul	---	---
Nesda	B	Occasional	Brief	Mar-Jun	>6.0	---	---	---	---
493B:									
Enbar	B	Occasional	Brief	Mar-Jun	2.5-5.0	Apparent	Apr-Jul	---	---
Bigsandy	D	Occasional	Brief	Mar-Jun	1.0-2.0	Apparent	Dec-Jun	---	---
Korchea	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
503B:									
Telstad	C	None	---	---	>6.0	---	---	---	---
Joplin	C	None	---	---	>6.0	---	---	---	---
503C:									
Telstad	C	None	---	---	>6.0	---	---	---	---
Joplin	C	None	---	---	>6.0	---	---	---	---
512F:									
Elve	B	None	---	---	>6.0	---	---	---	---
Rubble land.									
521C:									
Elloam	D	None	---	---	>6.0	---	---	---	---
Absher	D	None	---	---	>6.0	---	---	---	---
531C:									
Turner	B	None	---	---	>6.0	---	---	---	---
Beaverton	B	None	---	---	>6.0	---	---	---	---
561B:									
Scobey	C	None	---	---	>6.0	---	---	---	---
Kevin	C	None	---	---	>6.0	---	---	---	---
561C:									
Scobey	C	None	---	---	>6.0	---	---	---	---
Kevin	C	None	---	---	>6.0	---	---	---	---
601A:									
Havre	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
Glendive	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
603B:									
Thibadeau	C	Occasional	Brief	Apr-Jun	2.0-3.5	Apparent	May-Aug	---	---
605C:									
Yamacall	B	None	---	---	>6.0	---	---	---	---
Havre	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
631B:									
Nunemaker	D	None	---	---	>6.0	---	---	---	---
631C:									
Nunemaker	D	None	---	---	>6.0	---	---	---	---
661C:									
Twilight	B	None	---	---	>6.0	---	---	---	---
Blacksheep	C	None	---	---	>6.0	---	---	---	---
671C:									
Bearpaw	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
671C:									
Vida	C	None	---	---	>6.0	---	---	---	---
Nishon	D	None	---	---	---	---	Apr-Aug	Long	1.0
673B:									
Bearpaw	C	None	---	---	>6.0	---	---	---	---
Daglum	D	None	---	---	>6.0	---	---	---	---
691D:									
Vida	C	None	---	---	>6.0	---	---	---	---
Williams	B	None	---	---	>6.0	---	---	---	---
692D:									
Vida	C	None	---	---	>6.0	---	---	---	---
Bearpaw	C	None	---	---	>6.0	---	---	---	---
693D:									
Vida	C	None	---	---	>6.0	---	---	---	---
Bearpaw	C	None	---	---	>6.0	---	---	---	---
Nishon	D	None	---	---	---	Perched	Apr-Aug	Long	1.0
695C:									
Vida	C	None	---	---	>6.0	---	---	---	---
Zahill	C	None	---	---	>6.0	---	---	---	---
695E:									
Vida	C	None	---	---	>6.0	---	---	---	---
Zahill	C	None	---	---	>6.0	---	---	---	---
702F:									
Winspect	B	None	---	---	>6.0	---	---	---	---
Winspect	B	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
712E:									
Roy	B	None	---	---	>6.0	---	---	---	---
Barkof	D	None	---	---	>6.0	---	---	---	---
712F:									
Roy	B	None	---	---	>6.0	---	---	---	---
Barkof	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
723F:									
Zahill	C	None	---	---	>6.0	---	---	---	---
Cabba	D	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
781C:									
Creed	C	None	---	---	>6.0	---	---	---	---
Weingart	D	None	---	---	>6.0	---	---	---	---
791B:									
Yamacall	B	None	---	---	>6.0	---	---	---	---
801B:									
Williams	B	None	---	---	>6.0	---	---	---	---
Vida	C	None	---	---	>6.0	---	---	---	---
801C:									
Williams	B	None	---	---	>6.0	---	---	---	---
Vida	C	None	---	---	>6.0	---	---	---	---
812A:									
Glendive	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
Havre	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
882F:									
Perma	B	None	---	---	>6.0	---	---	---	---
Whitlash	D	None	---	---	>6.0	---	---	---	---
892F:									
Whitlash	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
952F:									
Dast	B	None	---	---	>6.0	---	---	---	---
Rock outcrop.									

Soil Features

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
5A:					
McKenzie	>60	---	Low	High	Low
12C:					
Beaverton	>60	---	Moderate	High	Low
14C:					
Brockway	>60	---	Moderate	High	Moderate
15E:					
Lambeth	>60	---	Moderate	High	Low
15F:					
Lambeth	>60	---	Moderate	High	Low
16B:					
Degrand	>60	---	Moderate	High	Low
18E:					
Yawdim	10-20	Soft	Low	High	Low
21E:					
Cabbart	10-20	Soft	Moderate	High	Low
Delpoint	20-40	Soft	Moderate	High	Low
22F:					
Hillon	>60	---	Moderate	High	Low
23B:					
Acel	>60	---	Low	High	Low
24B:					
Farnuf	>60	---	Moderate	High	Low
27B:					
Attewan	>60	---	Moderate	High	Low
28A:					
Nishon	>60	---	Moderate	High	Low
30B:					
Marvan	>60	---	Low	High	Moderate
30C:					
Marvan	>60	---	Low	High	Moderate
32B:					
Kobase	>60	---	Low	High	Low
32C:					
Kobase	>60	---	Low	High	Low
34A:					
Linnet	>60	---	Low	High	Low
35B:					
Assinniboine	>60	---	Moderate	High	Low
36C:					
Chinook	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
37B:					
Evanston--------	>60	---	Moderate	High	Low
37C:					
Evanston--------	>60	---	Moderate	High	Low
38B:					
Ethridge--------	>60	---	Low	High	Low
39C:					
Lisk------------	>60	---	Moderate	High	Low
39E:					
Lisk------------	>60	---	Moderate	High	Low
41C:					
Reeder----------	20-40	Soft	Moderate	High	Low
43B:					
Marmarth--------	20-40	Soft	Moderate	High	Low
47B:					
M. rias----------	>60	---	Low	High	Low
51F:					
Elve------------	>60	---	Moderate	Moderate	Moderate
54B:					
Lawther---------	>60	---	Low	High	High
54C:					
Lawther---------	>60	---	Low	High	High
58B:					
Lonna-----------	>60	---	Moderate	High	Low
58C:					
Lonna-----------	>60	---	Moderate	High	Low
60A:					
Havre-----------	>60	---	Moderate	High	Low
63B:					
Nunemaker-------	>60	---	Low	High	Low
63C:					
Nunemaker-------	>60	---	Low	High	Low
64D:					
Barkof----------	20-40	Soft	Moderate	High	Moderate
67B:					
Bearpaw---------	>60	---	Moderate	High	Moderate
67C:					
Bearpaw---------	>60	---	Moderate	High	Moderate
69C:					
Vida------------	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
71D:					
Roy	>60	---	Moderate	High	Low
Roy	>60	---	Moderate	High	Low
71F:					
Roy	>60	---	Moderate	High	Low
72F:					
Zahill	>60	---	Moderate	High	Low
75C:					
Benz	>60	---	Moderate	High	Low
77D:					
Tinsley	>60	---	Low	High	Low
77F:					
Tinsley	>60	---	Low	High	Low
79B:					
Yamacall	>60	---	Moderate	High	Low
82B:					
Savage	>60	---	Low	High	Low
86C:					
Work	>60	---	Moderate	High	Low
87C:					
Tamaneen	>60	---	Moderate	High	Low
Tamaneen	>60	---	Moderate	High	Low
88C:					
Perma	>60	---	Moderate	Moderate	Low
88E:					
Perma	>60	---	Moderate	Moderate	Low
90A:					
Harlake	>60	---	Low	High	Low
92D:					
Sunburst	>60	---	Low	High	Low
92F:					
Sunburst	>60	---	Low	High	Low
94C:					
Busby	>60	---	Moderate	High	Low
94E:					
Busby	>60	---	Moderate	High	Low
98C:					
Kremlin	>60	---	Moderate	High	Low
100F:					
Rubble land.					

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
115B:					
Thoeny	>60	---	Low	High	Moderate
Elloam	>60	---	Low	High	High
171C:					
Delpoint	20-40	Soft	Moderate	High	Low
Cabbart	10-20	Soft	Moderate	High	Low
190B:					
Hedstrom	>60	---	Moderate	High	Low
200F:					
Badland.					
201D:					
Cabba	10-20	Soft	Moderate	High	Low
Wayden	10-20	Soft	Low	High	Low
201F:					
Cabba	10-20	Soft	Moderate	High	Low
Wayden	10-20	Soft	Low	High	Low
Rock outcrop.					
211E:					
Cabbart	10-20	Soft	Moderate	High	Low
Yawdim	10-20	Soft	Low	High	Low
211F:					
Cabbart	10-20	Soft	Moderate	High	Low
Yawdim	10-20	Soft	Low	High	Low
Rock outcrop.					
221E:					
Hillon	>60	---	Moderate	High	Low
Kevin	>60	---	Moderate	High	Low
224B:					
Hillon	>60	---	Moderate	High	Low
Joplin	>60	---	Moderate	High	Low
224E:					
Hillon	>60	---	Moderate	High	Low
Joplin	>60	---	Moderate	High	Low
225F:					
Hillon	>60	---	Moderate	High	Low
Cabbart	10-20	Soft	Moderate	High	Low
Yawdim	10-20	Soft	Low	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
261C:					
Auchard	20-40	Soft	Low	High	Moderate
Williams	>60	---	Moderate	High	Low
271D:					
Beaverell	>60	---	Moderate	High	Low
Tinsley	>60	---	Low	High	Low
272C:					
Attewan	>60	---	Moderate	High	Low
Tinsley	>60	---	Low	High	Low
301C:					
Marvan	>60	---	Low	High	Moderate
Vanda	>60	---	Low	High	Moderate
302B:					
Marvan	>60	---	Low	High	Moderate
304B:					
Marvan	>60	---	Low	High	Moderate
Joplin	>60	---	Moderate	High	Low
306D:					
Marvan	>60	---	Low	High	Moderate
Yawdim	10-20	Soft	Low	High	Low
Cabbart	10-20	Soft	Moderate	High	Low
311B:					
Ferd	>60	---	Low	High	Low
Creed	>60	---	Low	High	Moderate
Gerdrum	>60	---	Low	High	Moderate
321B:					
Kobase	>60	---	Low	High	Low
321C:					
Kobase	>60	---	Low	High	Low
323B:					
Sagedale	>60	---	Low	High	Low
323C:					
Sagedale	>60	---	Low	High	Low
331B:					
Phillips	>60	---	Low	High	Low
Elloam	>60	---	Low	High	High
351B:					
Kenilworth	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
351B:					
Fortbenton	>60	---	Moderate	High	Low
363B:					
Cozberg	>60	---	Moderate	High	Low
Chinook	>60	---	Moderate	High	Low
368C:					
Fortbenton	>60	---	Moderate	High	Low
Hillon	>60	---	Moderate	High	Low
385B:					
Ethridge	>60	---	Low	High	Low
Kobase	>60	---	Low	High	Low
401C:					
Gerdrum	>60	---	Low	High	Moderate
Yamacall	>60	---	Moderate	High	Low
421C:					
Joplin	>60	---	Moderate	High	Low
Hillon	>60	---	Moderate	High	Low
441C:					
Kevin	>60	---	Moderate	High	Low
Hillon	>60	---	Moderate	High	Low
442C:					
Kevin	>60	---	Moderate	High	Low
Elloam	>60	---	Low	High	High
445E:					
Kevin	>60	---	Moderate	High	Low
Hillon	>60	---	Moderate	High	Low
Nishon	>60	---	Moderate	High	Low
471B:					
Marias	>60	---	Low	High	Low
Kobase	>60	---	Low	High	Low
491B:					
Enbar	>60	---	High	High	Low
Nesda	>60	---	Low	High	Low
493B:					
Enbar	>60	---	High	High	Low
Bigsandy	>60	---	High	High	High
Korchea	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
503B:					
Telstad	>60	---	Low	High	Low
Joplin	>60	---	Moderate	High	Low
503C:					
Telstad	>60	---	Low	High	Low
Joplin	>60	---	Moderate	High	Low
512F:					
Elve	>60	---	Moderate	Moderate	Moderate
Rubble land.					
521C:					
Elloam	>60	---	Low	High	High
Absher	>60	---	Low	High	Moderate
531C:					
Turner	>60	---	Moderate	High	Low
Beaverton	>60	---	Moderate	High	Low
561B:					
Scobey	>60	---	Low	High	Low
Kevin	>60	---	Moderate	High	Low
561C:					
Scobey	>60	---	Low	High	Low
Kevin	>60	---	Moderate	High	Low
601A:					
Havre	>60	---	Moderate	High	Low
Glendive	>60	---	Moderate	High	Low
603B:					
Thibadeau	>60	---	Moderate	High	Moderate
605C:					
Yamacall	>60	---	Moderate	High	Low
Havre	>60	---	Moderate	High	Low
631B:					
Nunemaker	>60	---	Low	High	Low
631C:					
Nunemaker	>60	---	Low	High	Low
661C:					
Twilight	20-40	Soft	Moderate	High	Low
Blacksheep	10-20	Soft	Moderate	High	Low
671C:					
Bearpaw	>60	---	Moderate	High	Moderate

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
671C:					
Vida	>60	---	Moderate	High	Low
Nishon	>60	---	Moderate	High	Low
673B:					
Bearpaw	>60	---	Moderate	High	Moderate
Daglum	>60	---	Moderate	High	Moderate
691D:					
Vida	>60	---	Moderate	High	Low
Williams	>60	---	Moderate	High	Low
692D:					
Vida	>60	---	Moderate	High	Low
Bearpaw	>60	---	Moderate	High	Moderate
693D:					
Vida	>60	---	Moderate	High	Low
Bearpaw	>60	---	Moderate	High	Moderate
Nishon	>60	---	Moderate	High	Low
695C:					
Vida	>60	---	Moderate	High	Low
Zahill	>60	---	Moderate	High	Low
695E:					
Vida	>60	---	Moderate	High	Low
Zahill	>60	---	Moderate	High	Low
702F:					
Winspect	>60	---	Moderate	High	Low
Winspect	>60	---	Moderate	High	Low
Rock outcrop.					
712E:					
Roy	>60	---	Moderate	High	Low
Barkof	20-40	Soft	Moderate	High	Moderate
712F:					
Roy	>60	---	Moderate	High	Low
Barkof	20-40	Soft	Moderate	High	Moderate
Rock outcrop.					
723F:					
Zahill	>60	---	Moderate	High	Low
Cabba	10-20	Soft	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
781C:					
Creed	>60	---	Low	High	Moderate
Weingart	20-40	Soft	Low	High	Moderate
791B:					
Yamacall	>60	---	Moderate	High	Low
801B:					
Williams	>60	---	Moderate	High	Low
Vida	>60	---	Moderate	High	Low
801C:					
Williams	>60	---	Moderate	High	Low
Vida	>60	---	Moderate	High	Low
812A:					
Glendive	>60	---	Moderate	High	Low
Havre	>60	---	Moderate	High	Low
882F:					
Perma	>60	---	Moderate	Moderate	Low
Whitlash	10-20	Hard	Moderate	High	Low
892F:					
Whitlash	10-20	Hard	Moderate	High	Low
Rock outcrop.					
952F:					
Dast	20-40	Soft	Moderate	High	Low
Rock outcrop.					

References

Alexander, R.R. 1966. Site indexes for lodgepole pine with corrections for stand density. U.S. Dep. Agric., Forest Serv., Res. Pap. RM-24.

American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.

American Society for Testing and Materials. 1993. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

Dahms, W.G. 1964. Gross and net yield tables for lodgepole pine. U.S. Dep. Agric., Forest Serv., Pacific Northwest Forest and Range Experiment Station, Portland, OR, Res. Pap. PNW-8.

Myers, C.A. 1967. Yield tables for managed stands of lodgepole pine in Colorado and Wyoming. U.S. Dep. Agric., Forest Serv., Rocky Mountain For. and Range Exp. Stn. Res. Pap. RM-RP-26.

United States Department of Agriculture, Natural Resources Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210

United States Department of Agriculture, Natural Resources Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	More than 7.5

Avalanche chute. The track or path formed by an avalanche.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Cirque. A semicircular, concave, bowllike 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 ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, 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.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	Very low
0.2 to 0.4	Low
0.4 to 0.75	Moderately low
0.75 to 1.25	Moderate
1.25 to 1.75	Moderately high
1.75 to 2.5	High
More than 2.5	Very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—

few, common, and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	Less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	More than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	More than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	More than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic (vertical axis of aggregates longer than horizontal),* columnar (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated 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.

Variegation. 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 ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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