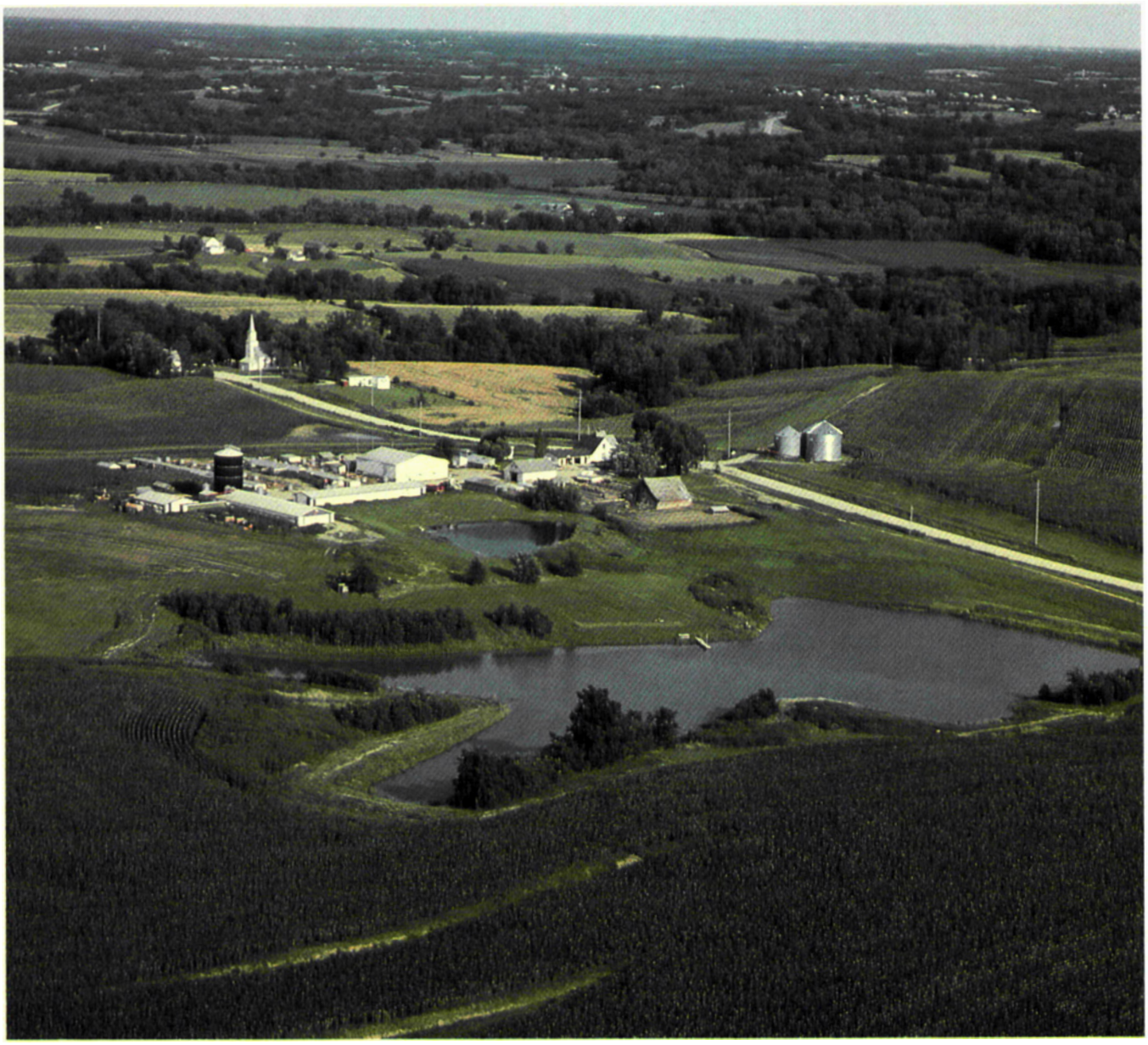
United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Jefferson County, Iowa

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 general soil map units, 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.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

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**. Note the number of the map sheet, and turn to that sheet.

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

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. See the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

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

Major fieldwork for this soil survey was completed in 1992. 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; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Jefferson County Soil and Water Conservation District. Funds appropriated by Jefferson County were used to defray part of the cost of the survey.

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.

Cover: Contour farming, erosion-control structures, and terraces are common conservation practices in Jefferson County.

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

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Soil Survey of Jefferson County, Iowa

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 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.

Interpretive 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
Ackmore	Aeric Fluvaquents, fine-silty, mixed, nonacid, mesic
Ainsworth	Typic Hapludalfs, fine, montmorillonitic, mesic
*Arispe	Aquic Argiudolls, fine, montmorillonitic, mesic
Armstrong	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Ashgrove	Aeric Ochraqualfs, fine, montmorillonitic, mesic, sloping
Beckwith	Typic Albaqualfs, fine, montmorillonitic, mesic
Belinda	Mollic Albaqualfs, fine, montmorillonitic, mesic
Bucknell	Udollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Cantril	Udollic Ochraqualfs, fine-loamy, mixed, mesic
Chelsea	Alfic Udipsamments, mixed, mesic
Chequest	Typic Haplaquolls, fine, montmorillonitic, mesic
Clarinda	Typic Argiaquolls, fine, montmorillonitic, mesic, sloping
Clinton	Typic Hapludalfs, fine, montmorillonitic, mesic
Colo	Cumulic Haplaquolls, fine-silty, mixed, mesic
Coppock	Mollic Ochraqualfs, fine-silty, mixed, mesic
Douds	Typic Hapludalfs, fine-loamy, mixed, mesic
Edina	Typic Argialbolls, fine, montmorillonitic, mesic
Fayette	Typic Hapludalfs, fine-silty, mixed mesic
Galland	Aquic Hapludalfs, fine, montmorillonitic, mesic
Gara	Mollic Hapludalfs, fine-loamy, mixed, mesic
Givin	Udollic Ochraqualfs, fine, montmorillonitic, mesic
Gosport	Typic Dystrochrepts, fine, illitic, mesic
Grundy	Aquic Argiudolls, fine, montmorillonitic, mesic
Haig	Typic Argiaquolls, fine, montmorillonitic, mesic
Hedrick	Mollic Hapludalfs, fine-silty, mixed, mesic
Inton	Typic Hapludalfs, fine-silty, mixed mesic
Kalona	Typic Haplaquolls, fine, montmorillonitic, mesic
Keomah	Aeric Ochraqualfs, fine, montmorillonitic, mesic
Keswick	Aquic Hapludalfs, fine, montmorillonitic, mesic
Klum	Mollic Udifluvents, coarse-loamy, mixed, nonacid, mesic
Ladoga	Mollic Hapludalfs, fine, montmorillonitic, mesic
*Lamoni	Aquic Argiudolls, fine, montmorillonitic, mesic
Lindley	Typic Hapludalfs, fine-loamy, mixed, mesic
Mahaska	Aquic Argiudolls, fine, montmorillonitic, mesic
*Nira	Typic Hapludolls, fine-silty, mixed, mesic
Nodaway	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Nordness	Lithic Hapludalfs, loamy, mixed, mesic
Okaw	Typic Albaqualfs, fine, montmorillonitic, mesic
Olmitz	Cumulic Hapludolls, fine-loamy, mixed, mesic
Orthents	Orthents
Otley	Typic Argiudolls, fine, montmorillonitic, mesic
Perks	Typic Udipsamments, mixed, mesic
Pershing	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Richwood	Typic Argiudolls, fine-silty, mixed, mesic
Rinda	Mollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Rubio	Mollic Albaqualfs, fine, montmorillonitic, mesic
*Shelby	Typic Argiudolls, fine-loamy, mixed, mesic
Sparta	Entic Hapludolls, sandy, mixed, mesic
Sperry	Typic Argialbolls, fine, montmorillonitic, mesic
Taintor	Typic Argiaquolls, fine, montmorillonitic, mesic
Tuskeego	Mollic Ochraqualfs, fine, montmorillonitic, mesic
Vesser	Argiaquic Argialbolls, fine-silty, mixed, mesic
Weller	Aquic Hapludalfs, fine, montmorillonitic, mesic
Zook	Cumulic Haplaquolls, fine, montmorillonitic, mesic

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes	8,290	2.9
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded	1,500	0.5
24D2	Shelby clay loam, 9 to 14 percent slopes, moderately eroded	1,780	0.6
41B	Sparta loamy fine sand, 2 to 5 percent slopes	130	*
51	Vesser silt loam, 0 to 2 percent slopes	1,230	0.4
51B	Vesser silt loam, 2 to 5 percent slopes	390	0.1
54	Zook silty clay loam, 0 to 2 percent slopes	810	0.3
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded	4,240	1.5
65E	Lindley loam, 14 to 18 percent slopes	2,210	0.8
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	7,360	2.6
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded	1,370	0.5
65G	Lindley loam, 25 to 40 percent slopes	7,560	2.7
74	Rubio silt loam, 0 to 2 percent slopes	470	0.2
75	Givin silt loam, 0 to 2 percent slopes	1,600	0.6
75B	Givin silt loam, 2 to 5 percent slopes	3,590	1.3
76B	Ladoga silt loam, 2 to 5 percent slopes	4,190	1.5
76C2	Ladoga silty clay loam, 5 to 9 percent slopes, moderately eroded	8,360	3.0
76D2	Ladoga silty clay loam, 9 to 14 percent slopes, moderately eroded	200	*
80B	Clinton silt loam, 2 to 5 percent slopes	2,160	0.8
80C2	Clinton silty clay loam, 5 to 9 percent slopes, moderately eroded	9,410	3.3
80D2	Clinton silty clay loam, 9 to 14 percent slopes, moderately eroded	3,380	1.2
87B	Colo-Zook complex, 0 to 5 percent slopes	200	*
122	Sperry silt loam, 0 to 1 percent slopes	410	0.1
130	Belinda silt loam, 0 to 2 percent slopes	1,100	0.4
131B	Pershing silt loam, 2 to 5 percent slopes	5,200	1.8
131B2	Pershing silty clay loam, 2 to 5 percent slopes, moderately eroded	320	0.1
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded	6,330	2.3
132B	Weller silt loam, 2 to 5 percent slopes	3,190	1.1
132C	Weller silt loam, 5 to 9 percent slopes	430	0.2
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded	9,140	3.2
132D	Weller silt loam, 9 to 14 percent slopes	280	*
132D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded	3,830	1.4
139	Perks loamy sand, 1 to 3 percent slopes	200	*
179D2	Gara clay loam, 9 to 14 percent slopes, moderately eroded	4,350	1.5
179E2	Gara clay loam, 14 to 18 percent slopes, moderately eroded	1,260	0.4
180	Keomah silt loam, 0 to 2 percent slopes	200	*
180B	Keomah silt loam, 2 to 5 percent slopes	410	0.1
208	Klum fine sandy loam, 0 to 2 percent slopes	440	0.2
211	Edina silt loam, depressional, 0 to 1 percent slopes	80	*
220	Nodaway silt loam, 0 to 2 percent slopes	7,320	2.6
222C	Clarinda silty clay loam, 5 to 9 percent slopes	830	0.3
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded	7,820	2.8
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded	10,050	3.6
260	Beckwith silt loam, 0 to 2 percent slopes	530	0.2
263	Okaw silt loam, 0 to 2 percent slopes	250	*
264B	Ainsworth silt loam, 2 to 5 percent slopes	270	*
273B	Olmitz loam, 2 to 5 percent slopes	210	*
279	Taintor silty clay loam, 0 to 2 percent slopes	15,400	5.5
280	Mahaska silty clay loam, 0 to 2 percent slopes	7,390	2.6
280B	Mahaska silty clay loam, 2 to 5 percent slopes	13,450	4.8
281B	Otley silty clay loam, 2 to 5 percent slopes	6,200	2.2
281B2	Otley silty clay loam, 2 to 5 percent slopes, moderately eroded	850	0.3
281C	Otley silty clay loam, 5 to 9 percent slopes	330	0.1
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded	5,970	2.1
293C	Chelsea-Fayette complex, 5 to 9 percent slopes	260	*
293F	Chelsea-Fayette complex, 18 to 25 percent slopes	430	0.2
313E2	Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded	260	*
313G	Gosport silty clay loam, 25 to 40 percent slopes	350	0.1
315	Nodaway-Klum-Perks complex, 0 to 3 percent slopes	410	0.1
362	Haig silt loam, 0 to 2 percent slopes	14,560	5.2
363	Haig silty clay loam, 0 to 1 percent slopes	350	0.1

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
364B	Grundy silty clay loam, 2 to 5 percent slopes	8,520	3.0
364B2	Grundy silty clay loam, 2 to 5 percent slopes, moderately eroded	1,740	0.6
423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded	4,750	1.7
424D2	Lindley-Keswick complex, 9 to 14 percent slopes, moderately eroded	1,500	0.5
424E2	Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded	1,690	0.6
425D	Keswick loam, 9 to 14 percent slopes	450	0.2
425D2	Keswick clay loam, 9 to 14 percent slopes, moderately eroded	1,460	0.5
430	Ackmore silt loam, 0 to 2 percent slopes	660	0.2
453	Tuskeego silt loam, 0 to 2 percent slopes	270	*
499G	Nordness silt loam, 25 to 40 percent slopes	240	*
520	Coppock silt loam, 0 to 2 percent slopes	2,140	0.8
520B	Coppock silt loam, 2 to 5 percent slopes	1,920	0.7
570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded	6,960	2.5
571C2	Hedrick silty clay loam, 5 to 9 percent slopes, moderately eroded	6,240	2.2
572C2	Inton silty clay loam, 5 to 9 percent slopes, moderately eroded	1,270	0.5
572D2	Inton silty clay loam, 9 to 14 percent slopes, moderately eroded	570	0.2
587	Chequest silty clay loam, 0 to 2 percent slopes	890	0.3
594D2	Galland clay loam, 9 to 14 percent slopes, moderately eroded	1,440	0.5
729	Nodaway-Coppock complex, 0 to 2 percent slopes	1,300	0.5
730B	Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes	3,880	1.4
779	Kalona silty clay loam, 0 to 1 percent slopes	1,600	0.6
792C2	Armstrong clay loam, 5 to 9 percent slopes, moderately eroded	200	*
792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded	570	0.2
795C2	Ashgrove silty clay loam, 5 to 9 percent slopes, moderately eroded	1,280	0.5
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded	7,320	2.6
822D2	Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded	430	0.2
831B	Pershing silt loam, bench, 2 to 5 percent slopes	490	0.2
831C2	Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded	380	0.1
832B	Weller silt loam, bench, 2 to 5 percent slopes	1,110	0.4
832C2	Weller silty clay loam, bench, 5 to 9 percent slopes, moderately eroded	2,030	0.7
832D2	Weller silty clay loam, bench, 9 to 14 percent slopes, moderately eroded	380	0.1
876B	Ladoga silt loam, bench, 2 to 5 percent slopes	200	*
876C2	Ladoga silty clay loam, bench, 5 to 9 percent slopes, moderately eroded	300	0.1
880B	Clinton silt loam, bench, 2 to 5 percent slopes	510	0.2
880C2	Clinton silty clay loam, bench, 5 to 9 percent slopes, moderately eroded	2,070	0.7
880D2	Clinton silty clay loam, bench, 9 to 14 percent slopes, moderately eroded	650	0.2
977	Richwood silt loam, 0 to 2 percent slopes	290	0.1
993D2	Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded	1,650	0.6
993E2	Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded	320	0.1
994D2	Galland-Douds complex, 9 to 14 percent slopes, moderately eroded	760	0.3
994E2	Galland-Douds complex, 14 to 18 percent slopes, moderately eroded	900	0.3
1075B	Givin silt loam, bench, 2 to 5 percent slopes	260	*
1130	Belinda silt loam, bench, 0 to 2 percent slopes	220	*
1260	Beckwith silt loam, bench, 0 to 2 percent slopes	270	*
1715	Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes	7,210	2.6
5020	Pits and Dumps	50	*
5030	Pits, limestone quarries	140	*
5040	Orthents, loamy	160	*
	Water	570	0.2
	Total	281,300	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 Management Considerations

The management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table "Cropland Management Considerations." The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, 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 *wind erosion* and *water erosion.* Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, 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 considerations shown in the table cannot be easily overcome. These are *channels, flooding, gullies,* and *ponding.*

Additional considerations are as follows:

Lime content, limited available water capacity, potential poor tilth and compaction, and *restricted permeability.*—These limitations can be minimized 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.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seedling development after periods of heavy rainfall.

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

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

Salt content.—In areas where this is a limitation, only salt-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. Also, it can create drainage problems, raise the water table, and increase soil salinity.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

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

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.

Depth to rock.—The depth to bedrock is less than 40 inches.

Eroded.—The word "eroded" is included in the map unit name.

Excessive permeability.—Permeability is 6 inches per hour or more within the soil profile.

Flooding.—Flooding is occasional or frequent.

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

High organic matter content.—The surface layer has more than 20 percent organic matter.

Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.

Limited organic matter content.—The content of organic matter is 2 percent or less in the surface layer.

Ponding.—Ponding duration is assigned to the map unit component. The water table is above the surface.

Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.

Potential for ground-water contamination (by nutrients or pesticides).—Depth to the water table is 4 feet or less, the permeability of any layer is more than 6.0 inches per hour, or the depth to bedrock is less than 60 inches.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally flooded or frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6 percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

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

Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.

Slope (equipment limitation).—The slope is more than 15 percent.

Surface crusting.—The content of clay is 27 percent or more and the content of organic matter is 2 percent or less in the surface layer.

Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.

Surface stones (equipment limitation).—The word "stony" or "bouldery" is included in the map unit name or in the description of the surface layer.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Water table.—A water table is within 2.5 feet of the surface.

Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Agronomic Considerations

Inherent subsoil fertility levels, in terms of potential plant-available phosphorus and potassium, are described in the table "Agronomic Considerations" at the end of this section. Soil tests of the tilled layer are used to determine the most profitable rates of fertilizers for various crops. Nutrient levels in the subsurface layers do influence crop yields, particularly in the drier seasons when the nutrients in the dry tilled layer become temporarily unavailable to plants. The availability of nutrients in the tilled layer and the subsoil influences the relative uptake from the two zones in the soil profile. Fertilizer recommendations based on soil tests of the tilled layer may be adjusted by the average nutrient levels in the subsoil of each soil series. Fertilizer recommendations are adjusted for subsoil nutrient levels. The ratings given in the table are described as follows:

Subsoil phosphorus.—The amount of plant-available phosphorus in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 30 to 42 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of *very low* indicates less than 7.5 ppm; *low,* 7.5 to 13.0 ppm; *medium,* 13.0 to 22.5 ppm; and *high,* more than 22.5 ppm.

Subsoil potassium.—The amount of plant-available potassium in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 12 to 24 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of *very low minus* indicates less than 25 ppm; *very low plus,* 25 to 50 ppm; *low,* 50 to

79 ppm; *medium,* 79 to 125 ppm; and *high,* more than 125 ppm.

Tilth rating.—This rating is based on clay content, organic matter content, drainage class, sand size, and sand content. A rating of 1 indicates good tilth; 2, fair; 3, poor; and 4, very poor.

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 woodland or for engineering purposes.

In the capability system, soils generally are grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories 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 4. 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.

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 identify the dominant kind of limitation 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, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the tables "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops" and "Land Capability and Yields per Acre of Crops and Pasture" at the end of this section.

Corn Suitability Rating (CSR)

The corn suitability rating for the soils in the survey area is given in the table "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops." Corn suitability ratings provide a relative ranking of all soils mapped in the State of Iowa based on their potential to be utilized for the intensive production of row crops. The CSR is an index that can be used to rate the potential production of one soil compared with another over a period of time. The CSR considers average weather conditions and frequency of use of the soil for row crops. Ratings range from 100 for soils that have no physical limitations, are on minimal slopes, and can be continuously row cropped to as low as 5 for soils that have severe limitations affecting the production of row crops. The ratings listed in this table assume adequate management, natural weather conditions (no irrigation), artificial drainage where required, and no land leveling or terracing. They also assume that soils in the lower positions on the landscape are not affected by frequent damaging floods. The weighted CSR for a given field can be modified by the occurrence of sandy spots, local deposits, rock and gravel

outcrops, field boundaries, and noncrossable drainageways. Even though predicted average yields will change with time, the CSR's are expected to remain relatively constant in relation to one another.

The CSR's in Jefferson County range from 95 for map unit 280, Mahaska silty clay loam, 0 to 2 percent slopes, to 5 for several map units, including 313G, Gosport silty clay loam, 25 to 40 percent slopes. No ratings are provided for miscellaneous areas because of the variability of properties and use of these areas.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the tables "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops" and "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 tables because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the tables.

The 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.

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. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the tables 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

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 tables.

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, feed, 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 range mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland where these limitations are overcome by drainage measures or flood control. 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 116,000 acres, or nearly 41 percent of the survey area, would meet the requirements for prime farmland if adequately drained and protected from flooding.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime Farmland." This list does not constitute a recommendation for a particular land use. 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. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units."

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices. The erosion factors for the soils in the survey area are listed in the table "Physical Properties of the Soils."

Soil Erodibility (K) Factor

The soil erodibility (K) factor 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 (T) factor 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 (I) factor 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. The wind erodibility groups and wind

erodibility index numbers are listed in the table "Physical Properties of the Soils."

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 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 or 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. The windbreak suitability group for each soil in the survey area is listed in the table "Windbreak Suitability Groups" at the end of this section. The following paragraphs explain the characteristics of the soils in each group.

Group 1 consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and do not have free carbonates in the upper 20 inches.

Group 1K consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and have free carbonates within 20 inches of the surface. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2 consists of poorly drained soils that have been artificially drained and do not have free carbonates in the upper 20 inches. Permeability varies.

Group 2K consists of poorly drained or very poorly drained soils that have been artificially drained and have free carbonates within 20 inches of the surface. Permeability varies. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2H consists of very poorly drained soils that have been artificially drained and have more than 16 inches of organic material. Permeability varies.

Group 2W consists of very poorly drained soils that are subject to ponding and have been artificially drained. It includes soils that have an organic surface layer up to 16 inches thick. Permeability varies.

Group 3 consists of soils that are well drained or moderately well drained and are loamy or silty throughout. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 20 inches.

Group 4 consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a silty or loamy surface layer and a clayey subsoil. Permeability is slow or very slow.

Group 4C consists of soils that are well drained, moderately well drained, or somewhat poorly drained

and have a clayey surface layer and subsoil. Permeability is slow or very slow.

Group 4F consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a substratum of dense till. Permeability is slow or very slow.

Group 5 consists of soils that are excessively drained to moderately well drained and have a moderate available water capacity. These soils are dominantly fine sandy loam or sandy loam, but some are sandy in the upper part and loamy in the lower part.

Group 6G consists of excessively drained to moderately well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 7 consists of excessively drained to well drained soils that are dominantly loamy fine sand or coarser textured and are shallow to sand or to sand and gravel. These soils have a low available water capacity.

Group 8 consists of excessively drained to well drained, loamy soils that have free carbonates within 20 inches of the surface.

Group 9W consists of soils that are somewhat poorly drained, poorly drained, or very poorly drained and are moderately saline (the electrical conductivity is 8 to 16).

Group 10 consists of soils or miscellaneous land types that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

Cropland Management Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Cropland management considerations
13B:	
Olmitz	Potential for surface-water contamination Water erosion
Vesser	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
Zook	Potential for ground-water contamination Potential poor tilth and compaction Water erosion Water table
23C2:	
Arispe	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
24D2:	
Shelby	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
41B:	
Sparta	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
51:	
Vesser	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
51B:	
Vesser	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
54:	
Zook	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
65D2:	
Lindley	Potential for surface-water contamination Previously eroded Water erosion
65E:	
Lindley	Potential for surface-water contamination Slope Water erosion
65E2, 65F2:	
Lindley	Potential for surface-water contamination Previously eroded Slope Water erosion
65G:	
Lindley	Potential for surface-water contamination Slope Water erosion
74:	
Rubio	Acid soil Potential for ground-water contamination Water table
75:	
Givin	Acid soil Potential for ground-water contamination Water table
75B:	
Givin	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
76B:	
Ladoga	Acid soil Potential for surface-water contamination Water erosion
76C2:	
Ladoga	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
76D2:	
Ladoga	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
80B:	
Clinton	Acid soil Potential for surface-water contamination Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
80C2, 80D2:	
Clinton	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
87B:	
Colo	Potential for ground-water contamination Potential poor tilth and compaction Water table
Zook	Potential for ground-water contamination Potential poor tilth and compaction Water table
122:	
Sperry	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
130:	
Belinda	Acid soil Potential for ground-water contamination Restricted permeability Water table
131B:	
Pershing	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
131B2, 131C2:	
Pershing	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
132B, 132C:	
Weller	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
132C2:	
Weller	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
132D:	
Weller	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
132D2:	
Weller	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
139:	
Perks	Excessive permeability Flooding Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
179D2:	
Gara	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
179E2:	
Gara	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
180:	
Keomah	Acid soil Potential for ground-water contamination Water table
180B:	
Keomah	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
208:	
Klum	Flooding Potential for ground-water contamination Potential for surface-water contamination Wind erosion
211:	
Edina	Potential for ground-water contamination Restricted permeability Water table
220:	
Nodaway	Flooding Potential for ground-water contamination Potential for surface-water contamination

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
222C:	
Clarinda	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability Water erosion Water table
222C2:	
Clarinda	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
223C2:	
Rinda	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
260:	
Beckwith	Acid soil Potential for ground-water contamination Restricted permeability Water table
263:	
Okaw	Acid soil Ponding Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water table
264B:	
Ainsworth	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion
273B:	
Olmitz	Potential for surface-water contamination Water erosion
279:	
Taintor	Potential for ground-water contamination Potential poor tilth and compaction Water table
280:	
Mahaska	Acid soil Potential for ground-water contamination Potential poor tilth and compaction Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
280B:	
Mahaska	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion Water table
281B:	
Otley	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
281B2:	
Otley	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
281C:	
Otley	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
281C2:	
Otley	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
293C:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Fayette	Potential for surface-water contamination Water erosion
293F:	
Chelsea	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Fayette	Potential for surface-water contamination Slope Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
313E2:	
Gosport	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Slope Water erosion Water table
313G:	
Gosport	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion Water table
315:	
Nodaway	Flooding Potential for ground-water contamination Potential for surface-water contamination
Klum	Flooding Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Perks	Excessive permeability Flooding Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
362:	
Haig	Acid soil Potential for ground-water contamination Restricted permeability Water table
363:	
Haig	Acid soil Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table
364B:	
Grundy	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
364B2:	
Grundy	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
423D2:	
Bucknell	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
424D2:	
Lindley	Potential for surface-water contamination Water erosion
Keswick	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
424E2:	
Lindley	Potential for surface-water contamination Previously eroded Slope Water erosion
Keswick	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Slope Water erosion Water table
425D:	
Keswick	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
425D2:	
Keswick	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
430:	
Ackmore	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
453:	
Tuskeego	Potential for ground-water contamination Restricted permeability Water table
499G:	
Nordness	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
520:	
Coppock	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
520B:	
Coppock	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
570C2:	
Nira	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
571C2:	
Hedrick	Potential for surface-water contamination Water erosion
572C2, 572D2:	
Inton	Potential for surface-water contamination Previously eroded Water erosion
587:	
Chequest	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
594D2:	
Galland	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
729:	
Nodaway	Flooding Potential for ground-water contamination Potential for surface-water contamination

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
729:	
Coppock	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
730B:	
Nodaway	Flooding Potential for ground-water contamination Potential for surface-water contamination Water erosion
Coppock	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
Cantril	Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
779:	
Kalona	Potential for ground-water contamination Potential poor tilth and compaction Water table
792C2, 792D2:	
Armstrong	Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
795C2, 795D2:	
Ashgrove	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
822D2:	
Lamoni	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
831B:	
Pershing	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
831C2:	
Pershing	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
832B:	
Weller	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
832C2, 832D2:	
Weller	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
876B:	
Ladoga	Acid soil Potential for surface-water contamination Water erosion
876C2:	
Ladoga	Acid soil Potential for surface-water contamination Previously eroded Water erosion
880B:	
Clinton	Acid soil Potential for surface-water contamination Water erosion
880C2, 880D2:	
Clinton	Acid soil Potential for surface-water contamination Previously eroded Water erosion
977:	
Richwood	No major limitations or hazards
993D2:	
Gara	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Armstrong	Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
993E2:	
Gara	Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion
Armstrong	Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Water table
994D2:	
Galland	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
Douds	Acid soil Potential for surface-water contamination Previously eroded Water erosion
994E2:	
Galland	Acid soil Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Water table
Douds	Acid soil Potential for surface-water contamination Slope Water erosion
1075B:	
Givin	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
1130:	
Belinda	Acid soil Potential for ground-water contamination Restricted permeability Water table
1260:	
Beckwith	Acid soil Potential for ground-water contamination Restricted permeability Water table
1715:	
Nodaway	Flooding Potential for ground-water contamination Potential for surface-water contamination

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1715:	
Vesser	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
Ackmore	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
5020:	
Pits and dumps	Nonsoil material
5030:	
Pits	Nonsoil material
5040:	
Orthents	Slope Water erosion Wind erosion

Agronomic Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
13B---------- Olmitz-Vesser-Zook	Very low	Very low plus	Fair
23C2---------- Arispe	Very low	Medium	Fair
24D2---------- Shelby	Very low	Low	Fair
41B---------- Sparta	Very low	Low	Poor
51---------- Vesser	Medium	Very low plus	Fair
51B---------- Vesser	Medium	Very low plus	Good
54---------- Zook	High	Medium	Fair
65D2---------- Lindley	Medium	Low	Fair
65E---------- Lindley	Medium	Low	Good
65E2, 65F2---------- Lindley	Medium	Low	Fair
65G---------- Lindley	Medium	Low	Good
74---------- Rubio	High	Medium	Good
75---------- Givin	High	Medium	Good
75B---------- Givin	Medium	Medium	Good
76B---------- Ladoga	High	Medium	Good
76C2, 76D2---------- Ladoga	High	Medium	Fair
80B---------- Clinton	High	Medium	Good
80C2, 80D2---------- Clinton	High	Medium	Fair
87B---------- Colo-Zook	Medium	Low	Fair
122---------- Sperry	Medium	Medium	Fair

Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
130---------- Belinda	High	Low	Good
131B---------- Pershing	High	Low	Good
131B2, 131C2--------- Pershing	High	Low	Fair
132B, 132C---------- Weller	High	Low	Good
132C2---------- Weller	High	Low	Fair
132D---------- Weller	High	Low	Good
132D2---------- Weller	High	Low	Fair
139---------- Perks	Very low	Very low plus	Poor
179D2, 179E2--------- Gara	Medium	Low	Fair
180, 180B---------- Keomah	High	Very low minus	Good
208---------- Klum	Very low	Very low plus	Good
211---------- Edina	Very low	Low	Fair
220---------- Nodaway	High	Low	Fair
222C, 222C2---------- Clarinda	Very low	Low	Fair
223C2---------- Rinda	Very low	Low	Fair
260---------- Beckwith	High	Very low plus	Fair
263---------- Okaw	Very low	Very low plus	Good
264B---------- Ainsworth	High	Medium	Good
273B---------- Olmitz	Very low	Medium	Good
279---------- Taintor	Very low	Low	Fair
280, 280B---------- Mahaska	High	Medium	Good

Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
281B, 281B2, 281C, 281C2---------- Otley	Medium	Low	Fair
293C, 293F---------- Chelsea-Fayette	Very low	Very low plus	Good
313E2---------- Gosport	Very low	Low	Fair
313G---------- Gosport	Very low	Low	Good
315---------- Nodaway-Klum-Perks	Very low	Very low plus	Good
362, 363---------- Haig	Medium	Medium	Fair
364B---------- Grundy	Low	Medium	Good
364B2---------- Grundy	Low	Medium	Fair
423D2---------- Bucknell	Very low	Very low plus	Fair
424D2, 424E2--------- Lindley-Keswick	Very low	Low	Fair
425D---------- Keswick	Very low	Low	Fair
425D2---------- Keswick	Very low	Low	Poor
430---------- Ackmore	Low	Low	Fair
453---------- Tuskeego	Medium	Very low plus	Fair
499G---------- Nordness	Very low	Medium	Good
520, 520B---------- Coppock	High	Medium	Fair
570C2---------- Nira	Medium	Medium	Fair
571C2---------- Hedrick	High	Medium	Fair
572C2, 572D2--------- Inton	High	Medium	Poor
587---------- Chequest	High	Medium	Fair
594D2---------- Galland	Very low	Very low plus	Fair

Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
729--- Nodaway-Coppock	Very low	Very low plus	Good
730B--- Nodaway-Coppock-Cantril	Very low	Very low plus	Fair
779--- Kalona	Very low	Low	Fair
792C2, 792D2--- Armstrong	Very low	Low	Fair
795C2, 795D2--- Ashgrove	Very low	Medium	Poor
822D2--- Lamoni	Very low	Medium	Fair
831B, 831C2--- Pershing	High	Low	Fair
832B--- Weller	High	Low	Good
832C2, 832D2--- Weller	High	Low	Fair
876B--- Ladoga	High	Medium	Good
876C2--- Ladoga	High	Medium	Fair
880B--- Clinton	High	Medium	Good
880C2, 880D2--- Clinton	High	Medium	Fair
977--- Richwood	High	Low	Good
993D2, 993E2--- Gara-Armstrong	Very low	Low	Fair
994D2, 994E2--- Galland-Douds	Very low	Very low plus	Fair
1075B--- Givin	High	Medium	Good
1130--- Belinda	High	Low	Good
1260--- Beckwith	High	Very low plus	Fair
1715--- Nodaway-Vesser-Ackmore	High	Medium	Good

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
13B Olmitz	2e	60	123	62	41	49
Vesser	2w					
Zook	2w					
23C2 Arispe	3e	50	124	62	42	50
24D2 Shelby	3e	48	115	63	39	46
41B Sparta	4s	40	77	42	26	31
51 Vesser	2w	70	130	65	44	52
51B Vesser	2w	65	127	64	43	51
54 Zook	2w	70	126	69	42	50
65D2 Lindley	4e	38	97	49	32	39
65E Lindley	6e	30	---	42	---	---
65E2 Lindley	6e	28	---	40	---	---
65F2 Lindley	7e	8	---	---	---	---
65G Lindley	7e	5	---	---	---	---
74 Rubio	3w	78	138	76	46	55
75 Givin	1	85	148	81	50	59
75B Givin	2e	81	145	80	49	58
76B Ladoga	2e	85	148	81	50	59
76C2 Ladoga	3e	65	139	76	47	56

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
76D2---------- Ladoga	3e	55	130	72	44	52
80B---------- Clinton	2e	80	139	76	47	56
80C2---------- Clinton	3e	60	130	72	44	52
80D2---------- Clinton	3e	50	121	67	41	48
87B---------- Colo-Zook	2w	62	127	70	43	51
122---------- Sperry	3w	63	124	68	42	50
130---------- Belinda	3w	63	112	56	38	45
131B---------- Pershing	3e	67	119	60	40	48
131B2---------- Pershing	3e	63	112	56	38	45
131C2---------- Pershing	3e	45	107	54	36	43
132B---------- Weller	3e	60	105	53	35	42
132C---------- Weller	3e	44	100	50	34	40
132C2---------- Weller	3e	40	93	47	31	37
132D---------- Weller	3e	32	91	46	30	36
132D2---------- Weller	4e	28	84	42	28	34
139---------- Perks	4s	15	50	28	17	20
179D2---------- Gara	4e	43	106	53	36	42
179E2---------- Gara	6e	33	---	45	---	---
180---------- Keomah	2w	76	131	72	44	52
180B---------- Keomah	2e	73	128	70	43	51

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
208---------- Klum	2w	55	103	57	35	41
211---------- Edina	3w	55	98	49	33	39
220---------- Nodaway	2w	87	153	84	51	61
222C---------- Clarinda	4w	30	82	41	27	33
222C2---------- Clarinda	4w	25	72	36	24	29
223C2---------- Rinda	4w	22	63	32	21	25
260---------- Beckwith	3w	57	100	50	34	40
263---------- Okaw	3w	53	98	54	33	39
264B---------- Ainsworth	2e	70	127	70	43	51
273B---------- Olmitz	2e	72	137	69	46	55
279---------- Taintor	2w	88	155	85	52	62
280---------- Mahaska	1	95	165	91	55	66
280B---------- Mahaska	2e	90	162	89	54	65
281B---------- Otley	2e	90	157	86	53	63
281B2---------- Otley	2e	85	153	84	51	84
281C---------- Otley	3e	75	152	84	51	61
281C2---------- Otley	3e	70	148	81	50	59
293C----------		41	87	48	29	35
Chelsea---------	4s					
Fayette---------	3e					
293F----------		11	---	---	---	---
Chelsea---------	7s					
Fayette---------	4e					

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
313E2, 313G---- Gosport	7e	5	---	---	---	---
315---- Nodaway----	2w	60	113	62	38	45
Klum----	2s					
Perks----	4s					
362---- Haig	2w	70	131	66	44	52
363---- Haig	2w	65	126	63	42	50
364B---- Grundy	2e	75	133	67	45	53
364B2---- Grundy	2e	70	126	63	42	50
423D2---- Bucknell	4e	13	64	32	21	26
424D2---- Lindley-Keswick	4e	15	74	37	25	30
424E2---- Lindley-Keswick	6e	5	---	29	---	---
425D---- Keswick	4e	16	65	33	22	26
425D2---- Keswick	4e	12	55	28	18	22
430---- Ackmore	2w	83	141	78	47	56
453---- Tuskeego	3w	53	105	53	35	42
499G---- Nordness	7s	5	---	---	---	---
520---- Coppock	2w	65	121	61	41	48
520B---- Coppock	2w	60	118	59	40	47
570C2---- Nira	3e	67	143	79	48	57
571C2---- Hedrick	3e	62	128	70	43	51
572C2---- Inton	3e	57	125	69	42	50

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
572D2---------- Inton	3e	47	116	64	39	46
587---------- Chequest	2w	65	120	60	40	48
594D2---------- Galland	4e	5	51	26	17	20
729---------- Nodaway-Coppock	2w	77	134	74	45	54
730B----------		61	124	42	62	50
Nodaway---------	2w					
Coppock---------	2w					
Cantril---------	2e					
779---------- Kalona	2w	85	152	84	51	61
792C2---------- Armstrong	3e	27	73	37	24	29
792D2---------- Armstrong	4e	13	64	32	21	26
795C2---------- Ashgrove	4e	20	54	27	18	22
795D2---------- Ashgrove	4e	8	---	23	---	---
822D2---------- Lamoni	4e	15	73	37	24	29
831B---------- Pershing	3e	67	119	60	40	48
831C2---------- Pershing	3e	45	107	54	36	43
832B---------- Weller	3e	60	105	53	35	42
832C2---------- Weller	3e	40	93	47	31	37
832D2---------- Weller	4e	28	84	42	28	34
876B---------- Ladoga	2e	85	148	81	50	59
876C2---------- Ladoga	3e	65	139	76	47	56
880B---------- Clinton	2e	80	139	76	47	56

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
880C2---------- Clinton	3e	60	130	72	44	52
880D2---------- Clinton	3e	50	121	67	41	48
977---------- Richwood	1	95	162	89	54	65
993D2---------- Gara-Armstrong	4e	20	83	42	28	33
993E2---------- Gara-Armstrong	6e	10	---	33	---	---
994D2---------- Galland-Douds	4e	12	54	27	18	---
994E2---------- Galland-Douds	6e	5	---	21	---	---
1075B---------- Givin	2e	81	145	80	49	58
1130---------- Belinda	3w	63	112	56	38	45
1260---------- Beckwith	3w	57	100	50	34	40
1715---------- Nodaway-Vesser-Ackmore	2w	80	140	77	47	56
5020---------- Pits and Dumps	8s	---	---	---	---	---
5030---------- Pits	8s	---	---	---	---	---
5040. Orthents						

* Productivity index; on a scale of 5 to 100.

Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Bromegrass-alfalfa	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*	AUM*
13B---------- Olmitz----------	2e	3.7	9.6	3.0	5.0
Vesser----------	2w				
Zook----------	2w				
23C2---------- Arispe	3e	5.0	8.3	3.1	5.1
24D2---------- Shelby	3e	4.8	8.1	2.8	4.7
41B---------- Sparta	4s	3.2	---	1.9	3.2
51---------- Vesser	2w	3.9	6.5	3.2	5.3
51B---------- Vesser	2w	3.8	6.4	3.1	5.2
54---------- Zook	2w	3.8	---	3.1	5.2
65D2---------- Lindley	4e	4.1	---	2.4	4.0
65E---------- Lindley	6e	3.5	---	2.1	3.4
65E2---------- Lindley	6e	3.4	---	2.0	3.3
65F2---------- Lindley	7e	---	---	1.7	2.9
65G---------- Lindley	7e	---	---	1.7	2.8
74---------- Rubio	3w	4.1	6.9	3.4	5.7
75---------- Givin	1	5.9	9.9	3.6	6.1
75B---------- Givin	2e	5.8	9.7	3.6	5.9
76B---------- Ladoga	2e	6.2	10.4	3.6	6.1
76C2---------- Ladoga	3e	5.8	9.8	3.4	5.7

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Bromegrass-alfalfa	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*	AUM*
76D2--- Ladoga	3e	5.5	9.1	3.2	5.3
80B--- Clinton	2e	5.8	9.8	3.4	5.7
80C2--- Clinton	3e	5.5	9.1	3.2	5.3
80D2--- Clinton	3e	5.1	8.5	3.0	5.0
87B--- Colo-Zook	2w	3.8	6.8	3.1	5.2
122--- Sperry	3w	3.7	6.2	3.1	5.1
130--- Belinda	3w	3.4	5.6	2.8	4.6
131B--- Pershing	3e	4.8	8.0	2.9	4.9
131B2--- Pershing	3e	4.5	7.5	2.8	4.6
131C2--- Pershing	3e	4.3	7.2	2.6	4.4
132B--- Weller	3e	4.4	7.4	2.6	4.3
132C--- Weller	3e	4.2	7.0	2.5	4.1
132C2--- Weller	3e	3.9	6.5	2.3	3.8
132D--- Weller	3e	3.8	6.4	2.2	3.7
132D2--- Weller	4e	3.5	5.9	2.1	3.4
139--- Perks	4s	2.1	3.3	1.2	2.1
179D2--- Gara	4e	4.5	7.4	2.6	4.3
179E2--- Gara	6e	3.7	6.2	2.2	3.6
180--- Keomah	2w	5.2	8.8	3.2	5.4
180B--- Keomah	2e	5.1	8.6	3.1	5.2

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Bromegrass-alfalfa	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*	AUM*
208--- Klum	2w	4.3	7.2	2.5	4.2
211--- Edina	3w	3.2	---	2.6	4.6
220--- Nodaway	2w	6.4	10.7	3.8	6.3
222C--- Clarinda	4w	2.5	4.1	2.0	3.4
222C2--- Clarinda	4w	2.2	3.6	1.8	3.3
223C2--- Rinda	4w	1.9	3.2	1.5	2.6
260--- Beckwith	3w	3.0	5.0	2.5	4.1
263--- Okaw	3w	2.9	---	2.4	4.0
264B--- Ainsworth	2e	5.3	8.9	3.1	5.2
273B--- Olmitz	2e	5.8	9.6	3.4	5.6
279--- Taintor	2w	4.7	7.8	3.8	6.4
280--- Mahaska	1	6.6	11.0	4.1	6.8
280B--- Mahaska	2e	6.5	10.8	4.0	6.6
281B--- Otley	2e	6.6	11.0	3.9	6.4
281B2--- Otley	2e	6.4	10.7	3.8	6.3
281C--- Otley	3e	6.4	10.7	3.7	6.2
281C2--- Otley	3e	6.2	10.4	3.6	6.1
293C---		3.7	4.4	2.1	3.6
Chelsea---	4s				
Fayette---	3e				
293F---		---	---	1.3	2.1
Chelsea---	7s				
Fayette---	4e				

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Bromegrass-alfalfa	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*	AUM*
313E2--Gosport	7e	---	---	0.8	1.4
313G--Gosport	7e	---	---	0.7	1.1
315--Nodaway	2w	4.7	10.7	2.8	4.6
Klum	2s				
Perks	4s				
362--Haig	2w	3.9	6.6	3.2	5.4
363--Haig	2w	3.8	6.6	3.1	5.2
364B--Grundy	2e	5.3	---	3.3	5.5
364B2--Grundy	2e	5.0	---	3.1	5.2
423D2--Bucknell	4e	2.6	4.3	1.6	2.6
424D2--Lindley-Keswick	4e	3.1	---	1.8	3.0
424E2--Lindley-Keswick	6e	2.4	---	1.4	2.3
425D--Keswick	4e	2.7	4.6	1.6	2.7
425D2--Keswick	4e	2.3	3.9	1.4	2.3
430--Ackmore	2w	4.2	7.1	3.5	5.8
453--Tuskeego	3w	3.2	5.3	2.6	4.3
499G--Nordness	7s	---	---	0.5	0.8
520--Coppock	2w	3.6	6.1	3.0	5.0
520B--Coppock	2w	3.5	5.9	2.9	4.8
570C2--Nira	3e	6.0	10.0	3.5	5.9
571C2--Hedrick	3e	5.4	9.0	3.1	5.2

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Bromegrass-alfalfa	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*	AUM*
572C2---------- Inton	3e	5.3	8.8	3.1	5.1
572D2---------- Inton	3e	4.9	8.1	2.9	4.8
587---------- Chequest	2w	3.6	6.0	3.0	4.9
594D2---------- Galland	4e	2.0	3.0	1.3	2.1
729---------- Nodaway-Coppock	2w	5.6	10.7	3.3	5.5
730B----------		6.4	5.0	3.1	5.1
Nodaway---------	2w				
Coppock---------	2w				
Cantril---------	2e				
779---------- Kalona	2w	4.6	7.6	3.7	6.2
792C2---------- Armstrong	3e	2.9	4.9	1.8	3.0
792D2---------- Armstrong	4e	2.6	4.3	1.6	2.6
795C2---------- Ashgrove	4e	1.6	2.7	1.3	2.2
795D2---------- Ashgrove	4e	1.4	2.3	1.1	1.8
822D2---------- Lamoni	4e	2.9	4.9	1.8	3.0
831B---------- Pershing	3e	4.8	8.0	2.9	4.9
831C2---------- Pershing	3e	4.3	7.2	2.6	4.4
832B---------- Weller	3e	4.4	7.4	2.6	4.3
832C2---------- Weller	3e	3.9	6.5	2.3	3.8
832D2---------- Weller	4e	3.5	5.9	2.1	3.4
876B---------- Ladoga	2e	6.2	10.4	3.6	6.1
876C2---------- Ladoga	3e	5.8	9.8	3.4	5.7

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-alfalfa hay	Bromegrass-alfalfa	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*	AUM*
880B---------- Clinton	2e	5.8	9.8	3.4	5.7
880C2---------- Clinton	3e	5.5	9.1	3.2	5.3
880D2---------- Clinton	3e	5.1	8.5	3.0	5.0
977---------- Richwood	1	6.8	---	4.0	6.6
993D2---------- Gara-Armstrong	4e	3.3	7.4	2.0	3.4
993E2---------- Gara-Armstrong	6e	2.6	6.2	1.6	2.7
994D2---------- Galland-Douds	4e	2.3	3.0	1.4	2.4
994E2---------- Galland-Douds	6e	1.0	1.6	1.0	1.7
1075B---------- Givin	2e	5.8	9.7	3.6	5.9
1130---------- Belinda	3w	3.4	5.6	2.8	4.6
1260---------- Beckwith	3w	3.0	5.0	2.5	4.1
1715---------- Nodaway-Vesser-Ackmore	2w	5.6	10.7	3.4	5.7
5020---------- Pits and Dumps	8s	---	---	---	---
5030---------- Pits	8s	---	---	---	---
5040. Orthents					

* Animal unit month: 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.

Prime Farmland

Map symbol	Soil name
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes (where drained)
51	Vesser silt loam, 0 to 2 percent slopes (where drained)
51B	Vesser silt loam, 2 to 5 percent slopes (where drained)
54	Zook silty clay loam, 0 to 2 percent slopes (where drained)
74	Rubio silt loam, 0 to 2 percent slopes (where drained)
75	Givin silt loam, 0 to 2 percent slopes
75B	Givin silt loam, 2 to 5 percent slopes
76B	Ladoga silt loam, 2 to 5 percent slopes
80B	Clinton silt loam, 2 to 5 percent slopes
87B	Colo-Zook complex, 0 to 5 percent slopes (where drained)
122	Sperry silt loam, 0 to 1 percent slopes (where drained)
130	Belinda silt loam, 0 to 2 percent slopes (where drained)
131B	Pershing silt loam, 2 to 5 percent slopes
132B	Weller silt loam, 2 to 5 percent slopes
180	Keomah silt loam, 0 to 2 percent slopes
180B	Keomah silt loam, 2 to 5 percent slopes
211	Edina silt loam, depressional, 0 to 1 percent slopes (where drained)
220	Nodaway silt loam, 0 to 2 percent slopes
264B	Ainsworth silt loam, 2 to 5 percent slopes
273B	Olmitz loam, 2 to 5 percent slopes
279	Taintor silty clay loam, 0 to 2 percent slopes (where drained)
280	Mahaska silty clay loam, 0 to 2 percent slopes
280B	Mahaska silty clay loam, 2 to 5 percent slopes
281B	Otley silty clay loam, 2 to 5 percent slopes
362	Haig silt loam, 0 to 2 percent slopes (where drained)
363	Haig silty clay loam, 0 to 1 percent slopes (where drained)
364B	Grundy silty clay loam, 2 to 5 percent slopes
430	Ackmore silt loam, 0 to 2 percent slopes (where drained)
453	Tuskeego silt loam, 0 to 2 percent slopes (where drained)
520	Coppock silt loam, 0 to 2 percent slopes (where drained)
520B	Coppock silt loam, 2 to 5 percent slopes (where drained)
587	Chequest silty clay loam, 0 to 2 percent slopes (where drained)
729	Nodaway-Coppock complex, 0 to 2 percent slopes (where drained)
730B	Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes (where drained)
779	Kalona silty clay loam, 0 to 1 percent slopes (where drained)
831B	Pershing silt loam, bench, 2 to 5 percent slopes
832B	Weller silt loam, bench, 2 to 5 percent slopes
876B	Ladoga silt loam, bench, 2 to 5 percent slopes
880B	Clinton silt loam, bench, 2 to 5 percent slopes
977	Richwood silt loam, 0 to 2 percent slopes
1075B	Givin silt loam, bench, 2 to 5 percent slopes
1130	Belinda silt loam, bench, 0 to 2 percent slopes (where drained)
1715	Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes (where drained)

Windbreaks and Environmental Plantings

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
13B:					
Olmitz	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Vesser	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
Zook	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
23C2:					
Arispe	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
24D2:					
Shelby	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
41B:					
Sparta	Siberian peashrub	Washington hawthorn, autumn-olive, eastern redcedar, Amur honeysuckle, radiant crabapple, lilac.	Jack pine, Austrian pine, red pine.	Eastern white pine	---
51, 51B:					
Vesser	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
54:					
Zook	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
65D2, 65E, 65E2, 65F2, 65G:					
Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
74:					
Rubio	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
75, 75B:					
Givin	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
76B, 76C2, 76D2:					
Ladoga	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
80B, 80C2, 80D2:					
Clinton	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
87B:					
Colo	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
Zook	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
122: Sperry	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
130: Belinda	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
131B, 131B2, 131C2: Pershing	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
132B, 132C, 132C2, 132D, 132D2: Weller	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
139: Perks	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
179D2, 179E2: Gara	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
180, 180B:					
Keomah	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
208:					
Klum	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
211:					
Edina	Redosier dogwood	Silky dogwood, holly, American cranberrybush.	Washington hawthorn, green ash, Austrian pine, northern whitecedar.	Red maple, eastern white pine.	Pin oak.
220:					
Nodaway	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
222C, 222C2:					
Clarinda	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange.	Austrian pine, eastern white pine, pin oak.	---
223C2:					
Rinda	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
260:					
Beckwith	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
263:					
Okaw	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
264B:					
Ainsworth	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
273B:					
Olmitz	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
279:					
Taintor	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
280, 280B:					
Mahaska	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, eastern white pine.	Norway spruce	Pin oak.
281B, 281B2, 281C, 281C2:					
Otley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
293C, 293F:					
Chelsea	Siberian peashrub	Washington hawthorn, autumn-olive, eastern redcedar, Amur honeysuckle, radiant crabapple, lilac.	Jack pine, Austrian pine, red pine.	Eastern white pine	---
Fayette	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
313E2, 313G:					
Gosport	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
315:					
Nodaway	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
Klum	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
Perks	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
362, 363:					
Haig	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
364B, 364B2:					
Grundy	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
423D2:					
Bucknell	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
424D2, 424E2:					
Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Keswick	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
425D, 425D2:					
Keswick	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
430:					
Ackmore	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
453:					
Tuskeego	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
520, 520B:					
Coppock	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
570C2:					
Nira	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
571C2:					
Hedrick	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
572C2, 572D2:					
Inton	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Silver maple, eastern white pine, pin oak.
587:					
Chequest	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
594D2:					
Galland	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
729:					
Nodaway	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
Coppock	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
730B:					
Nodaway	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
730B: Cantril	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
779: Kalona	---	Silky dogwood, Amur privet, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
792C2, 792D2: Armstrong	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
795C2, 795D2: Ashgrove	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
822D2: Lamoni	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
831B, 831C2: Pershing	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
832B, 832C2, 832D2: Weller	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
876B, 876C2: Ladoga	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
880B, 880C2, 880D2: Clinton	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
977: Richwood	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
993D2, 993E2: Gara	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Armstrong	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
994D2, 994E2: Galland	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
994D2, 994E2:					
Douds	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
1075B:					
Givin	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
1130:					
Belinda	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
1260:					
Beckwith	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
1715:					
Nodaway	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.
Vesser	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
Ackmore	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce	Eastern white pine, pin oak.

Windbreak Suitability Groups

(Suitable shrubs and trees with their mature heights are listed in the "Windbreaks and Environmental Plantings" table. Absence of an entry indicates that a windbreak suitability group is not assigned)

Map symbol and soil name	Windbreak suitability group
13B:	
Olmitz	3
Vesser	2
Zook	2
23C2—Arispe	3
24D2—Shelby	3
41B—Sparta	7
51, 51B—Vesser	2
54—Zook	2
65D2, 65E, 65E2, 65F2, 65G—Lindley	3
74—Rubio	2
75, 75B—Givin	1
76B, 76C2, 76D2—Ladoga	3
80B, 80C2, 80D2—Clinton	3
87B—Colo-Zook	2
122—Sperry	2
130—Belinda	2
131B, 131B2, 131C2—Pershing	4
132B, 132C, 132C2, 132D, 132D2—Weller	4

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
139--- Perks	1
179D2, 179E2-- Gara	3
180, 180B--- Keomah	1
208--- Klum	1
211--- Edina	2
220--- Nodaway	1
222C, 222C2--- Clarinda	4
223C2--- Rinda	4
260--- Beckwith	2
263--- Okaw	2
264B--- Ainsworth	3
273B--- Olmitz	3
279--- Taintor	2
280, 280B--- Mahaska	1
281B, 281B2, 281C, 281C2-- Otley	3
293C, 293F: Chelsea---	7
Fayette---	3
313E2, 313G--- Gosport	4
315--- Klum-Nodaway-Perks	1
362, 363--- Haig	2
364B, 364B2--- Grundy	4

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
423D2--- Bucknell	4
424D2, 424E2: Keswick	4
Lindley	3
425D, 425D2--- Keswick	4
430--- Ackmore	1
453--- Tuskeego	2
499G--- Nordness	10
520, 520B--- Coppock	1
570C2--- Nira	3
571C2--- Hedrick	3
572C2, 572D2-- Inton	3
587--- Chequest	2
594D2--- Galland	4
729--- Coppock- Nodaway	1
730B--- Cantril- Coppock- Nodaway	1
779--- Kalona	2
792C2, 792D2-- Armstrong	4
795C2, 795D2-- Ashgrove	4
822D2--- Lamoni	4
831B, 831C2--- Pershing	4

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
832B, 832C2, 832D2--------- Weller	4
876B, 876C2---- Ladoga	3
880B, 880C2, 880D2--------- Clinton	3
977------------ Richwood	3
993D2, 993E2: Armstrong----- Gara----------	4 3
994D2, 994E2: Douds--------- Galland------	3 4
1075B---------- Givin	1
1130----------- Belinda	2
1260----------- Beckwith	2
1715: Ackmore------ Nodaway------ Vesser-------	1 1 2

Forest Land

The original land survey of Iowa, made from 1832 to 1859, indicated that 143,250 acres in the survey area, or about 51 percent of the total acreage, was wooded when the first settlers arrived. The early settlers felled a large percentage of this timber when they cleared the land for farming (Andreas, 1875).

According to a 1954 USDA Forest Service survey, woodland in Jefferson County had declined to about 37,000 acres, or 13 percent of the total acreage of the county (Davidson, 1961). From 1954 to 1974, the acreage used as woodland decreased to about 17,000 acres, or only 6 percent of the total acreage. This decrease of almost 50 percent of the standing timber in the county over a 20-year period is attributed to the conversion of moderately steep, highly erodible woodland sites to cropland (Ostron, 1974).

According to the 1991 USDA Forest Service woodland survey, the trend toward a decreasing forest resource ended between 1974 and 1990. The report showed that Jefferson County's woodland base increased to 22,600 acres, or 8 percent of the total acreage. Most of this new timberland came from land that was formerly classified as pasture (improved pasture, wooded pasture, and improved pasture with trees) but is no longer grazed (Branel and Walkowiak, 1991).

The principal upland tree species in Jefferson County are white oak, northern red oak, black oak, shagbark hickory, and bitternut hickory. Typical bottom-land species are eastern cottonwood, silver maple, green ash, hackberry, basswood, and black walnut. Black cherry and river birch are common, if not plentiful. American elm and red elm are abundant; however, these trees are generally small because of the effect of Dutch elm disease.

The majority of the upland timber is in areas of Lindley, Weller, Keswick, Gara, and Clinton soils. Most of the bottom-land timber is in areas of Nodaway and Coppock soils.

Woodland owners tend to cut only the best individual trees or species from their timber stands. This practice, known as high-grading, results in a residual stand of poor quality trees. Scientific forest management of woodland stands (silviculture) can result in the production of an increased volume of valuable forest products. A well managed stand can maximize economic return, reduce soil loss, improve water quality, and enhance recreational opportunities.

Woodland management is important for maximizing the potential of a stand. The first step in sound forest management is protecting the timber from grazing and fire. Grazing by livestock results in sparse, poor quality woodlands. The hooves of livestock damage the base of larger trees, thereby allowing access by decay organisms. The decay results in a decrease in value of the standing trees. Livestock hooves also trample young seedlings and cause surface compaction. Surface compaction reduces the rate of water infiltration, deprives trees of the moisture they need for rapid growth, and increases the runoff rate. An increased runoff rate results in erosion and siltation (Wray and Farris, 1986).

In a stand of trees, the trees that have the greatest potential for high quality production should be allowed to grow. Undesirable trees and vines that compete for moisture, nutrients, and light should be eradicated. Before the trees are harvested, the growing space of the trees to be removed should be occupied with young, desirable trees. The volume harvested should balance with the growth rate of the residual stand.

The suitability of soil types for growing individual tree species varies greatly. Green ash, for example, can grow in poorly drained soils and in droughty soils on south-facing slopes. Most species cannot tolerate such a wide range of conditions. Black walnut grows best in deep, permeable soils on moist sites.

Soils on north- and east-facing slopes are better suited to trees than soils on south- and west-facing slopes. Generally, deep, well drained or moderately well drained soils are well suited to trees (Countryman and others, 1985). If the subsoil is slowly permeable, root development and growth are restricted. Severely eroded areas are suitable for eastern redcedar, Scotch pine, jack pine, black locust, and Osage-orange.

Further information about woodland management, tree planting, and insect and disease control can be obtained from the Jefferson County Soil Conservation

District, from the district forester of the Iowa Department of Natural Resources, or from private consulting foresters.

The information in the table "Woodland Management and Productivity" at the end of this section can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

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

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates

that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity class*. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to plant are those that are suitable for commercial wood production.

Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed)

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
41B:										
Sparta	4S	Slight	Slight	Severe	Slight	Slight	Northern red oak	70	4	Jack pine, red pine, eastern white pine.
							Jack pine	---	---	
							Red pine	---	---	
							Eastern white pine	---	---	
65D2:										
Lindley	3A	Slight	Slight	Slight	Slight	Severe	White oak	56	3	White oak, northern red oak, black oak.
							Northern red oak	61	3	
							Black oak	63	3	
65E, 65E2, 65F2, 65G:										
Lindley	3R	Moderate	Moderate	Slight	Slight	Severe	White oak	56	3	White oak, northern red oak, black oak.
							Northern red oak	61	3	
							Black oak	63	3	
74:										
Rubio	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, green ash, American sycamore, eastern cottonwood, laurel willow, northern whitecedar.
75, 75B:										
Givin	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	---	---	
76B, 76C2, 76D2:										
Ladoga	4A	Slight	Slight	Slight	Slight	Moderate	White oak	75	4	Sugar maple, black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	75	4	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
80B, 80C2, 80D2:										
Clinton	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	65	3	
130:										
Belinda	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, green ash, American sycamore, eastern cottonwood, golden willow, northern whitecedar.
131B, 131B2, 131C2:										
Pershing	3C	Slight	Slight	Severe	Severe	Slight	White oak	55	3	Red pine, eastern white pine, white oak.
132B, 132C, 132C2, 132D, 132D2:										
Weller	3C	Slight	Slight	Severe	Severe	Slight	White oak	55	3	Sugar maple, black walnut, red pine, eastern white pine.
139:										
Perks	3S	Slight	Slight	Moderate	Slight	Slight	White oak	55	3	Eastern white pine.
179D2:										
Gara	3A	Slight	Slight	Slight	Slight	Slight	White oak	55	3	Red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	55	3	
179E2:										
Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak	55	3	Red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	55	3	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
180, 180B:										
Keomah	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	70	4	
220:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
223C2:										
Rinda	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, hackberry, green ash, eastern redcedar, Norway spruce, white spruce, American sycamore.
							Northern red oak	45	2	
260:										
Beckwith	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, green ash, American sycamore, eastern cottonwood.
263:										
Okaw	4W	Slight	Severe	Severe	Severe	Severe	Pin oak	70	4	Red maple, green ash, water tupelo, swamp white oak, pin oak, baldcypress.
							Blackjack oak	60	3	
							Black oak	55	3	
							White oak	---	---	
264B:										
Ainsworth	6A	Slight	Slight	Slight	Slight	Moderate	Green ash	80	6	Sugar maple, European larch, Norway spruce, white spruce, red pine, eastern white pine, white oak, northern red oak.
							Silver maple	---	---	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
293C:										
Chelsea	3S	Slight	Slight	Moderate	Slight	Slight	White oak	55	3	Eastern redcedar, European larch, jack pine, red pine, eastern white pine, Scotch pine.
Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak	80	4	Green ash, yellow-poplar, eastern white pine, northern red oak.
							Black walnut	---	---	
							Yellow-poplar	90	6	
							Northern red oak	80	4	
293F:										
Chelsea	3R	Moderate	Severe	Moderate	Slight	Slight	White oak	55	3	Eastern redcedar, European larch, jack pine, red pine, eastern white pine, Scotch pine.
Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	80	4	Green ash, yellow-poplar, eastern white pine, northern red oak.
							Black walnut	---	---	
							Yellow-poplar	90	6	
							Northern red oak	80	4	
313E2:										
Gosport	2C	Slight	Slight	Severe	Severe	Slight	White oak	45	2	Norway spruce, white spruce, red pine, eastern white pine, Scotch pine, cottonwood.
313G:										
Gosport	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	Norway spruce, white spruce, red pine, eastern white pine, Scotch pine, cottonwood.
315:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Klum.										

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
315:										
Perks	3S	Slight	Slight	Moderate	Slight	Slight	White oak	55	3	Eastern white pine.
423D2:										
Bucknell	2C	Slight	Slight	Slight	Moderate	Slight	White oak	50	2	Silver maple, hackberry, green ash, eastern redcedar, American sycamore.
							Northern red oak	50	2	
424D2:										
Lindley	3A	Slight	Slight	Slight	Slight	Severe	White oak	56	3	White oak, northern red oak, black oak.
							Northern red oak	61	3	
							Black oak	63	3	
Keswick	3C	Slight	Slight	Moderate	Severe	Slight	White oak	55	3	Sugar maple, red pine, eastern white pine.
							Northern red oak	55	3	
424E2:										
Lindley	3R	Moderate	Moderate	Slight	Slight	Severe	White oak	56	3	White oak, northern red oak, black oak.
							Northern red oak	61	3	
							Black oak	63	3	
Keswick	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak	55	3	Sugar maple, red pine, eastern white pine.
							Northern red oak	55	3	
425D, 425D2:										
Keswick	3C	Slight	Slight	Moderate	Severe	Slight	White oak	55	3	Sugar maple, red pine, eastern white pine.
							Northern red oak	55	3	
430:										
Ackmore	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine, cottonwood.
453:										
Tuskeego	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple	80	2	Silver maple, green ash, American sycamore, eastern cottonwood, laurel willow, northern whitecedar.
							Eastern cottonwood	90	7	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
499G:										
Nordness	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	---
							Northern red oak	45	2	
520, 520B:										
Coppock	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, red pine, eastern white pine.
							Northern red oak	65	3	
571C2:										
Hedrick	4A	Slight	Slight	Slight	Slight	Moderate	White oak	75	4	Sugar maple, eastern redcedar, Norway spruce, white spruce, red pine, eastern white pine, Scotch pine.
572C2, 572D2:										
Inton	3A	Slight	Slight	Slight	Slight	Slight	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	65	3	
587:										
Chequest	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple	80	2	Silver maple, green ash, American sycamore, eastern cottonwood, laurel willow, northern whitecedar.
							Eastern cottonwood	90	7	
594D2:										
Galland	3C	Slight	Slight	Severe	Severe	Moderate	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine.
							Northern red oak	70	4	
729:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Coppock	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, red pine, eastern white pine.
							Northern red oak	65	3	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
730B:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Coppock.										
Cantril	4A	Slight	Slight	Slight	Slight	Moderate	White oak	75	4	Sugar maple, white spruce, red pine, eastern white pine.
792C2, 792D2:										
Armstrong	3C	Slight	Slight	Moderate	Severe	Slight	White oak	55	3	Sugar maple, European larch, red pine, eastern white pine.
							Northern red oak	55	3	
795C2, 795D2:										
Ashgrove	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, hackberry, green ash, American sycamore.
							Northern red oak	45	2	
831B, 831C2:										
Pershing	3C	Slight	Slight	Severe	Severe	Slight	White oak	55	3	Red pine, eastern white pine, white oak.
832B, 832C2, 832D2:										
Weller	3C	Slight	Slight	Severe	Severe	Slight	White oak	55	3	Sugar maple, black walnut, red pine, eastern white pine.
876B, 876C2:										
Ladoga	4A	Slight	Slight	Slight	Slight	Moderate	White oak	75	4	Sugar maple, black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	75	4	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
880B, 880C2, 880D2:										
Clinton	3A	Slight	Slight	Slight	Slight	Moderate	White oak Northern red oak	65 65	3 3	Black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
993D2:										
Gara	3A	Slight	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Red pine, eastern white pine, white oak, northern red oak.
Armstrong	3C	Slight	Slight	Moderate	Severe	Slight	White oak Northern red oak	55 55	3 3	Sugar maple, European larch, red pine, eastern white pine.
993E2:										
Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Red pine, eastern white pine, white oak, northern red oak.
Armstrong	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak Northern red oak	55 55	3 3	Sugar maple, European larch, red pine, eastern white pine.
994D2:										
Galland	3C	Slight	Slight	Severe	Severe	Moderate	White oak Northern red oak	65 70	3 4	Sugar maple, black walnut, red pine, eastern white pine.
Douds	3A	Slight	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Sugar maple, European larch, Norway spruce, white spruce, red pine, eastern white pine, Scotch pine.
994E2:										
Galland	3R	Moderate	Moderate	Severe	Severe	Moderate	White oak Northern red oak	65 70	3 4	Sugar maple, black walnut, red pine, eastern white pine.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
994E2:										
Douds	3R	Moderate	Moderate	Slight	Slight	Slight	White oak	55	3	Sugar maple, European larch, Norway spruce, white spruce, red pine, eastern white pine, Scotch pine.
							Northern red oak	55	3	
1075B:										
Givin	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak	---	---	
1130:										
Belinda	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, green ash, American sycamore, eastern cottonwood, golden willow, northern whitecedar.
1260:										
Beckwith	2W	Slight	Severe	Moderate	Moderate	Severe	White oak	45	2	Silver maple, green ash, American sycamore, eastern cottonwood.
1715:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Vesser.										
Ackmore	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Sugar maple, black walnut, red pine, eastern white pine, cottonwood.

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

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 (fig. 1). 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 interpretive 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

Figure 1.—A playground in Round Prairie County Park, in an area of Weller silty clay loam, 5 to 9 percent slopes, moderately eroded.

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 table 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
13B:					
Olmitz	Slight	Slight	Moderate: slope.	Slight	Slight.
Vesser	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Zook	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
23C2:					
Arispe	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
24D2:					
Shelby	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
41B:					
Sparta	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
51:					
Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
51B:					
Vesser	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
54:					
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
65D2:					
Lindley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
65E, 65E2, 65F2:					
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65G:					
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
74:					
Rubio	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
75:					
Givin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
75B:					
Givin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
76B:					
Ladoga	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
76C2:					
Ladoga	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
76D2:					
Ladoga	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
80B:					
Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
80C2:					
Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
80D2:					
Clinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
87B:					
Colo	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Zook	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
122:					
Sperry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
130:					
Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
131B, 131B2:					
Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
131C2:					
Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
132B:					
Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
132C, 132C2:					
Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
132D, 132D2:					
Weller	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
139:					
Perks	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
179D2:					
Gara	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
179E2:					
Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
180:					
Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
180B:					
Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
208:					
Klum	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
211:					
Edina	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
220:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
222C, 222C2:					
Clarinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
223C2:					
Rinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
260:					
Beckwith	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
263:					
Okaw	Severe: flooding, ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
264B:					
Ainsworth	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
273B:					
Olmitz	Slight	Slight	Moderate: slope.	Slight	Slight.
279:					
Taintor	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
280:					
Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
280B:					
Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
281B, 281B2:					
Otley	Slight	Slight	Moderate: slope.	Slight	Slight.
281C, 281C2:					
Otley	Slight	Slight	Severe: slope.	Slight	Slight.
293C:					
Chelsea	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
Fayette	Slight	Slight	Severe: slope.	Slight	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
293F:					
Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
313E2:					
Gosport	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, depth to rock.
313G:					
Gosport	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
315:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Klum	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Perks	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
362, 363:					
Haig	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
364B, 364B2:					
Grundy	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
423D2:					
Bucknell	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
424D2:					
Lindley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
424E2:					
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Keswick	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
425D:					
Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
425D2:					
Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
430:					
Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
453:					
Tuskeego	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
499G:					
Nordness	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
520:					
Coppock	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
520B:					
Coppock	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
570C2:					
Nira	Slight	Slight	Severe: slope.	Slight	Slight.
571C2:					
Hedrick	Slight	Slight	Severe: slope.	Slight	Slight.
572C2:					
Inton	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
572D2:					
Inton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
587:					
Chequest	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
594D2:					
Galland	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
729:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Coppock	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
730B:					
Nodaway	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
Coppock	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Cantril	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
779:					
Kalona	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
792C2:					
Armstrong	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
792D2:					
Armstrong	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
795C2:					
Ashgrove	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
795D2:					
Ashgrove	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
822D2:					
Lamoni	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
831B:					
Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
831C2:					
Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
832B:					
Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
832C2:					
Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
832D2:					
Weller	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
876B:					
Ladoga	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
876C2:					
Ladoga	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
880B:					
Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
880C2:					
Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
880D2:					
Clinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
977:					
Richwood	Slight	Slight	Slight	Slight	Slight.
993D2:					
Gara	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Armstrong	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
993E2:					
Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Armstrong	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Moderate: wetness, slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
994D2:					
Galland	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
Douds	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
994E2:					
Galland	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.
Douds	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1075B:					
Givin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
1130:					
Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1260:					
Beckwith	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
1715:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
5020:					
Pits and Dumps	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
5030:					
Pits	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
5040:					
Orthents	Slight	Slight	Moderate: slope.	Slight	Slight.

Wildlife Habitat

Jefferson County supports a variety of wildlife species. These resources provide opportunities for hunting, fishing, and wildlife observation and thus have a positive effect on the local economy. Some species, such as songbirds, hawks, owls, snakes, and other predators, provide additional benefits by controlling rodents and undesirable insects.

Both the diversity and abundance of wildlife in Jefferson County are indirectly affected by soil types through their influence on vegetation and land use. Topography also plays a role in determining the types and abundance of wildlife throughout the county. The nearly level Taintor and Haig soils are rowcropped intensively and provide only limited shelter and nesting areas for wildlife unless special provisions are made. These provisions could include leaving brushy or herbaceous fence rows undisturbed, delaying mowing of set-aside areas and other odd areas, and planting wildlife food and cover plots. The moderately steep and steep areas throughout the county, such as areas of Lindley and Gara soils, are important to wildlife because they are generally cropped less intensively than some other areas. The interspersion of woodlands, pastures, brushy ravines, and croplands associated with these steeper soils results in more diverse and abundant wildlife resources.

Pheasant, cottontail rabbit, raccoon, skunk, and opossum are generally abundant in the upland flats and in the moderately sloping areas of the county. White-tailed deer and bobwhite quail are abundant in areas of the Clinton-Lindley-Ashgrove and Weller-Lindley associations, where the flat uplands break off into moderately sloping or steeper topography. Wild turkeys are abundant in the more extensive woodlands associated with the steeper soils, such as Lindley loam, 25 to 40 percent slopes. Mink, muskrat, and some beaver frequent the Skunk River and creeks throughout the county. The remaining undrained wetland areas along the Skunk River and other streams provide habitat for waterfowl and other wetland wildlife. The most common nesting waterfowl species is the wood duck, which nests in hollow trees along the larger streams and along the Skunk River. Old bayous, cut-off channels, and other shallow water areas along these streams provide important brood areas where young wood ducks can find food and protection from predators. Various other marsh birds, including herons, egrets, and shorebirds, use these shallow water areas for feeding or nesting. Giant Canada geese nest on some of the larger farm ponds in the county.

The Nodaway and Coppock soils on bottom land provide sites for dikes and shallow water impoundments, which can improve habitat for waterfowl and other wetland wildlife. Fish, mainly bullheads and carp, are fairly plentiful in the streams throughout the county. Channel catfish are a sought-after species in the Skunk River (fig. 2). Many privately owned artificial ponds are well distributed throughout the county. The well managed ponds provide excellent fishing for largemouth bass, bluegill, and channel catfish. Internal drainage, available water capacity, texture of the subsoil, and permeability are important factors affecting the selection of sites for farm ponds and shallow water areas for waterfowl. The city of Fairfield's waterworks reservoir number 1 and reservoir number 2 and Walton Lake provide excellent fishing opportunities within a short distance from Fairfield.

Many areas in the county could be improved or developed as wildlife habitat. Small irregularly shaped areas of limited value for other uses could be developed as wildlife habitat by planting trees, shrubs, and native grasses or by merely fencing the area and allowing natural succession to occur. Woodlands can be made more productive for timber and wildlife by excluding livestock. Reducing or eliminating fall tillage of cropland protects the land from erosion and provides winter food for wildlife. Incorporating islands and other features in the design of new farm ponds and shallow water areas can provide safe nesting areas for Canada geese and other waterfowl.

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

Figure 2.—The soils on bottom land along the Skunk River, in northeastern Jefferson County, provide good wildlife habitat. The river supports many species of fish.

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 corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are bromegrass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestems, indiangrass, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, 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, 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, box elder, 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 honeysuckle, American plum, redosier dogwood, chokecherry, highbush cranberry, elderberry, blackberry, raspberry, gooseberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provides habitat or supplies food in the form of browse, seed, or fruit-like cones. Examples are pine, spruce, and redcedar.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of the 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 smartweeds, wild millet, rushes, sedges, bulrushes, arrowhead, waterplantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

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 waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife 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, ring-necked pheasant, bobwhite quail, 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, raccoon, and white-tailed deer.

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

Wildlife Habitat

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
13B:										
Olmitz	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
23C2:										
Arispe	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.
24D2:										
Shelby	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
41B:										
Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
51, 51B:										
Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
54:										
Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
65D2:										
Lindley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
65E, 65E2, 65F2:										
Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
65G:										
Lindley	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
74:										
Rubio	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
75, 75B:										
Givin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
76B:										
Ladoga	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
76C2, 76D2:										
Ladoga	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
80B:										
Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
80C2, 80D2:										
Clinton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
87B:										
Colo	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Fair	Fair	Good.
Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
122:										
Sperry	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
130:										
Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
131B, 131B2:										
Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
131C2:										
Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
132B:										
Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
132C, 132C2, 132D, 132D2:										
Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
139:										
Perks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
179D2:										
Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
179E2:										
Gara	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
180, 180B:										
Keomah	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair.
208:										
Klum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
211:										
Edina	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
220:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
222C, 222C2:										
Clarinda	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
223C2:										
Rinda	Poor	Fair	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
260:										
Beckwith	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
263:										
Okaw	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
264B:										
Ainsworth	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
273B:										
Olmitz	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
279:										
Taintor	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
280, 280B:										
Mahaska	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
281B, 281B2:										
Otley	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
281C, 281C2:										
Otley	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
293C:										
Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
293F:										
Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
313E2, 313G:										
Gosport	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
315:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Klum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Perks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
362, 363:										
Haig	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
364B, 364B2:										
Grundy	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
423D2:										
Bucknell	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life
424D2:										
Lindley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
424E2:										
Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Keswick	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
425D, 425D2:										
Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
430:										
Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
453:										
Tuskeego	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
499G:										
Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
520, 520B:										
Coppock	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
570C2:										
Nira	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
571C2:										
Hedrick	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
572C2, 572D2:										
Inton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
587:										
Chequest	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
594D2:										
Galland	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
729:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Coppock	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
730B:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Coppock	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Cantril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
779:										
Kalona	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
792C2, 792D2:										
Armstrong	Fair	Good	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
795C2, 795D2:										
Ashgrove	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
822D2:										
Lamoni	Fair	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
831B:										
Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
831C2:										
Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
832B:										
Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
832C2, 832D2:										
Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
876B:										
Ladoga	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
876C2:										
Ladoga	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
880B:										
Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
880C2, 880D2:										
Clinton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
977:										
Richwood	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
993D2:										
Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
Armstrong	Fair	Good	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
993E2:										
Gara	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Armstrong	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life
994D2:										
Galland	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
Douds	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
994E2:										
Galland	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
Douds	Very poor.	Good	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
1075B:										
Givin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
1130:										
Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1260:										
Beckwith	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1715:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
5020:										
Pits and Dumps	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
5030:										
Pits	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
5040:										
Orthents.										

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 kinds 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, 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, the available water capacity in the upper 40 inches, and the content of salts 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, 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, 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 and bedrock 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, 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 affect trench 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 wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock 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 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, or slopes of more than 25 percent. They are wet and have 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 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, 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. 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. The performance of a system is affected by the depth of the root zone, the amount of salts, 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 affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion 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 affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Building Site Development

(The information in this table 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
13B:						
Olmitz	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Zook	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
23C2:						
Arispe	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
24D2:						
Shelby	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
41B:						
Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
51:						
Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
51B:						
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
54:						
Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
65D2:						
Lindley	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
65E, 65E2, 65F2, 65G:						
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
74:						
Rubio	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
75, 75B:						
Givin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
76B:						
Ladoga	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
76C2:						
Ladoga	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
76D2:						
Ladoga	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
80B:						
Clinton	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
80C2:						
Clinton	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
80D2:						
Clinton	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
87B:						
Colo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Zook	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
122:						
Sperry	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
130: Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
131B, 131B2, 131C2: Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132B, 132C, 132C2: Weller	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132D, 132D2: Weller	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.	Moderate: slope.
139: Perks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
179D2: Gara	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
179E2: Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
180, 180B: Keomah	Severe: wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
208: Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
211: Edina	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
220: Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
222C:						
Clarinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
222C2:						
Clarinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
223C2:						
Rinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
260:						
Beckwith	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
263:						
Okaw	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
264B:						
Ainsworth	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
273B:						
Olmitz	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
279:						
Taintor	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
280, 280B:						
Mahaska	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
281B, 281B2:						
Otley	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
281C, 281C2:						
Otley	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
293C:						
Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
293C:						
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
293F:						
Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
313E2:						
Gosport	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Moderate: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, depth to rock.
313G:						
Gosport	Severe: wetness, slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
315:						
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Perks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
362, 363:						
Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
364B, 364B2:						
Grundy	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
423D2:						
Bucknell	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
424D2:						
Lindley	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
424D2:						
Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
424E2:						
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Keswick	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
425D, 425D2:						
Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
430:						
Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
453:						
Tuskeego	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
499G:						
Nordness	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
520:						
Coppock	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
520B:						
Coppock	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
570C2:						
Nira	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
571C2:						
Hedrick	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
572C2:						
Inton	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
572D2:						
Inton	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
587:						
Chequest	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.
594D2:						
Galland	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
729:						
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Coppock	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
730B:						
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Coppock	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Cantril	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Slight.
779:						
Kalona	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
792C2:						
Armstrong	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
792D2: Armstrong	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
795C2: Ashgrove	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
795D2: Ashgrove	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness, slope.
822D2: Lamoni	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
831B, 831C2: Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
832B, 832C2: Weller	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
832D2: Weller	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.	Moderate: slope.
876B: Ladoga	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
876C2: Ladoga	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
880B: Clinton	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
880C2: Clinton	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
880D2:						
Clinton	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
977:						
Richwood	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
993D2:						
Gara	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Armstrong	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
993E2:						
Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Armstrong	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
994D2:						
Galland	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
Douds	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
994E2:						
Galland	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Douds	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1075B:						
Givin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
1130:						
Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1260:						
Beckwith	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
1715:						
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
5020:						
Pits and Dumps	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: slope, depth to rock.
5030:						
Pits	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: slope, depth to rock.
5040:						
Orthents	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.

Sanitary Facilities

(The information in this table 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
13B:					
Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Zook	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
23C2:					
Arispe	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: hard to pack.
24D2:					
Shelby	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
41B:					
Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
51:					
Vesser	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
51B:					
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
54:					
Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
65D2:					
Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
65E, 65E2, 65F2, 65G:					
Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
74:					
Rubio	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
75, 75B:					
Givin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
76B:					
Ladoga	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
76C2:					
Ladoga	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
76D2:					
Ladoga	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
80B:					
Clinton	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
80C2:					
Clinton	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
80D2:					
Clinton	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
87B:					
Colo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Zook	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
122:					
Sperry	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
130:					
Belinda	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
131B, 131B2:					
Pershing	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
131C2: Pershing	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132B: Weller	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132C, 132C2: Weller	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132D, 132D2: Weller	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
139: Perks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
179D2: Gara	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
179E2: Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
180, 180B: Keomah	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
208: Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.
211: Edina	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
220: Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
222C: Clarinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
222C2: Clarinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
223C2: Rinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
260: Beckwith	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
263: Okaw	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
264B: Ainsworth	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Poor: hard to pack.
273B: Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
279: Taintor	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
280, 280B: Mahaska	Severe: wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
281B, 281B2: Otley	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
281C, 281C2: Otley	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
293C: Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Fayette	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
293F:					
Chelsea	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
313E2:					
Gosport	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
313G:					
Gosport	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
315:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.
Perks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
362, 363:					
Haig	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
364B, 364B2:					
Grundy	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
423D2:					
Bucknell	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
424D2:					
Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
424E2:					
Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Keswick	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
425D, 425D2:					
Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
430:					
Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
453:					
Tuskeego	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
499G:					
Nordness	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.
520:					
Coppock	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
520B:					
Coppock	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
570C2:					
Nira	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
571C2:					
Hedrick	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
572C2:					
Inton	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
572D2:					
Inton	Moderate: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Poor: hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
587:					
Chequest	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
594D2:					
Galland	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
729:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Coppock	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
730B:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Coppock	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Cantril	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
779:					
Kalona	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
792C2, 792D2:					
Armstrong	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
795C2, 795D2:					
Ashgrove	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
822D2:					
Lamoni	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
831B:					
Pershing	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
831C2:					
Pershing	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832B:					
Weller	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832C2:					
Weller	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832D2:					
Weller	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
876B:					
Ladoga	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
876C2:					
Ladoga	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
880B:					
Clinton	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
880C2:					
Clinton	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
880D2:					
Clinton	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
977:					
Richwood	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
993D2:					
Gara	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Armstrong	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
993E2:					
Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Armstrong	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
994D2:					
Galland	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
Douds	Moderate: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey, too sandy, slope.
994E2:					
Galland	Severe: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
Douds	Severe: slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: seepage, slope.	Poor: slope.
1075B:					
Givin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
1130:					
Belinda	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1260:					
Beckwith	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
1715:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Vesser	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
5020: Pits and Dumps--	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.
5030: Pits----------	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.
5040: Orthents--------	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.

Construction Materials

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

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
13B:				
Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
23C2:				
Arispe	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
24D2:				
Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
41B:				
Sparta	Good	Probable	Improbable: too sandy.	Poor: too sandy.
51, 51B:				
Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54:				
Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
65D2:				
Lindley	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
65E, 65E2, 65F2:				
Lindley	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65G:				
Lindley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
74:				
Rubio	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
75, 75B:				
Givin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
76B, 76C2, 76D2:				
Ladoga	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
80B, 80C2, 80D2:				
Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
87B:				
Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
122:				
Sperry	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
130:				
Belinda	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
131B, 131B2, 131C2:				
Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
132B, 132C, 132C2, 132D, 132D2:				
Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
139:				
Perks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
179D2:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
179E2:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
180, 180B:				
Keomah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
208:				
Klum	Good	Probable	Improbable: too sandy.	Good.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
211: Edina	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
220: Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
222C, 222C2: Clarinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
223C2: Rinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
260: Beckwith	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
263: Okaw	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
264B: Ainsworth	Good	Probable	Improbable: too sandy.	Fair: too clayey.
273B: Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
279: Taintor	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
280, 280B: Mahaska	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
281B, 281B2, 281C, 281C2: Otley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
293C: Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
293F: Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
293F:				
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
313E2:				
Gosport	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
313G:				
Gosport	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
315:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Klum	Good	Probable	Improbable: too sandy.	Good.
Perks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
362, 363:				
Haig	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
364B, 364B2:				
Grundy	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
423D2:				
Bucknell	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
424D2:				
Lindley	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
424E2:				
Lindley	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
425D:				
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
425D2:				
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
430:				
Ackmore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
453:				
Tuskeego	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
499G:				
Nordness	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
520:				
Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
520B:				
Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
570C2:				
Nira	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
571C2:				
Hedrick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
572C2:				
Inton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
572D2:				
Inton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
587:				
Chequest	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
594D2:				
Galland	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
729:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
730B:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
730B:				
Cantril	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
779:				
Kalona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
792C2, 792D2:				
Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
795C2, 795D2:				
Ashgrove	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
822D2:				
Lamoni	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
831B, 831C2:				
Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
832B, 832C2, 832D2:				
Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
876B, 876C2:				
Ladoga	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
880B, 880C2, 880D2:				
Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
977:				
Richwood	Good	Probable	Improbable: too sandy.	Good.
993D2:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
993E2:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
994D2:				
Galland	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Douds	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
994E2:				
Galland	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Douds	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1075B:				
Givin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1130:				
Belinda	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1260:				
Beckwith	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1715:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ackmore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
5020:				
Pits and Dumps	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
5030:				
Pits	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
5040:				
Orthents	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

Water Management

(The information in this table 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
13B:							
Olmitz	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Vesser	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
23C2:							
Arispe	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
24D2:							
Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope	Slope.
41B:							
Sparta	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
51:							
Vesser	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
51B:							
Vesser	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
54:							
Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
65D2, 65E, 65E2, 65F2, 65G:							
Lindley	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.

Water Management--Continued

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
74:							
Rubio	Slight	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
75:							
Givin	Slight	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
75B:							
Givin	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
76B, 76C2:							
Ladoga	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope	Erodes easily	Erodes easily.
76D2:							
Ladoga	Severe: slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
80B, 80C2:							
Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
80D2:							
Clinton	Severe: slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
87B:							
Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
122:							
Sperry	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.

Water Management--Continued

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
130: Belinda	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
131B, 131B2, 131C2: Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
132B, 132C, 132C2: Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
132D, 132D2: Weller	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
139: Perks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.
179D2, 179E2: Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
180: Keomah	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
180B: Keomah	Moderate: slope.	Moderate: wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
208: Klum	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Deep to water	Soil blowing, flooding.	Soil blowing	Favorable.
211: Edina	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

Water Management--Continued

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
220:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
222C, 222C2:							
Clarinda	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
223C2:							
Rinda	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
260:							
Beckwith	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
263:							
Okaw	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
264B:							
Ainsworth	Severe: seepage.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
273B:							
Olmitz	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
279:							
Taintor	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
280:							
Mahaska	Moderate: seepage.	Severe: hard to pack.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
280B:							
Mahaska	Moderate: seepage, slope.	Severe: hard to pack.	Moderate: deep to water, slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.

Water Management--Continued

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
281B, 281B2, 281C, 281C2:							
Otley	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope	Erodes easily	Erodes easily.
293C:							
Chelsea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Fayette	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
293F:							
Chelsea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
313E2:							
Gosport	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
313G:							
Gosport	Severe: slope.	Slight	Severe: no water.	Percs slowly, depth to rock, slope.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
315:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
Klum	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Deep to water	Soil blowing, flooding.	Soil blowing	Favorable.
Perks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.

Water Management--Continued

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
362, 363:							
Haig	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
364B, 364B2:							
Grundy	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
423D2:							
Bucknell	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
424D2, 424E2:							
Lindley	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Keswick	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
425D, 425D2:							
Keswick	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
430:							
Ackmore	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
453:							
Tuskeego	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
499G:							
Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
520:							
Coppock	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.

Water Management--Continued

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
520B:							
Coppock	Moderate: seepage, slope.	Severe: hard to pack, wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
570C2:							
Nira	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope	Erodes easily	Erodes easily.
571C2:							
Hedrick	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope	Erodes easily	Erodes easily.
572C2:							
Inton	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
572D2:							
Inton	Severe: slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
587:							
Chequest	Slight	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
594D2:							
Galland	Severe: seepage, slope.	Moderate: thin layer, hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
729:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
Coppock	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
730B:							
Nodaway	Moderate: seepage, slope.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Slope, flooding.	Erodes easily	Erodes easily.

Water Management--Continued

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
730B:							
Coppock	Moderate: seepage, slope.	Severe: hard to pack, wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Cantril	Moderate: seepage, slope.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Slope, wetness, rooting depth.	Wetness	Rooting depth.
779:							
Kalona	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
792C2:							
Armstrong	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
792D2:							
Armstrong	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
795C2:							
Ashgrove	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
795D2:							
Ashgrove	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
822D2:							
Lamoni	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
831B, 831C2:							
Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
832B, 832C2:							
Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.

Water Management--Continued

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
832D2:							
Weller	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
876B, 876C2:							
Ladoga	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope	Erodes easily	Erodes easily.
880B, 880C2:							
Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
880D2:							
Clinton	Severe: slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
977:							
Richwood	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
993D2, 993E2:							
Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Armstrong	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
994D2, 994E2:							
Galland	Severe: seepage, slope.	Moderate: thin layer, hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Douds	Severe: seepage, slope.	Severe: piping.	Severe: cutbanks cave	Deep to water	Slope, rooting depth.	Slope, too sandy	Slope, rooting depth.
1075B:							
Givin	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.

Water Management--Continued

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
1130:							
Belinda	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1260:							
Beckwith	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
1715:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
Vesser	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Ackmore	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
5020:							
Pits and Dumps	Severe: depth to rock, slope.	Slight	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
5030:							
Pits	Severe: depth to rock, slope.	Slight	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
5040:							
Orthents	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, droughty.	Soil blowing	Droughty.

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.

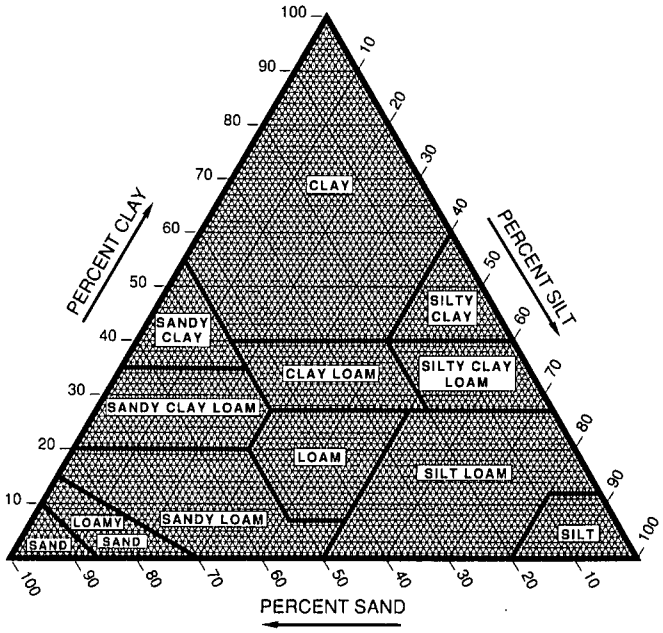

Figure 3.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

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 (fig. 3). "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 Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

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 the 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 wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. 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 wind erosion 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 wind erosion 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 wind erosion 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 wind erosion 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. They are moderately erodible. Crops can be grown if measures to control wind erosion 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. They are moderately erodible. Crops can be grown if ordinary measures to control wind erosion 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. They are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

In the table "Chemical Properties of the Soils," *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. It is a measurement of the nutrient-holding capacity of the soil.

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 is expressed as a weighted percentage of the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients, such as phosphorus, is affected by the amount of carbonates in the soil.

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 drained 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.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes (fig. 4). 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 more than 50 percent in any year).

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

Figure 4.—Because the soil is occasionally flooded, camping is limited in this area of Nodaway silt loam, 0 to 2 percent slopes, along the Skunk River.

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. "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 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 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	
13B:												
Olmitz	0-8	Loam	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	8-25	Loam, clay loam	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	25-60	Clay loam	CL	A-6, A-7	0	0	100	90-100	85-95	60-80	35-45	15-25
Vesser	0-10	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25
Zook	0-18	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	18-60	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
23C2:												
Arispe	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	8-13	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-60	25-35
	13-52	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	52-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	20-30
24D2:												
Shelby	0-8	Clay loam	CL	A-6, A-7	0	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-16	Clay loam	CL	A-6, A-7	0	0	90-95	85-95	75-90	55-70	35-45	15-25
	16-45	Clay loam	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	45-60	Clay loam	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	30-45	15-25
41B:												
Sparta	0-20	Loamy fine sand	SM	A-2, A-4	0	0	85-100	85-100	50-95	15-50	0-14	NP
	20-30	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	30-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
51:												
Vesser	0-10	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25
51B:												
Vesser	0-10	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	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	
54:												
Zook----------	0-18	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	18-53	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
	53-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	0	100	100	95-100	95-100	35-80	10-50
65D2:												
Lindley---------	0-9	Loam----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	9-43	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	43-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65E:												
Lindley---------	0-10	Loam----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	10-50	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	50-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65E2:												
Lindley---------	0-8	Loam----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	8-42	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65F2:												
Lindley---------	0-7	Loam----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	7-41	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	41-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65G:												
Lindley---------	0-10	Loam----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	10-48	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	48-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
74:												
Rubio----------	0-8	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	8-16	Silt loam------	CL-ML, CL, ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	16-47	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	47-60	Silty clay loam	CH, CL	A-7	0	0	100	100	100	95-100	45-55	20-30
75:												
Givin----------	0-14	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	14-41	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	45-60	25-35
	41-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30

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	
75B:												
Givin	0-10	Silt loam	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	10-37	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	45-60	25-35
	37-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30
76B:												
Ladoga	0-13	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	13-45	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	45-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
76C2:												
Ladoga	0-11	Silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	11-43	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	43-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
76D2:												
Ladoga	0-10	Silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	10-40	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	40-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
80B:												
Clinton	0-10	Silt loam	ML	A-4	0	0	100	100	100	95-100	30-40	5-10
	10-32	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	32-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	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	
80C2:												
Clinton	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	9-27	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	27-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
80D2:												
Clinton	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	8-26	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	26-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
87B:												
Colo	0-22	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	22-52	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	52-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30
Zook	0-18	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	18-60	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
122:												
Sperry	0-10	Silt loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	10-18	Silt loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	18-35	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
	35-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	100	95-100	40-50	20-30
130:												
Belinda	0-7	Silt loam	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	7-12	Silt loam	CL-ML, CL, ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	12-41	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	41-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35

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	
131B:												
Pershing--------	0-15	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	15-20	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	20-54	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	54-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
131B2:												
Pershing--------	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	9-13	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	13-48	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	48-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
131C2:												
Pershing--------	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	9-12	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	12-44	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	44-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
132B:												
Weller----------	0-11	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	11-37	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	37-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
132C:												
Weller----------	0-10	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	10-36	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	36-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30

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	
132C2:												
Weller----------	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	8-32	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	32-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
132D:												
Weller----------	0-9	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	9-35	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	35-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
132D2:												
Weller----------	0-7	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	7-31	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
139:												
Perks-----------	0-9	Loamy sand-----	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
	9-60	Sand, loamy sand.	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
179D2:												
Gara------------	0-7	Clay loam------	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	7-47	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	47-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179E2:												
Gara------------	0-6	Clay loam------	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	6-46	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	46-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	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	
180:												
Keomah----------	0-14	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	14-47	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	45-60	30-45
	47-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-30
180B:												
Keomah----------	0-12	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	12-45	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	45-60	30-45
	45-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-30
208:												
Klum----------	0-20	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	95-100	70-90	40-55	20-35	3-10
	20-60	Stratified silt loam to sandy loam.	CL-ML, SP-SM, SC-SM	A-4, A-2	0	0	100	95-100	70-95	10-70	15-30	NP-10
211:												
Edina----------	0-9	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-15
	9-16	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-15
	16-47	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	90-100	55-75	30-45
	47-60	Silty clay loam	CL, CH	A-6, A-7	0	0	100	100	95-100	90-100	35-60	15-35
220:												
Nodaway---------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
222C:												
Clarinda--------	0-12	Silty clay loam	CL	A-7	0	0	100	95-100	90-100	85-100	40-50	20-30
	12-21	Silty clay, clay.	CH	A-7	0	0	100	95-100	85-100	80-100	55-70	30-40
	21-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	80-95	75-90	55-70	35-45

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	
222C2:												
Clarinda--------	0-9	Silty clay loam	CL	A-7	0	0	100	95-100	90-100	85-100	40-50	20-30
	9-19	Silty clay, clay.	CH	A-7	0	0	100	95-100	85-100	80-100	55-70	30-40
	19-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	80-95	75-90	55-70	35-45
223C2:												
Rinda----------	0-8	Silty clay loam	CL	A-7	0	0	100	95-100	90-100	85-100	40-50	20-30
	8-60	Clay, silty clay.	CH, CL	A-7	0	0	95-100	95-100	80-95	75-90	55-70	35-45
260:												
Beckwith--------	0-5	Silt loam------	CL, ML, CL-ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	5-15	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	15-31	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	31-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
263:												
Okaw----------	0-17	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	17-40	Silty clay, clay, silty clay loam.	CH	A-7	0	0	100	95-100	95-100	85-100	50-70	30-50
	40-55	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	0	100	100	95-100	80-100	45-65	20-40
	55-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	0	100	100	95-100	80-100	45-65	20-35
264B:												
Ainsworth-------	0-8	Silt loam------	ML	A-4	0	0	100	100	100	90-95	30-40	5-10
	8-42	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	42-60	Sandy loam, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	0	95-100	90-100	60-85	5-35	15-20	NP
273B:												
Olmitz----------	0-8	Loam----------	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	8-25	Loam, clay loam	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	25-60	Clay loam------	CL	A-6, A-7	0	0	100	90-100	85-95	60-80	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	
279:												
Taintor	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	45-60	20-30
	8-22	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	45-60	20-30
	22-46	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
	46-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
280:												
Mahaska	0-20	Silty clay loam	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-25
	20-55	Silty clay loam, silty clay.	CH, MH	A-7	0	0	100	100	100	95-100	50-60	20-30
	55-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-20
280B:												
Mahaska	0-20	Silty clay loam	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-25
	20-49	Silty clay loam, silty clay.	CH, MH	A-7	0	0	100	100	100	95-100	50-60	20-30
	49-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-20
281B:												
Otley	0-18	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	18-41	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	41-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30
281B2:												
Otley	0-9	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	9-28	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	28-36	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	36-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30

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	
281C:												
Otley	0-15	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	15-38	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	38-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30
281C2:												
Otley	0-8	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	8-26	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	26-34	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	34-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30
293C:												
Chelsea	0-5	Loamy fine sand	SM, SP-SM	A-2-4	0	0	100	100	65-95	10-35	0-14	NP
	5-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-95	3-15	0-14	NP
Fayette	0-10	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-57	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	57-60	Silt loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
293F:												
Chelsea	0-5	Loamy fine sand	SM, SP-SM	A-2-4	0	0	100	100	65-95	10-35	0-14	NP
	5-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-95	3-15	0-14	NP
Fayette	0-8	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	8-55	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	55-60	Silt loam	CL	A-6	0	0	100	100	100	95-100	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	
313E2:												
Gosport	0-8	Silty clay loam	ML, MH	A-7	0	0	100	90-100	90-100	85-100	41-55	11-20
	8-22	Clay, silty clay, silty clay loam.	CH	A-7	0	0	100	90-100	90-100	85-100	50-65	35-50
	22-60	Weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
313G:												
Gosport	0-6	Silty clay loam	ML, MH	A-7	0	0	100	90-100	90-100	85-100	41-55	11-20
	6-18	Clay, silty clay, silty clay loam.	CH	A-7	0	0	100	90-100	90-100	85-100	50-65	35-50
	18-60	Weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
315:												
Nodaway	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Klum	0-20	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	95-100	70-90	40-55	20-35	3-10
	20-60	Stratified silt loam to sandy loam.	CL-ML, SP-SM, SC-SM	A-4, A-2	0	0	100	95-100	70-95	10-70	15-30	NP-10
Perks	0-9	Sand	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
	9-60	Sand, loamy sand.	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
362:												
Haig	0-12	Silt loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	12-22	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	22-42	Silty clay	CH	A-7	0	0	100	100	100	95-100	50-65	30-40
	42-60	Silty clay loam	CL, CH	A-7, A-6	0	0	100	100	100	95-100	35-55	20-30
363:												
Haig	0-12	Silty clay loam	CL, CH, ML, MH	A-7	0	0	100	100	100	95-100	40-55	15-25
	12-22	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	22-42	Silty clay	CH	A-7	0	0	100	100	100	95-100	50-65	30-40
	42-60	Silty clay loam	CL, CH	A-7, A-6	0	0	100	100	100	95-100	35-55	20-30

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	
364B:												
Grundy----------	0-15	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-55	20-35
	15-19	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	95-100	90-100	45-55	25-35
	19-42	Silty clay-----	CH	A-7	0	0	100	100	95-100	90-100	50-70	30-45
	42-60	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	90-100	40-55	25-35
364B2:												
Grundy----------	0-10	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-55	20-35
	10-15	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	95-100	90-100	45-55	25-35
	15-38	Silty clay-----	CH	A-7	0	0	100	100	95-100	90-100	50-70	30-45
	38-60	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	90-100	40-55	25-35
423D2:												
Bucknell--------	0-6	Silty clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-95	70-95	35-45	15-25
	6-50	Clay, clay loam	CH	A-7	0	0	95-100	95-100	90-100	85-100	50-60	25-35
	50-60	Clay loam------	CL	A-6, A-7	0	0	95-100	95-100	70-90	55-85	35-50	15-30
424D2:												
Lindley---------	0-9	Loam-----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	9-43	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	43-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick---------	0-10	Loam-----------	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	10-29	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	29-60	Clay loam------	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25
424E2:												
Lindley---------	0-8	Loam-----------	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	8-42	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick---------	0-9	Loam-----------	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	9-27	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	27-60	Clay loam------	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425D:												
Keswick---------	0-12	Loam-----------	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	12-31	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	31-60	Clay loam------	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425D2:												
Keswick---------	0-10	Clay loam------	CL	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	35-50	15-25
	10-29	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	29-60	Clay loam------	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	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	
430:												
Ackmore---------	0-8	Silt loam------	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	8-27	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	95-100	85-100	35-60	15-30
453:												
Tuskeego--------	0-14	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	14-46	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	95-100	95-100	30-35	11-15
	46-60	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	95-100	95-100	50-60	25-35
499G:												
Nordness--------	0-4	Silt loam------	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	4-11	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	11-17	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	17-60	Unweathered bedrock, weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
520:												
Coppock---------	0-9	Silt loam------	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam------	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30
520B:												
Coppock---------	0-9	Silt loam------	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam------	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	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	
570C2:												
Nira	0-11	Silty clay loam	CL, CH, ML, MH	A-7	0	0	100	100	100	95-100	40-55	15-25
	11-39	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
571C2:												
Hedrick	0-7	Silty clay loam	CL	A-6, A-4	0	0	100	100	100	95-100	35-45	15-25
	7-56	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	56-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
572C2:												
Inton	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	7-48	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	48-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-25
572D2:												
Inton	0-5	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	5-46	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	46-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-25
587:												
Chequest	0-17	Silty clay loam	CL	A-7	0	0	100	100	95-100	95-100	40-50	15-25
	17-60	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	45-60	20-30
594D2:												
Galland	0-7	Clay loam	CL	A-6, A-7	0	0	90-100	80-100	75-100	65-90	30-45	10-20
	7-54	Clay loam, clay, silty clay.	CL, CH	A-7	0	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	54-60	Stratified sandy loam to clay.	SC-SM, SC, CL-ML, CL	A-4, A-2, A-6	0	0-5	90-100	80-100	65-95	30-60	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	
729:												
Nodaway	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Coppock	0-9	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30
730B:												
Nodaway	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Coppock	0-9	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30
Cantril	0-13	Silt loam	CL	A-6	0	0	100	100	85-95	65-75	30-40	11-20
	13-60	Clay loam	CL	A-6, A-7	0	0	100	100	90-100	70-88	35-45	15-25
779:												
Kalona	0-20	Silty clay loam	MH	A-7	0	0	100	100	100	95-100	50-65	20-30
	20-41	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
	41-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
792C2:												
Armstrong	0-7	Clay loam	CL	A-6, A-7	0	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	7-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	20-35
792D2:												
Armstrong	0-6	Clay loam	CL	A-6, A-7	0	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	6-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	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	
795C2:												
Ashgrove--------	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-100	35-45	15-25
	9-18	Silty clay, silty clay loam.	CH	A-7	0	0	100	95-100	85-100	85-100	55-70	30-40
	18-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	75-90	75-90	50-60	25-35
795D2:												
Ashgrove--------	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-100	35-45	15-25
	7-16	Silty clay, silty clay loam.	CH	A-7	0	0	100	95-100	85-100	85-100	55-70	30-40
	16-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	75-90	75-90	50-60	25-35
822D2:												
Lamoni----------	0-12	Silty clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-95	70-95	35-45	15-25
	12-52	Clay loam, clay	CH	A-7	0	0	95-100	95-100	90-100	85-100	50-60	25-35
	52-60	Clay loam------	CL	A-6, A-7	0	0	95-100	95-100	70-90	55-85	35-50	15-30
831B:												
Pershing--------	0-15	Silt loam------	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	15-20	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	20-54	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	54-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
831C2:												
Pershing--------	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	9-12	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	12-44	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	44-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
832B:												
Weller----------	0-11	Silt loam------	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	11-37	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	37-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30

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	
832C2:												
Weller	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	8-32	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	32-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
832D2:												
Weller	0-7	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	7-31	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
876B:												
Ladoga	0-13	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	13-45	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	45-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
876C2:												
Ladoga	0-11	Silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	11-43	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	43-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
880B:												
Clinton	0-10	Silt loam	ML	A-4	0	0	100	100	100	95-100	30-40	5-10
	10-32	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	32-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	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	
880C2:												
Clinton	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	9-27	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	27-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
880D2:												
Clinton	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	8-26	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	26-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
977:												
Richwood	0-15	Silt loam	CL, ML	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
	15-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-40	7-20
993D2:												
Gara	0-7	Loam	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	7-47	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	47-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong	0-6	Loam	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	6-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	20-35
993E2:												
Gara	0-6	Loam	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	6-46	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	46-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong	0-5	Loam	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	5-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	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	
994D2:												
Galland	0-7	Loam	CL	A-6	0	0	90-100	80-100	75-100	65-90	30-40	10-20
	7-54	Clay loam, clay, silty clay.	CL, CH	A-7	0	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	54-60	Stratified sandy loam to clay.	SC-SM, SC, CL-ML, CL	A-4, A-2, A-6	0	0-5	90-100	80-100	65-95	30-60	20-35	5-15
Douds	0-8	Loam	CL	A-6	0	0	95-100	85-100	70-90	60-80	25-35	10-20
	8-33	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	0	90-100	85-100	70-80	35-60	30-45	15-25
	33-60	Stratified loamy sand to clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2	0	0	90-100	85-100	65-85	20-60	15-35	5-15
994E2:												
Galland	0-8	Loam	CL	A-6	0	0	90-100	80-100	75-100	65-90	30-40	10-20
	8-55	Clay loam, clay, silty clay.	CL, CH	A-7	0	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	55-60	Stratified sandy loam to clay.	SC-SM, SC, CL-ML, CL	A-4, A-2, A-6	0	0-5	90-100	80-100	65-95	30-60	20-35	5-15
Douds	0-12	Loam	CL	A-6	0	0	95-100	85-100	70-90	60-80	25-35	10-20
	12-37	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	0	90-100	85-100	70-80	35-60	30-45	15-25
	37-60	Stratified loamy sand to clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2	0	0	90-100	85-100	65-85	20-60	15-35	5-15
1075B:												
Givin	0-10	Silt loam	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	10-37	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	45-60	25-35
	37-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30
1130:												
Belinda	0-7	Silt loam	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	7-12	Silt loam	CL-ML, CL, ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	12-41	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	41-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35

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	
1260:												
Beckwith--------	0-5	Silt loam------	CL, ML, CL-ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	5-15	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	15-31	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	31-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
1715:												
Nodaway---------	0-7	Silt loam------	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Vesser----------	0-10	Silt loam------	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam------	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25
Ackmore---------	0-8	Silt loam------	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	8-27	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	95-100	85-100	35-60	15-30
5020:												
Pits and Dumps--	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
5030:												
Pits------------	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
5040:												
Orthents--------	0-60	Loam-----------	---	---	0	0	0	0	0	0	---	NP-15
	60-80	Variable-------	---	---	0	0	0	0	0	0	---	NP

Physical Properties of the Soils

(Entries under "Erosion factors—T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility 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	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
13B:												
Olmitz	0-8	24-27	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.24	0.24	5	6	48
	8-25	24-30	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	2.0-3.0	0.28	0.28			
	25-60	27-34	1.45-1.55	0.60-2.00	0.15-0.17	Moderate	1.0-2.0	0.28	0.28			
Vesser	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.0-3.0	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
Zook	0-18	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High	5.0-7.0	0.37	0.37	5	7	38
	18-60	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High	3.0-4.0	0.28	0.28			
23C2:												
Arispe	0-8	28-38	1.35-1.40	0.60-2.00	0.21-0.23	High	2.2-3.2	0.37	0.37	3	7	38
	8-13	38-42	1.35-1.45	0.06-0.20	0.18-0.20	High	0.5-1.0	0.43	0.43			
	13-52	30-38	1.35-1.45	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			
	52-60	24-35	1.40-1.50	0.60-2.00	0.18-0.20	High	0.0-0.5	0.43	0.43			
24D2:												
Shelby	0-8	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.2-3.2	0.32	0.32	5	6	48
	8-16	30-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	1.0-2.0	0.28	0.28			
	16-45	30-35	1.55-1.65	0.20-0.60	0.16-0.18	Moderate	0.0-1.0	0.28	0.28			
	45-60	30-35	1.55-1.65	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	0.37			
41B:												
Sparta	0-20	3-10	1.20-1.40	2.00-6.00	0.09-0.12	Low	1.0-2.0	0.17	0.17	5	2	134
	20-30	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low	0.1-1.0	0.17	0.17			
	30-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low	0.0-0.5	0.17	0.17			
51:												
Vesser	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
51B:												
Vesser	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
54:												
Zook	0-18	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High	5.0-7.0	0.37	0.37	5	7	38
	18-53	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High	2.0-4.0	0.28	0.28			
	53-60	20-45	1.30-1.45	0.06-0.60	0.11-0.22	High	0.0-1.0	0.28	0.28			
65D2:												
Lindley	0-9	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	1.5-2.5	0.32	0.32	5	6	48
	9-43	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	43-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
65E:												
Lindley	0-10	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	2.0-3.0	0.32	0.32	5	6	48
	10-50	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	50-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
65E2:												
Lindley	0-8	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	1.5-2.5	0.32	0.32	5	6	48
	8-42	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	42-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
65F2:												
Lindley	0-7	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	1.5-2.5	0.32	0.32	5	6	48
	7-41	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	41-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
65G:												
Lindley	0-10	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	2.0-3.0	0.32	0.32	5	6	48
	10-48	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	48-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
74:												
Rubio	0-8	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low	2.5-3.5	0.37	0.37	3	6	48
	8-16	16-22	1.40-1.45	0.60-2.00	0.20-0.22	Low	0.0-0.5	0.43	0.43			
	16-47	35-42	1.45-1.50	0.06-0.20	0.12-0.18	High	0.0-0.5	0.43	0.43			
	47-60	32-40	1.50-1.55	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			
75:												
Givin	0-14	18-26	1.30-1.40	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.32	0.32	5	6	48
	14-41	36-42	1.30-1.45	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	41-60	27-34	1.40-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
75B:												
Givin	0-10	18-26	1.30-1.40	0.60-2.00	0.22-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	10-37	36-42	1.30-1.45	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	37-60	27-34	1.40-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
76B:												
Ladoga	0-13	18-27	1.30-1.35	0.60-2.00	0.22-0.24	Low	2.5-3.5	0.32	0.32	5	6	48
	13-45	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	45-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
76C2:												
Ladoga	0-11	27-35	1.30-1.35	0.60-2.00	0.22-0.24	Low	2.0-3.0	0.32	0.32	5	7	38
	11-43	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	43-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
76D2:												
Ladoga	0-10	27-35	1.30-1.35	0.60-2.00	0.22-0.24	Low	2.0-3.0	0.32	0.32	5	7	38
	10-40	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
80B:												
Clinton	0-10	16-26	1.30-1.40	0.60-2.00	0.20-0.22	Low	2.0-3.0	0.37	0.37	5	6	48
	10-32	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-1.0	0.37	0.37			
	32-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
80C2:												
Clinton	0-9	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	7	38
	9-27	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	27-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
80D2:												
Clinton	0-8	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	7	38
	8-26	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	26-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
87B:												
Colo	0-22	27-36	1.28-1.32	0.60-2.00	0.21-0.23	Moderate	5.0-7.0	0.28	0.28	5	7	38
	22-52	30-35	1.25-1.35	0.60-2.00	0.18-0.20	Moderate	3.0-4.0	0.28	0.28			
	52-60	25-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.32	0.32			
Zook	0-18	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High	5.0-7.0	0.37	0.37	5	7	38
	18-60	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High	3.0-4.0	0.28	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
122:												
Sperry----------	0-10	18-22	1.35-1.40	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.37	0.37	3	6	48
	10-18	18-22	1.35-1.40	0.60-2.00	0.22-0.24	Moderate	0.5-1.0	0.43	0.43			
	18-35	38-45	1.40-1.45	0.06-0.20	0.14-0.16	High-----	0.5-2.0	0.43	0.43			
	35-60	26-34	1.45-1.50	0.20-0.60	0.19-0.21	High-----	0.0-1.0	0.43	0.43			
130:												
Belinda----------	0-7	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	3	6	48
	7-12	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	0.5-1.0	0.43	0.43			
	12-41	28-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.5-1.0	0.32	0.32			
	41-60	28-40	1.40-1.50	0.06-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
131B:												
Pershing--------	0-15	20-27	1.30-1.40	0.60-2.00	0.22-0.24	Low------	2.5-3.5	0.37	0.37	3	6	48
	15-20	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	20-54	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	54-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
131B2:												
Pershing--------	0-9	27-38	1.30-1.40	0.20-0.60	0.22-0.24	Moderate	2.0-3.0	0.37	0.37	3	7	38
	9-13	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	13-48	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	48-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
131C2:												
Pershing--------	0-9	27-38	1.30-1.40	0.20-0.60	0.22-0.24	Moderate	2.0-3.0	0.37	0.37	3	7	38
	9-12	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	12-44	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	44-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132B:												
Weller----------	0-11	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	3	6	48
	11-37	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	37-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132C:												
Weller----------	0-10	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	3	6	48
	10-36	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	36-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132C2:												
Weller----------	0-8	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	8-32	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	32-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132D:												
Weller----------	0-9	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	3	6	48
	9-35	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	35-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132D2:												
Weller----------	0-7	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	7-31	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	31-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
139:												
Perks----------	0-9	2-10	1.50-1.55	6.00-20.00	0.07-0.09	Low------	0.5-2.0	0.17	0.17	5	2	134
	9-60	2-10	1.50-1.75	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15			
179D2:												
Gara----------	0-7	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	7-47	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	47-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
179E2:												
Gara	0-6	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	6-46	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	46-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			
180:												
Keomah	0-14	16-26	1.30-1.40	0.60-2.00	0.22-0.24	Low	2.5-3.5	0.37	0.37	3	6	48
	14-47	35-42	1.30-1.45	0.06-0.60	0.18-0.20	High	0.0-0.5	0.37	0.37			
	47-60	24-38	1.40-1.55	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
180B:												
Keomah	0-12	16-26	1.30-1.40	0.60-2.00	0.22-0.24	Low	2.0-3.0	0.37	0.37	3	6	48
	12-45	35-42	1.30-1.45	0.06-0.60	0.18-0.20	High	0.0-0.5	0.37	0.37			
	45-60	24-38	1.40-1.55	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
208:												
Klum	0-20	5-18	1.50-1.60	2.00-6.00	0.15-0.18	Low	1.5-2.5	0.20	0.20	5	3	86
	20-60	5-18	1.50-1.60	2.00-6.00	0.13-0.18	Low	0.0-0.5	0.20	0.20			
211:												
Edina	0-9	15-27	1.35-1.45	0.60-2.00	0.22-0.24	Moderate	3.5-4.5	0.37	0.37	3	6	48
	9-16	15-27	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.37	0.37			
	16-47	45-60	1.30-1.45	0.00-0.06	0.11-0.13	Very high	0.0-0.5	0.37	0.37			
	47-60	27-40	1.35-1.50	0.06-0.20	0.18-0.20	High	0.0-0.5	0.37	0.37			
220:												
Nodaway	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
222C:												
Clarinda	0-12	27-38	1.45-1.50	0.20-0.60	0.17-0.19	Moderate	3.0-4.0	0.37	0.37	3	7	38
	12-21	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High	0.5-1.0	0.37	0.37			
	21-60	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High	0.0-0.5	0.37	0.37			
222C2:												
Clarinda	0-9	27-38	1.45-1.50	0.20-0.60	0.17-0.19	Moderate	2.2-3.2	0.37	0.37	3	7	38
	9-19	40-60	1.50-1.65	0.00-0.60	0.14-0.16	High	0.5-1.0	0.37	0.37			
	19-60	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High	0.0-0.5	0.37	0.37			
223C2:												
Rinda	0-8	27-35	1.45-1.50	0.20-0.60	0.20-0.22	Moderate	2.0-3.0	0.43	0.43	3	7	38
	8-60	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High	0.0-0.5	0.32	0.32			
260:												
Beckwith	0-5	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low	1.5-2.5	0.37	0.37	3	6	48
	5-15	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low	0.5-1.0	0.43	0.43			
	15-31	40-52	1.30-1.45	0.00-0.06	0.12-0.14	High	0.0-0.5	0.43	0.43			
	31-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			
263:												
Okaw	0-17	15-27	1.20-1.40	0.60-2.00	0.22-0.24	Low	2.0-3.0	0.43	0.43	3	6	48
	17-40	40-60	1.35-1.60	0.00-0.06	0.09-0.18	High	---	0.32	0.32			
	40-55	35-60	1.45-1.70	0.00-0.06	0.08-0.18	High	---	0.32	0.32			
	55-60	35-55	1.50-1.70	0.00-0.06	0.08-0.20	High	---	0.32	0.32			
264B:												
Ainsworth	0-8	18-26	1.30-1.40	0.60-2.00	0.20-0.22	Low	2.0-3.0	0.37	0.37	4	6	48
	8-42	32-40	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-1.0	0.37	0.37			
	42-60	4-12	1.55-1.65	6.00-20.00	0.05-0.07	Low	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
273B:												
Olmitz	0-8	24-27	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.24	0.24	5	6	48
	8-25	24-30	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	2.0-3.0	0.28	0.28			
	25-60	27-34	1.45-1.55	0.60-2.00	0.15-0.17	Moderate	1.0-2.0	0.28	0.28			
279:												
Taintor	0-8	27-36	1.30-1.40	0.20-0.60	0.21-0.23	Moderate	5.0-6.0	0.28	0.28	5	7	38
	8-22	30-36	1.30-1.40	0.20-0.60	0.21-0.23	Moderate	2.0-3.0	0.32	0.32			
	22-46	35-44	1.30-1.45	0.20-0.60	0.14-0.18	High-----	0.0-1.0	0.43	0.43			
	46-60	24-34	1.40-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
280:												
Mahaska	0-20	27-32	1.30-1.40	0.60-2.00	0.21-0.23	Moderate	5.0-6.0	0.28	0.28	5	7	38
	20-55	36-42	1.30-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.43	0.43			
	55-60	24-32	1.40-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
280B:												
Mahaska	0-20	27-32	1.30-1.40	0.60-2.00	0.21-0.23	Moderate	4.5-5.5	0.28	0.28	5	7	38
	20-49	36-42	1.30-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.43	0.43			
	49-60	24-32	1.40-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
281B:												
Otley	0-18	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	3.0-4.0	0.28	0.28	5	7	38
	18-41	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	41-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
281B2:												
Otley	0-9	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	2.2-3.2	0.32	0.32	5	7	38
	9-28	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	1.0-2.0	0.43	0.43			
	28-36	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	36-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
281C:												
Otley	0-15	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	3.0-4.0	0.28	0.28	5	7	38
	15-38	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	38-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
281C2:												
Otley	0-8	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	2.2-3.2	0.32	0.32	5	7	38
	8-26	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	1.0-2.0	0.43	0.43			
	26-34	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	34-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
293C:												
Chelsea	0-5	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.4-1.0	0.17	0.17	5	2	134
	5-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
Fayette	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	10-57	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	57-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
293F:												
Chelsea	0-5	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low------	0.4-1.0	0.17	0.17	5	2	134
	5-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.17	0.17			
Fayette	0-8	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.32	0.32	5	6	48
	8-55	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	55-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
313E2:												
Gosport	0-8	27-34	1.30-1.40	0.20-0.60	0.14-0.16	Moderate	1.0-2.0	0.43	0.43	3	7	38
	8-22	36-60	1.50-1.60	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
	22-60	---	---	0.00-0.06	---	---	---	---	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
313G:												
Gosport	0-6	27-34	1.30-1.40	0.20-0.60	0.14-0.16	Moderate	2.0-3.0	0.43	0.43	3	7	38
	6-18	36-60	1.50-1.60	0.00-0.06	0.12-0.14	High	0.0-0.5	0.32	0.32			
	18-60	---	---	0.00-0.06	---	---	---	---	---			
315:												
Nodaway	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Klum	0-20	5-18	1.50-1.60	2.00-6.00	0.15-0.18	Low	1.5-2.5	0.20	0.20	5	3	86
	20-60	5-18	1.50-1.60	2.00-6.00	0.13-0.18	Low	0.0-0.5	0.20	0.20			
Perks	0-9	2-10	1.50-1.55	6.00-20.00	0.07-0.09	Low	0.5-2.0	0.15	0.15	5	1	160
	9-60	2-10	1.50-1.75	6.00-20.00	0.02-0.04	Low	0.0-0.5	0.15	0.15			
362:												
Haig	0-12	22-27	1.35-1.40	0.60-2.00	0.22-0.24	Moderate	3.5-4.5	0.37	0.37	3	6	48
	12-22	28-48	1.30-1.35	0.60-2.00	0.21-0.23	High	1.0-2.0	0.37	0.37			
	22-42	40-50	1.30-1.45	0.00-0.20	0.12-0.14	High	0.0-1.0	0.32	0.32			
	42-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			
363:												
Haig	0-12	32-40	1.35-1.40	0.60-2.00	0.21-0.23	High	4.0-5.0	0.37	0.37	3	7	38
	12-22	28-48	1.30-1.35	0.60-2.00	0.21-0.23	High	1.0-2.0	0.37	0.37			
	22-42	40-50	1.30-1.45	0.00-0.20	0.12-0.14	High	0.0-1.0	0.32	0.32			
	42-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			
364B:												
Grundy	0-15	28-35	1.35-1.45	0.20-0.60	0.18-0.20	High	3.0-4.0	0.37	0.37	3	7	38
	15-19	32-45	1.35-1.45	0.20-0.60	0.18-0.20	High	0.5-1.0	0.37	0.37			
	19-42	40-50	1.30-1.40	0.06-0.20	0.11-0.13	High	0.0-0.5	0.37	0.37			
	42-60	28-35	1.35-1.40	0.06-0.20	0.18-0.20	High	0.0-0.5	0.37	0.37			
364B2:												
Grundy	0-10	28-35	1.35-1.45	0.20-0.60	0.18-0.20	High	2.7-3.7	0.37	0.37	3	7	38
	10-15	32-45	1.35-1.45	0.20-0.60	0.18-0.20	High	0.5-1.0	0.37	0.37			
	15-38	40-50	1.30-1.40	0.06-0.20	0.11-0.13	High	0.0-0.5	0.37	0.37			
	38-60	28-35	1.35-1.40	0.06-0.20	0.18-0.20	High	0.0-0.5	0.37	0.37			
423D2:												
Bucknell	0-6	27-38	1.45-1.50	0.20-0.60	0.17-0.21	Moderate	2.0-3.0	0.37	0.37	3	7	38
	6-50	38-50	1.55-1.65	0.00-0.20	0.13-0.17	High	0.0-0.5	0.32	0.32			
	50-60	30-40	1.60-1.70	0.06-0.20	0.14-0.18	High	0.0-0.5	0.32	0.32			
424D2:												
Lindley	0-9	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	1.5-2.5	0.32	0.32	5	6	48
	9-43	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	43-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
Keswick	0-10	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	1.5-2.5	0.37	0.37	3	6	48
	10-29	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High	0.0-0.5	0.37	0.37			
	29-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
424E2:												
Lindley	0-8	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low	1.5-2.5	0.32	0.32	5	6	48
	8-42	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	42-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
Keswick	0-9	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	1.5-2.5	0.37	0.37	3	6	48
	9-27	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High	0.0-0.5	0.37	0.37			
	27-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
425D:												
Keswick	0-12	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	2.0-3.0	0.32	0.32	3	6	48
	12-31	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High	0.0-0.5	0.37	0.37			
	31-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
425D2:												
Keswick	0-10	27-40	1.45-1.50	0.20-0.60	0.17-0.19	Moderate	1.0-2.0	0.37	0.37	3	4	86
	10-29	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High	0.0-0.5	0.37	0.37			
	29-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
430:												
Ackmore	0-8	18-27	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32	5	6	48
	8-27	18-30	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32			
	27-60	26-38	1.30-1.40	0.60-2.00	0.18-0.20	High	3.0-5.0	0.32	0.32			
453:												
Tuskeego	0-14	16-22	1.35-1.40	0.60-2.00	0.19-0.23	Moderate	3.0-4.0	0.37	0.37	5	5	56
	14-46	18-30	1.40-1.50	0.06-0.20	0.18-0.22	Moderate	1.0-2.0	0.43	---			
	46-60	32-48	1.30-1.45	0.00-0.06	0.13-0.17	High	0.0-2.0	0.43	0.43			
499G:												
Nordness	0-4	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low	2.0-3.0	0.32	0.32	1	6	48
	4-11	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	11-17	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37			
	17-60	---	---	0.00-0.06	---	---	---	---	---			
520:												
Coppock	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	25-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
520B:												
Coppock	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	24-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
570C2:												
Nira	0-11	28-34	1.25-1.40	0.60-2.00	0.21-0.23	Moderate	2.2-3.2	0.32	0.32	5	7	38
	11-39	30-38	1.25-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	39-60	24-34	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
571C2:												
Hedrick	0-7	27-34	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.32	0.32	5	7	38
	7-56	27-37	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	56-60	24-32	1.40-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
572C2:												
Inton	0-7	27-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	2.0-3.0	0.37	0.37	5	7	38
	7-48	27-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
	48-60	25-32	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
572D2:												
Inton	0-5	27-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	2.0-3.0	0.37	0.37	5	7	38
	5-46	27-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
	46-60	25-32	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
587:												
Chequest	0-17	30-35	1.30-1.35	0.20-0.60	0.18-0.20	High	3.0-4.0	0.32	0.32	5	7	38
	17-60	35-42	1.35-1.45	0.20-0.60	0.14-0.18	High	0.0-1.0	0.43	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
594D2:												
Galland	0-7	27-35	1.45-1.50	0.60-2.00	0.19-0.21	Moderate	1.0-2.0	0.37	0.37	3	6	48
	7-54	35-48	1.50-1.65	0.06-0.20	0.14-0.19	High	0.0-0.5	0.37	0.37			
	54-60	10-45	1.55-1.75	0.60-6.00	0.11-0.13	Low	0.0-0.5	0.24	0.24			
729:												
Nodaway	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Coppock	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	25-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
730B:												
Nodaway	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low	1.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Coppock	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	1.0-3.0	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	24-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
Cantril	0-13	14-27	1.40-1.45	0.60-2.00	0.17-0.19	Low	1.0-3.0	0.28	0.28	5	6	48
	13-60	27-35	1.45-1.75	0.60-2.00	0.14-0.16	Moderate	0.0-1.0	0.32	0.32			
779:												
Kalona	0-20	36-39	1.35-1.40	0.20-0.60	0.18-0.20	High	5.0-6.0	0.32	0.32	5	4	86
	20-41	36-42	1.40-1.45	0.20-0.60	0.14-0.18	High	2.0-3.0	0.37	0.37			
	41-60	26-34	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
792C2:												
Armstrong	0-7	35-42	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	2.0-3.0	0.32	0.32	3	4	86
	7-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High	0.0-1.0	0.32	0.32			
792D2:												
Armstrong	0-6	35-42	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	2.0-3.0	0.32	0.32	3	4	86
	6-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High	0.0-1.0	0.32	0.32			
795C2:												
Ashgrove	0-9	27-40	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	1.5-2.5	0.43	0.43	3	7	38
	9-18	35-45	1.45-1.50	0.00-0.06	0.12-0.14	High	0.0-0.5	0.32	0.32			
	18-60	40-60	1.50-1.65	0.00-0.06	0.12-0.14	High	0.0-0.5	0.32	0.32			
795D2:												
Ashgrove	0-7	27-40	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	1.5-2.5	0.43	0.43	3	7	38
	7-16	35-45	1.45-1.50	0.00-0.06	0.12-0.14	High	0.0-0.5	0.32	0.32			
	16-60	40-60	1.50-1.65	0.00-0.06	0.12-0.14	High	0.0-0.5	0.32	0.32			
822D2:												
Lamoni	0-12	27-40	1.45-1.50	0.20-0.60	0.17-0.21	Moderate	2.2-3.2	0.37	0.37	3	7	38
	12-52	38-50	1.55-1.65	0.00-0.20	0.13-0.17	High	0.5-2.0	0.37	0.37			
	52-60	32-40	1.60-1.70	0.06-0.20	0.14-0.18	High	0.0-0.5	0.37	0.37			
831B:												
Pershing	0-15	20-27	1.30-1.40	0.60-2.00	0.22-0.24	Low	2.5-3.5	0.37	0.37	3	6	48
	15-20	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	20-54	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High	0.0-0.5	0.43	0.43			
	54-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
831C2:												
Pershing--------	0-9	27-38	1.30-1.40	0.20-0.60	0.22-0.24	Moderate	2.0-3.0	0.37	0.37	3	7	38
	9-12	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	12-44	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	44-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
832B:												
Weller----------	0-11	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	3	6	48
	11-37	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	37-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
832C2:												
Weller----------	0-8	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	8-32	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	32-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
832D2:												
Weller----------	0-7	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	7-31	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	31-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
876B:												
Ladoga----------	0-13	18-27	1.30-1.35	0.60-2.00	0.22-0.24	Low------	2.5-3.5	0.32	0.32	5	6	48
	13-45	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	45-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
876C2:												
Ladoga----------	0-11	27-35	1.30-1.35	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.32	0.32	5	7	38
	11-43	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	43-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
880B:												
Clinton---------	0-10	16-26	1.30-1.40	0.60-2.00	0.20-0.22	Low------	2.0-3.0	0.37	0.37	5	6	48
	10-32	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-1.0	0.37	0.37			
	32-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
880C2:												
Clinton---------	0-9	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.37	0.37	5	7	38
	9-27	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	27-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
880D2:												
Clinton---------	0-8	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.37	0.37	5	7	38
	8-26	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	26-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
977:												
Richwood--------	0-15	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low------	3.5-4.5	0.28	0.28	4	5	56
	15-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	0.5-1.0	0.43	0.43			
993D2:												
Gara----------	0-7	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	7-47	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	47-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			
Armstrong-------	0-6	22-27	1.45-1.50	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.32	0.32	3	6	48
	6-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High-----	0.0-1.0	0.32	0.32			
993E2:												
Gara----------	0-6	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	6-46	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	46-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
993E2:												
Armstrong-------	0-5	22-27	1.45-1.50	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.32	0.32	3	6	48
	5-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High-----	0.0-1.0	0.32	0.32			
994D2:												
Galland---------	0-7	22-27	1.45-1.50	0.60-2.00	0.19-0.21	Moderate	1.5-2.5	0.37	0.37	3	6	48
	7-54	35-48	1.50-1.65	0.06-0.20	0.14-0.19	High-----	0.0-0.5	0.37	0.37			
	54-60	10-45	1.55-1.75	0.60-6.00	0.11-0.13	Low------	0.0-0.5	0.24	0.24			
Douds-----------	0-8	20-27	1.45-1.50	0.60-2.00	0.15-0.17	Low------	1.5-2.5	0.32	0.32	5	6	48
	8-33	26-35	1.45-1.65	0.60-2.00	0.15-0.17	Moderate	0.0-1.0	0.32	0.32			
	33-60	5-30	1.55-1.75	0.60-6.00	0.11-0.13	Low------	0.0-0.5	0.32	0.32			
994E2:												
Galland---------	0-8	22-27	1.45-1.50	0.60-2.00	0.19-0.21	Moderate	1.5-2.5	0.37	0.37	3	6	48
	8-55	35-48	1.50-1.65	0.06-0.20	0.14-0.19	High-----	0.0-0.5	0.37	0.37			
	55-60	10-45	1.55-1.75	0.60-6.00	0.11-0.13	Low------	0.0-0.5	0.24	0.24			
Douds-----------	0-12	20-27	1.45-1.50	0.60-2.00	0.15-0.17	Low------	1.5-2.5	0.32	0.32	5	6	48
	12-37	26-35	1.45-1.65	0.60-2.00	0.15-0.17	Moderate	0.0-1.0	0.32	0.32			
	37-60	5-30	1.55-1.75	0.60-6.00	0.11-0.13	Low------	0.0-0.5	0.32	0.32			
1075B:												
Givin-----------	0-10	18-26	1.30-1.40	0.60-2.00	0.22-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	10-37	36-42	1.30-1.45	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	37-60	27-34	1.40-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
1130:												
Belinda---------	0-7	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low------	2.0-3.0	0.37	0.37	3	6	48
	7-12	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	0.5-1.0	0.43	0.43			
	12-41	28-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.5-1.0	0.32	0.32			
	41-60	28-40	1.40-1.50	0.06-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
1260:												
Beckwith--------	0-5	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low------	1.5-2.5	0.37	0.37	3	6	48
	5-15	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low------	0.5-1.0	0.43	0.43			
	15-31	40-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.43	0.43			
	31-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
1715:												
Nodaway---------	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low------	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Vesser----------	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
Ackmore---------	0-8	18-27	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32	5	6	48
	8-27	18-30	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32			
	27-60	26-38	1.30-1.40	0.60-2.00	0.18-0.20	High-----	3.0-5.0	0.32	0.32			
5020:												
Pits and Dumps--	0-60	---	---	0.01-20.00	---	----------	---	---	---	5	8	---
5030:												
Pits------------	0-60	---	---	0.01-20.00	---	----------	---	---	---	5	8	---
5040:												
Orthents--------	0-60	2-18	1.50-1.70	0.60-2.00	0.08-0.14	Low------	---	0.24	---	5	3	86
	60-80	---	---	0.06-2.00	---	----------	---	---	---			

Chemical Properties of the Soils

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
13B:					
Olmitz	0-8	24-27	20.0-25.0	5.6-7.3	---
	8-25	24-30	20.0-25.0	5.6-7.3	---
	25-60	27-34	20.0-25.0	5.1-6.5	---
Vesser	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.6-6.5	---
Zook	0-18	35-40	36.0-41.0	5.6-7.3	---
	18-60	36-45	36.0-41.0	5.6-7.8	0-15
23C2:					
Arispe	0-8	28-38	25.0-30.0	5.6-7.3	---
	8-13	38-42	25.0-30.0	5.6-7.3	---
	13-52	30-38	25.0-30.0	6.6-7.3	---
	52-60	24-35	25.0-30.0	5.6-7.3	---
24D2:					
Shelby	0-8	27-35	20.0-25.0	5.1-7.3	---
	8-16	30-35	20.0-25.0	5.1-7.3	---
	16-45	30-35	20.0-25.0	5.1-7.3	---
	45-60	30-35	20.0-25.0	6.6-8.4	0-30
41B:					
Sparta	0-20	3-10	10.0-15.0	5.6-7.3	---
	20-30	1-8	1.0-6.0	5.1-7.3	---
	30-60	0-5	1.0-4.0	5.1-7.8	---
51:					
Vesser	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.1-6.5	---
51B:					
Vesser	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.6-6.5	---
54:					
Zook	0-18	35-40	36.0-41.0	5.6-7.3	---
	18-53	36-45	36.0-41.0	5.6-7.8	---
	53-60	20-45	30.0-36.0	5.6-7.8	---
65D2:					
Lindley	0-9	18-27	20.0-25.0	4.5-7.3	---
	9-43	25-35	15.0-20.0	4.5-6.5	---
	43-60	18-32	10.0-16.0	6.1-7.8	---
65E:					
Lindley	0-10	18-27	15.0-20.0	4.5-7.3	---
	10-50	25-35	15.0-20.0	4.5-6.5	---
	50-60	18-32	10.0-16.0	6.1-7.8	---
65E2:					
Lindley	0-8	18-27	20.0-25.0	4.5-7.3	---
	8-42	25-35	15.0-20.0	4.5-6.5	---
	42-60	18-32	10.0-16.0	6.1-7.8	---
65F2:					
Lindley	0-7	18-27	20.0-25.0	4.5-7.3	---
	7-41	25-35	15.0-20.0	4.5-6.5	---
	41-60	18-32	10.0-16.0	6.1-7.8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
65G:					
Lindley	0-10	18-27	15.0-20.0	4.5-7.3	---
	10-48	25-35	15.0-20.0	4.5-6.5	---
	48-60	18-32	10.0-16.0	6.1-7.8	---
74:					
Rubio	0-8	16-22	20.0-25.0	5.1-7.3	---
	8-16	16-22	15.0-20.0	5.1-6.0	---
	16-47	35-42	25.0-30.0	5.1-5.5	---
	47-60	32-40	20.0-25.0	5.1-7.3	---
75:					
Givin	0-14	18-26	20.0-25.0	5.6-7.3	---
	14-41	36-42	20.0-25.0	5.1-5.5	---
	41-60	27-34	20.0-25.0	5.1-6.0	---
75B:					
Givin	0-10	18-26	20.0-25.0	5.6-7.3	---
	10-37	36-42	20.0-25.0	5.1-5.5	---
	37-60	27-34	20.0-25.0	5.1-6.0	---
76B:					
Ladoga	0-13	18-27	20.0-25.0	6.1-7.3	---
	13-45	36-42	20.0-25.0	5.1-6.0	---
	45-60	24-32	20.0-25.0	5.1-6.5	---
76C2:					
Ladoga	0-11	27-35	25.0-30.0	6.1-7.3	---
	11-43	36-42	25.0-30.0	5.1-6.0	---
	43-60	24-32	20.0-25.0	5.1-6.5	---
76D2:					
Ladoga	0-10	27-35	25.0-30.0	6.1-7.3	---
	10-40	36-42	25.0-30.0	5.1-6.0	---
	40-60	24-32	20.0-25.0	5.1-6.5	---
80B:					
Clinton	0-10	16-26	15.0-20.0	5.1-7.3	---
	10-32	36-42	25.0-30.0	4.5-6.0	---
	32-60	24-35	20.0-25.0	6.1-6.5	---
80C2:					
Clinton	0-9	27-34	20.0-25.0	5.1-7.3	---
	9-27	36-42	25.0-30.0	4.5-6.0	---
	27-60	24-35	20.0-25.0	6.1-6.5	---
80D2:					
Clinton	0-8	27-34	20.0-25.0	5.1-7.3	---
	8-26	36-42	25.0-30.0	4.5-6.0	---
	26-60	24-35	20.0-25.0	6.1-6.5	---
87B:					
Colo	0-22	27-36	36.0-41.0	5.6-7.3	---
	22-52	30-35	36.0-41.0	5.6-7.3	---
	52-60	25-35	30.0-36.0	6.1-7.3	---
Zook	0-18	35-40	36.0-41.0	5.6-7.3	---
	18-60	36-45	36.0-41.0	5.6-7.8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
122:					
Sperry----------	0-10	18-22	25.0-30.0	5.6-7.3	---
	10-18	18-22	20.0-25.0	5.6-7.3	---
	18-35	38-45	30.0-36.0	5.1-6.5	---
	35-60	26-34	25.0-30.0	5.6-6.5	---
130:					
Belinda---------	0-7	16-22	20.0-25.0	5.6-7.3	---
	7-12	18-27	20.0-25.0	4.5-6.0	---
	12-41	28-52	30.0-36.0	4.5-6.5	---
	41-60	28-40	30.0-36.0	5.1-6.0	---
131B:					
Pershing--------	0-15	20-27	20.0-25.0	4.5-7.3	---
	15-20	27-35	25.0-30.0	5.1-6.0	---
	20-54	35-48	30.0-36.0	5.1-6.0	---
	54-60	24-40	25.0-30.0	5.1-6.5	---
131B2:					
Pershing--------	0-9	27-38	25.0-30.0	4.5-7.3	---
	9-13	27-35	25.0-30.0	5.1-6.0	---
	13-48	35-48	30.0-36.0	5.1-6.0	---
	48-60	24-40	25.0-30.0	5.1-6.5	---
131C2:					
Pershing--------	0-9	27-38	25.0-30.0	4.5-7.3	---
	9-12	27-35	25.0-30.0	5.1-6.0	---
	12-44	35-48	30.0-36.0	5.1-6.0	---
	44-60	24-40	25.0-30.0	5.1-6.5	---
132B:					
Weller----------	0-11	16-27	15.0-20.0	4.5-7.3	---
	11-37	28-48	30.0-35.0	4.5-6.0	---
	37-60	25-40	25.0-30.0	5.1-6.5	---
132C:					
Weller----------	0-10	16-27	15.0-20.0	4.5-7.3	---
	10-36	28-48	30.0-35.0	4.5-6.0	---
	36-60	25-40	25.0-30.0	5.1-6.5	---
132C2:					
Weller----------	0-8	27-36	25.0-30.0	4.5-7.3	---
	8-32	28-48	30.0-35.0	4.5-6.0	---
	32-60	25-40	25.0-30.0	5.1-6.5	---
132D:					
Weller----------	0-9	16-27	15.0-20.0	4.5-7.3	---
	9-35	28-48	30.0-35.0	4.5-6.0	---
	35-60	25-40	25.0-30.0	5.1-6.5	---
132D2:					
Weller----------	0-7	27-36	25.0-30.0	4.5-7.3	---
	7-31	28-48	30.0-35.0	4.5-6.0	---
	31-60	25-40	25.0-30.0	5.1-6.5	---
139:					
Perks-----------	0-9	2-10	5.0-10.0	5.6-7.3	---
	9-60	2-10	5.0-10.0	5.6-7.3	---
179D2:					
Gara------------	0-7	27-35	25.0-30.0	5.6-7.3	---
	7-47	25-38	25.0-30.0	4.5-6.5	---
	47-60	24-38	25.0-30.0	5.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
179E2:					
Gara	0-6	27-35	25.0-30.0	5.6-7.3	---
	6-46	25-38	25.0-30.0	4.5-6.5	---
	46-60	24-38	25.0-30.0	5.6-8.4	0-25
180:					
Keomah	0-14	16-26	15.0-20.0	5.1-7.3	---
	14-47	35-42	25.0-30.0	4.5-5.5	---
	47-60	24-38	15.0-20.0	5.1-7.3	---
180B:					
Keomah	0-12	16-26	15.0-20.0	5.1-7.3	---
	12-45	35-42	25.0-30.0	4.5-5.5	---
	45-60	24-38	15.0-20.0	5.1-7.3	---
208:					
Klum	0-20	5-18	10.0-15.0	6.1-7.3	---
	20-60	5-18	10.0-15.0	6.1-7.3	---
211:					
Edina	0-9	15-27	25.0-30.0	5.1-7.3	---
	9-16	15-27	14.0-20.0	5.1-7.3	---
	16-47	45-60	28.0-42.0	5.1-7.3	---
	47-60	27-40	20.0-30.0	6.1-7.3	---
220:					
Nodaway	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
222C:					
Clarinda	0-12	27-38	36.0-41.0	5.1-7.3	---
	12-21	40-60	41.0-50.0	5.1-6.5	---
	21-60	40-60	41.0-50.0	5.6-8.4	0-30
222C2:					
Clarinda	0-9	27-38	36.0-41.0	5.1-7.3	---
	9-19	40-60	41.0-50.0	5.1-6.5	---
	19-60	40-60	41.0-50.0	5.6-8.4	0-30
223C2:					
Rinda	0-8	27-35	30.0-36.0	5.1-7.3	---
	8-60	40-60	41.0-50.0	5.1-7.3	---
260:					
Beckwith	0-5	16-22	15.0-20.0	4.5-7.3	---
	5-15	18-27	15.0-20.0	4.5-5.5	---
	15-31	40-52	36.0-41.0	5.1-6.0	---
	31-60	28-40	30.0-36.0	5.6-6.5	---
263:					
Okaw	0-17	15-27	15.0-20.0	4.5-7.3	---
	17-40	40-60	---	4.5-6.0	---
	40-55	35-60	---	4.5-7.3	---
	55-60	35-55	---	3.6-8.4	---
264B:					
Ainsworth	0-8	18-26	15.0-20.0	6.1-7.3	---
	8-42	32-40	15.0-20.0	4.5-6.5	---
	42-60	4-12	5.0-10.0	4.5-7.3	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
273B:					
Olmitz	0-8	24-27	20.0-25.0	5.6-7.3	---
	8-25	24-30	20.0-25.0	5.6-7.3	---
	25-60	27-34	20.0-25.0	5.1-6.5	---
279:					
Taintor	0-8	27-36	36.0-41.0	5.6-7.3	---
	8-22	30-36	36.0-41.0	5.6-7.3	---
	22-46	35-44	30.0-36.0	5.6-6.5	---
	46-60	24-34	25.0-30.0	6.1-7.8	0-15
280:					
Mahaska	0-20	27-32	30.0-36.0	5.1-7.3	---
	20-55	36-42	30.0-36.0	4.5-6.0	---
	55-60	24-32	25.0-30.0	5.6-7.3	---
280B:					
Mahaska	0-20	27-32	30.0-36.0	5.1-7.3	---
	20-49	36-42	30.0-36.0	4.5-6.0	---
	49-60	24-32	25.0-30.0	5.6-7.3	---
281B:					
Otley	0-18	28-34	25.0-30.0	5.1-7.3	---
	18-41	36-42	25.0-30.0	5.1-5.5	---
	41-60	24-35	25.0-30.0	5.6-7.3	---
281B2:					
Otley	0-9	28-34	25.0-30.0	5.1-7.3	---
	9-28	28-34	25.0-30.0	5.1-7.3	---
	28-36	36-42	25.0-30.0	5.1-5.5	---
	36-60	24-35	25.0-30.0	5.6-7.3	---
281C:					
Otley	0-15	28-34	25.0-30.0	5.1-7.3	---
	15-38	36-42	25.0-30.0	5.1-5.5	---
	38-60	24-35	25.0-30.0	5.6-7.3	---
281C2:					
Otley	0-8	28-34	25.0-30.0	5.1-7.3	---
	8-26	28-34	25.0-30.0	5.1-7.3	---
	26-34	36-42	25.0-30.0	5.1-5.5	---
	34-60	24-35	25.0-30.0	5.6-7.3	---
293C:					
Chelsea	0-5	8-15	5.0-10.0	5.1-7.3	---
	5-60	5-10	5.0-10.0	5.1-6.5	---
Fayette	0-10	15-27	15.0-20.0	5.1-7.3	---
	10-57	25-35	15.0-20.0	4.5-6.5	---
	57-60	22-26	15.0-20.0	5.1-7.8	0-15
293F:					
Chelsea	0-5	8-15	5.0-10.0	5.1-7.3	---
	5-60	5-10	5.0-10.0	5.1-6.5	---
Fayette	0-8	15-27	15.0-20.0	5.1-7.3	---
	8-55	25-35	15.0-20.0	4.5-6.5	---
	55-60	22-26	15.0-20.0	5.1-7.8	0-15
313E2:					
Gosport	0-8	27-34	15.0-20.0	5.1-7.3	---
	8-22	36-60	30.0-50.0	3.6-5.5	---
	22-60	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
313G:					
Gosport	0-6	27-34	15.0-20.0	5.1-7.3	---
	6-18	36-60	30.0-50.0	3.6-5.5	---
	18-60	---	---	---	---
315:					
Nodaway	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Klum	0-20	5-18	10.0-15.0	6.1-7.3	---
	20-60	5-18	10.0-15.0	6.1-7.3	---
Perks	0-9	2-10	5.0-10.0	5.6-7.3	---
	9-60	2-10	5.0-10.0	5.6-7.3	---
362:					
Haig	0-12	22-27	36.0-41.0	5.6-7.3	---
	12-22	28-48	36.0-41.0	5.1-6.0	---
	22-42	40-50	36.0-41.0	5.1-6.0	---
	42-60	28-40	36.0-41.0	6.1-7.3	---
363:					
Haig	0-12	32-40	36.0-41.0	5.6-7.3	---
	12-22	28-48	36.0-41.0	5.1-6.0	---
	22-42	40-50	36.0-41.0	5.1-6.0	---
	42-60	28-40	36.0-41.0	6.1-7.3	---
364B:					
Grundy	0-15	28-35	30.0-36.0	5.6-7.3	---
	15-19	32-45	16.0-24.0	5.6-6.5	---
	19-42	40-50	20.0-26.0	5.1-7.3	---
	42-60	28-35	14.0-19.0	5.6-7.3	---
364B2:					
Grundy	0-10	28-35	30.0-36.0	5.6-7.3	---
	10-15	32-45	16.0-24.0	5.6-6.5	---
	15-38	40-50	20.0-26.0	5.1-7.3	---
	38-60	28-35	14.0-19.0	5.6-7.3	---
423D2:					
Bucknell	0-6	27-38	20.0-25.0	5.6-7.3	---
	6-50	38-50	36.0-41.0	4.5-6.0	---
	50-60	30-40	30.0-36.0	5.6-7.3	---
424D2:					
Lindley	0-9	18-27	10.0-16.0	4.5-7.3	---
	9-43	25-35	15.0-20.0	4.5-6.5	---
	43-60	18-32	10.0-16.0	6.1-7.8	---
Keswick	0-10	22-27	20.0-25.0	4.5-7.3	---
	10-29	35-60	30.0-50.0	4.5-6.0	---
	29-60	30-40	30.0-36.0	4.5-7.8	0-15
424E2:					
Lindley	0-8	18-27	10.0-16.0	4.5-7.3	---
	8-42	25-35	15.0-20.0	4.5-6.5	---
	42-60	18-32	10.0-16.0	6.1-7.8	---
Keswick	0-9	22-27	20.0-25.0	4.5-7.3	---
	9-27	35-60	30.0-50.0	4.5-6.0	---
	27-60	30-40	30.0-36.0	4.5-7.8	0-15

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
425D:					
Keswick	0-12	22-27	20.0-25.0	4.5-7.3	---
	12-31	35-60	30.0-50.0	4.5-6.0	---
	31-60	30-40	30.0-36.0	4.5-7.8	0-15
425D2:					
Keswick	0-10	27-40	25.0-30.0	4.5-7.3	---
	10-29	35-60	30.0-50.0	4.5-6.0	---
	29-60	30-40	30.0-36.0	4.5-7.8	0-15
430:					
Ackmore	0-8	18-27	25.0-30.0	5.6-7.3	---
	8-27	18-30	25.0-30.0	5.6-7.3	---
	27-60	26-38	25.0-30.0	5.6-7.8	5-10
453:					
Tuskeego	0-14	16-22	20.0-25.0	5.1-7.3	---
	14-46	18-30	20.0-25.0	5.1-6.5	---
	46-60	32-48	30.0-36.0	5.1-6.5	---
499G:					
Nordness	0-4	18-24	15.0-20.0	5.6-7.3	---
	4-11	22-29	15.0-20.0	5.6-7.3	---
	11-17	22-35	20.0-25.0	6.6-7.3	---
	17-60	---	---	---	---
520:					
Coppock	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	25-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
520B:					
Coppock	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	24-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
570C2:					
Nira	0-11	28-34	25.0-30.0	5.6-7.3	---
	11-39	30-38	25.0-30.0	5.1-6.0	---
	39-60	24-34	25.0-30.0	5.6-6.5	---
571C2:					
Hedrick	0-7	27-34	20.0-25.0	5.6-7.3	---
	7-56	27-37	20.0-25.0	5.1-6.5	---
	56-60	24-32	20.0-25.0	5.6-7.8	---
572C2:					
Inton	0-7	27-35	30.0-35.0	5.1-7.3	---
	7-48	27-35	30.0-35.0	5.1-6.5	---
	48-60	25-32	20.0-25.0	5.1-7.3	---
572D2:					
Inton	0-5	27-35	30.0-35.0	5.1-7.3	---
	5-46	27-35	30.0-35.0	5.1-6.5	---
	46-60	25-32	20.0-25.0	5.1-7.3	---
587:					
Chequest	0-17	30-35	25.0-30.0	5.6-7.3	---
	17-60	35-42	25.0-30.0	5.1-6.0	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
594D2:					
Galland	0-7	27-35	25.0-30.0	5.6-7.3	---
	7-54	35-48	25.0-35.0	4.5-6.0	---
	54-60	10-45	10.0-35.0	6.1-6.5	---
729:					
Nodaway	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Coppock	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	25-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
730B:					
Nodaway	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Coppock	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	24-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
Cantril	0-13	14-27	15.0-20.0	5.1-7.3	---
	13-60	27-35	20.0-25.0	5.1-6.5	---
779:					
Kalona	0-20	36-39	41.0-50.0	5.6-7.3	---
	20-41	36-42	36.0-41.0	5.6-7.3	---
	41-60	26-34	20.0-25.0	6.1-7.8	0-15
792C2:					
Armstrong	0-7	35-42	30.0-35.0	5.6-7.3	---
	7-60	36-60	41.0-50.0	4.5-6.5	---
792D2:					
Armstrong	0-6	35-42	30.0-35.0	5.6-7.3	---
	6-60	36-60	41.0-50.0	4.5-6.5	---
795C2:					
Ashgrove	0-9	27-40	25.0-30.0	4.5-7.3	---
	9-18	35-45	30.0-35.0	4.5-6.5	---
	18-60	40-60	41.0-50.0	4.5-7.3	---
795D2:					
Ashgrove	0-7	27-40	25.0-30.0	4.5-7.3	---
	7-16	35-45	30.0-35.0	4.5-6.5	---
	16-60	40-60	41.0-50.0	4.5-7.3	---
822D2:					
Lamoni	0-12	27-40	25.0-30.0	5.5-7.3	---
	12-52	38-50	41.0-50.0	5.1-6.5	---
	52-60	32-40	25.0-30.0	5.6-7.3	---
831B:					
Pershing	0-15	20-27	20.0-25.0	4.5-7.3	---
	15-20	27-35	25.0-30.0	5.1-6.0	---
	20-54	35-48	30.0-36.0	5.1-6.0	---
	54-60	24-40	25.0-30.0	5.1-6.5	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
831C2:					
Pershing	0-9	27-38	25.0-30.0	4.5-7.3	---
	9-12	27-35	25.0-30.0	5.1-6.0	---
	12-44	35-48	30.0-36.0	5.1-6.0	---
	44-60	24-40	25.0-30.0	5.1-6.5	---
832B:					
Weller	0-11	16-27	15.0-20.0	4.5-7.3	---
	11-37	28-48	30.0-35.0	4.5-6.0	---
	37-60	25-40	25.0-30.0	5.1-6.5	---
832C2:					
Weller	0-8	27-36	25.0-30.0	4.5-7.3	---
	8-32	28-48	30.0-35.0	4.5-6.0	---
	32-60	25-40	25.0-30.0	5.1-6.5	---
832D2:					
Weller	0-7	27-36	25.0-30.0	4.5-7.3	---
	7-31	28-48	30.0-35.0	4.5-6.0	---
	31-60	25-40	25.0-30.0	5.1-6.5	---
876B:					
Ladoga	0-13	18-27	20.0-25.0	6.1-7.3	---
	13-45	36-42	20.0-25.0	5.1-6.0	---
	45-60	24-32	20.0-25.0	5.1-6.5	---
876C2:					
Ladoga	0-11	27-35	20.0-30.0	6.1-7.3	---
	11-43	36-42	25.0-30.0	5.1-6.0	---
	43-60	24-32	20.0-25.0	5.1-6.5	---
880B:					
Clinton	0-10	16-26	15.0-20.0	5.1-7.3	---
	10-32	36-42	25.0-30.0	4.5-6.0	---
	32-60	24-35	20.0-25.0	6.1-6.5	---
880C2:					
Clinton	0-9	27-34	25.0-30.0	5.1-7.3	---
	9-27	36-42	25.0-30.0	4.5-6.0	---
	27-60	24-35	20.0-25.0	6.1-6.5	---
880D2:					
Clinton	0-8	27-34	25.0-30.0	5.1-7.3	---
	8-26	36-42	25.0-30.0	4.5-6.0	---
	26-60	24-35	20.0-25.0	6.1-6.5	---
977:					
Richwood	0-15	15-22	20.0-25.0	5.6-7.3	---
	15-60	18-30	4.0-25.0	5.6-7.3	---
993D2:					
Gara	0-7	27-35	25.0-30.0	5.6-7.3	---
	7-47	25-38	25.0-30.0	4.5-6.5	---
	47-60	24-38	25.0-30.0	5.6-8.4	0-25
Armstrong	0-6	22-27	20.0-25.0	5.6-7.3	---
	6-60	36-60	41.0-50.0	4.5-6.5	---
993E2:					
Gara	0-6	27-35	25.0-30.0	5.6-7.3	---
	46-60	24-38	25.0-30.0	5.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
993E2:					
Armstrong	0-5	22-27	20.0-25.0	5.6-7.3	---
	5-60	36-60	41.0-50.0	4.5-6.5	---
994D2:					
Galland	0-7	22-27	20.0-25.0	5.6-7.3	---
	7-54	35-48	25.0-35.0	4.5-6.0	---
	54-60	10-45	10.0-35.0	6.1-6.5	---
Douds	0-8	20-27	15.0-20.0	5.1-7.3	---
	8-33	26-35	15.0-20.0	4.5-6.0	---
	33-60	5-30	5.0-20.0	5.1-6.0	---
994E2:					
Galland	0-8	22-27	20.0-25.0	5.6-7.3	---
	8-55	35-48	25.0-35.0	4.5-6.0	---
	55-60	10-45	10.0-35.0	6.1-6.5	---
Douds	0-12	20-27	15.0-20.0	5.1-7.3	---
	12-37	26-35	15.0-20.0	4.5-6.0	---
	37-60	5-30	5.0-20.0	5.1-6.0	---
1075B:					
Givin	0-10	18-26	20.0-25.0	5.6-7.3	---
	10-37	36-42	20.0-25.0	5.1-5.5	---
	37-60	27-34	20.0-25.0	5.1-6.0	---
1130:					
Belinda	0-7	16-22	20.0-25.0	5.6-7.3	---
	7-12	18-27	20.0-25.0	4.5-6.0	---
	12-41	28-52	30.0-36.0	4.5-6.5	---
	41-60	28-40	30.0-36.0	5.1-6.0	---
1260:					
Beckwith	0-5	16-22	15.0-20.0	4.5-7.3	---
	5-15	18-27	15.0-20.0	4.5-5.5	---
	15-31	40-52	36.0-41.0	5.1-6.0	---
	31-60	28-40	30.0-36.0	5.6-6.5	---
1715:					
Nodaway	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Vesser	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.1-6.5	---
Ackmore	0-8	18-27	25.0-30.0	5.6-7.3	---
	8-27	18-30	25.0-30.0	5.6-7.3	---
	27-60	26-38	25.0-30.0	5.6-7.8	5-10
5020:					
Pits and Dumps	0-60	---	---	---	---
5030:					
Pits	0-60	---	---	---	---
5040:					
Orthents	0-60	2-18	---	---	---
	60-80	---	---	---	---

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
13B:									
Olmitz	B	None	---	---	>6.0	---	---	---	---
Vesser	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
Zook	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
23C2:									
Arispe	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
24D2:									
Shelby	B	None	---	---	>6.0	---	---	---	---
41B:									
Sparta	A	None	---	---	>6.0	---	---	---	---
51:									
Vesser	C	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
51B:									
Vesser	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
54:									
Zook	C/D	Occasional	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
65D2, 65E, 65E2, 65F2, 65G:									
Lindley	C	None	---	---	>6.0	---	---	---	---
74:									
Rubio	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
75, 75B:									
Givin	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
76B, 76C2, 76D2:									
Ladoga	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
80B, 80C2, 80D2:									
Clinton	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
87B:									
Colo	B	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
Zook	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
122:									
Sperry	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	Long	1.0
130:									
Belinda	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
131B, 131B2, 131C2:									
Pershing	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
132B, 132C, 132C2, 132D, 132D2:									
Weller	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
139:									
Perks	A	Occasional	Brief	Feb-Nov	>6.0	---	---	---	---

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
179D2, 179E2:									
Gara	C	None	---	---	>6.0	---	---	---	---
180, 180B:									
Keomah	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
208:									
Klum	B	Occasional	Brief	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	---	---
211:									
Edina	D	None	---	---	0.5-1.0	Apparent	Nov-Jul	---	---
220:									
Nodaway	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
222C, 222C2:									
Clarinda	D	None	---	---	0.0-1.0	Perched	Nov-Jul	---	---
223C2:									
Rinda	D	None	---	---	0.0-1.0	Perched	Nov-Jul	---	---
260:									
Beckwith	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
263:									
Okaw	D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	Brief	0.5
264B:									
Ainsworth	B	None	---	---	>6.0	---	---	---	---
273B:									
Olmitz	B	None	---	---	>6.0	---	---	---	---
279:									
Taintor	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
280, 280B:									
Mahaska	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
281B, 281B2, 281C, 281C2:									
Otley	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
293C, 293F:									
Chelsea	A	None	---	---	>6.0	---	---	---	---
Fayette	B	None	---	---	>6.0	---	---	---	---
313E2, 313G:									
Gosport	C	None	---	---	1.5-3.0	Perched	Nov-Jul	---	---
315:									
Nodaway	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Klum	B	Occasional	Brief	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	---	---
Perks	A	Occasional	Brief	Feb-Nov	>6.0	---	---	---	---
362, 363:									
Haig	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
364B, 364B2:									
Grundy	C	None	---	---	1.5-3.0	Perched	Nov-Jul	---	---

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
423D2:									
Bucknell	D	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
424D2, 424E2:									
Lindley	C	None	---	---	>6.0	---	---	---	---
Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
425D, 425D2:									
Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
430:									
Ackmore	B	Occasional	Brief	Sep-Jun	1.0-3.0	Apparent	Nov-Jul	---	---
453:									
Tuskeego	C/D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
499G:									
Nordness	B	None	---	---	>6.0	---	---	---	---
520:									
Coppock	B	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
520B:									
Coppock	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
570C2:									
Nira	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
571C2:									
Hedrick	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
572C2, 572D2:									
Inton	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
587:									
Chequest	C	Occasional	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
594D2:									
Galland	D	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
729:									
Nodaway	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Coppock	B	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
730B:									
Nodaway	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Coppock	B	None	---	---	1.0-3.0	Apparent	Nov-Jul	---	---
Cantril	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
779:									
Kalona	C	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
792C2, 792D2:									
Armstrong	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
795C2, 795D2:									
Ashgrove	D	None	---	---	0.0-1.0	Perched	Nov-Jul	---	---

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
822D2:									
Lamoni	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
831B, 831C2:									
Pershing	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
832B, 832C2, 832D2:									
Weller	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
876B, 876C2:									
Ladoga	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
880B, 880C2, 880D2:									
Clinton	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
977:									
Richwood	B	None	---	---	>6.0	---	---	---	---
993D2, 993E2:									
Gara	C	None	---	---	>6.0	---	---	---	---
Armstrong	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
994D2, 994E2:									
Galland	D	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
Douds	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
1075B:									
Givin	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
1130:									
Belinda	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
1260:									
Beckwith	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
1715:									
Nodaway	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Vesser	C	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
Ackmore	B	Occasional	Brief	Sep-Jun	1.0-3.0	Apparent	Nov-Jul	---	---
5020:									
Pits and Dumps	A	None	---	---	>6.0	---	---	---	---
5030:									
Pits	A	None	---	---	>6.0	---	---	---	---
5040:									
Orthents	B	None	---	---	>6.0	---	---	---	---

Soil Features

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
13B:					
Olmitz	>60	---	Moderate	Moderate	Moderate.
Vesser	>60	---	High	High	Moderate.
Zook	>60	---	High	High	Moderate.
23C2:					
Arispe	>60	---	High	High	Moderate.
24D2:					
Shelby	>60	---	Moderate	Moderate	Moderate.
41B:					
Sparta	>60	---	Low	Low	Moderate.
51, 51B:					
Vesser	>60	---	High	High	Moderate.
54:					
Zook	>60	---	High	High	Moderate.
65D2, 65E, 65E2, 65F2, 65G:					
Lindley	>60	---	Moderate	Moderate	Moderate.
74:					
Rubio	>60	---	High	High	Moderate.
75, 75B:					
Givin	>60	---	High	High	Moderate.
76B, 76C2, 76D2:					
Ladoga	>60	---	Moderate	Moderate	Moderate.
80B, 80C2, 80D2:					
Clinton	>60	---	Moderate	Moderate	Moderate.
87B:					
Colo	>60	---	High	High	Moderate.
Zook	>60	---	High	High	Moderate.
122:					
Sperry	>60	---	High	High	Moderate.
130:					
Belinda	>60	---	Moderate	High	Moderate.
131B, 131B2, 131C2:					
Pershing	>60	---	High	High	Moderate.
132B, 132C, 132C2, 132D, 132D2:					
Weller	>60	---	High	High	High.
139:					
Perks	>60	---	Low	Low	Moderate.
179D2, 179E2:					
Gara	>60	---	Moderate	Moderate	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
180, 180B:					
Keomah----------	>60	---	High	High	Moderate.
208:					
Klum----------	>60	---	Moderate	Low	Low.
211:					
Edina----------	>60	---	Moderate	High	Moderate.
220:					
Nodaway---------	>60	---	High	Moderate	Low.
222C, 222C2:					
Clarinda--------	>60	---	High	High	Moderate.
223C2:					
Rinda----------	>60	---	High	High	Moderate.
260:					
Beckwith--------	>60	---	Moderate	High	Moderate.
263:					
Okaw----------	>60	---	High	High	High.
264B:					
Ainsworth-------	>60	---	High	Moderate	Moderate.
273B:					
Olmitz----------	>60	---	Moderate	Moderate	Moderate.
279:					
Taintor---------	>60	---	High	High	Moderate.
280, 280B:					
Mahaska---------	>60	---	High	High	Moderate.
281B, 281B2, 281C, 281C2:					
Otley----------	>60	---	Moderate	Moderate	Moderate.
293C, 293F:					
Chelsea---------	>60	---	Low	Low	Low.
Fayette---------	>60	---	High	Moderate	Moderate.
313E2, 313G:					
Gosport---------	20-40	Soft	Moderate	High	High.
315:					
Nodaway---------	>60	---	High	Moderate	Low.
Klum----------	>60	---	Moderate	Low	Low.
Perks----------	>60	---	Low	Low	Moderate.
362, 363:					
Haig----------	>60	---	High	High	Moderate.
364B, 364B2:					
Grundy----------	>60	---	High	High	Moderate.
423D2:					
Bucknell--------	>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				
424D2, 424E2:					
Lindley	>60	---	Moderate	Moderate	Moderate.
Keswick	>60	---	High	High	Moderate.
425D, 425D2:					
Keswick	>60	---	High	High	Moderate.
430:					
Ackmore	>60	---	High	High	Low.
453:					
Tuskeego	>60	---	Moderate	High	Moderate.
499G:					
Nordness	8-20	Hard	Low	Low	Low.
520, 520B:					
Coppock	>60	---	High	High	Moderate.
570C2:					
Nira	>60	---	High	Moderate	Moderate.
571C2:					
Hedrick	>60	---	High	Moderate	Moderate.
572C2, 572D2:					
Inton	>60	---	High	Moderate	Moderate.
587:					
Chequest	>60	---	High	High	Moderate.
594D2:					
Galland	>60	---	High	High	Moderate.
729:					
Nodaway	>60	---	High	Moderate	Low.
Coppock	>60	---	High	High	Moderate.
730B:					
Nodaway	>60	---	High	Moderate	Low.
Coppock	>60	---	High	High	Moderate.
Cantril	>60	---	High	Moderate	Low.
779:					
Kalona	>60	---	High	High	Moderate.
792C2, 792D2:					
Armstrong	>60	---	High	High	Moderate.
795C2, 795D2:					
Ashgrove	>60	---	High	High	Moderate.
822D2:					
Lamoni	>60	---	Moderate	High	Moderate.
831B, 831C2:					
Pershing	>60	---	High	High	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
832B, 832C2, 832D2:					
Weller	>60	---	High	High	High.
876B, 876C2:					
Ladoga	>60	---	Moderate	Moderate	Moderate.
880B, 880C2, 880D2:					
Clinton	>60	---	Moderate	Moderate	Moderate.
977:					
Richwood	>60	---	High	Low	Low.
993D2, 993E2:					
Gara	>60	---	Moderate	Moderate	Moderate.
Armstrong	>60	---	High	High	Moderate.
994D2, 994E2:					
Galland	>60	---	High	High	Moderate.
Douds	>60	---	Moderate	Moderate	Moderate.
1075B:					
Givin	>60	---	High	High	Moderate.
1130:					
Belinda	>60	---	Moderate	High	Moderate.
1260:					
Beckwith	>60	---	Moderate	High	Moderate.
1715:					
Nodaway	>60	---	High	Moderate	Low.
Vesser	>60	---	High	High	Moderate.
Ackmore	>60	---	High	High	Low.
5020:					
Pits and Dumps	0-4	Hard	---	---	---
5030:					
Pits	0-4	Hard	---	---	---
5040:					
Orthents.					

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Glossary

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

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

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

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

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

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

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

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

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

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes (fig. 5). Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact glacial till deposited beneath the ice.

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

Base slope. A geomorphic component of hills. It consists of a concave surface at the bottom of hillslopes that is underlain by colluvial and slope-wash materials or forms a colluvial apron or wedge; a three-dimensional analog of a footslope. Distal base slope sediments commonly grade into, interfinger with, or are buried by alluvial fills.

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

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-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

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.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor

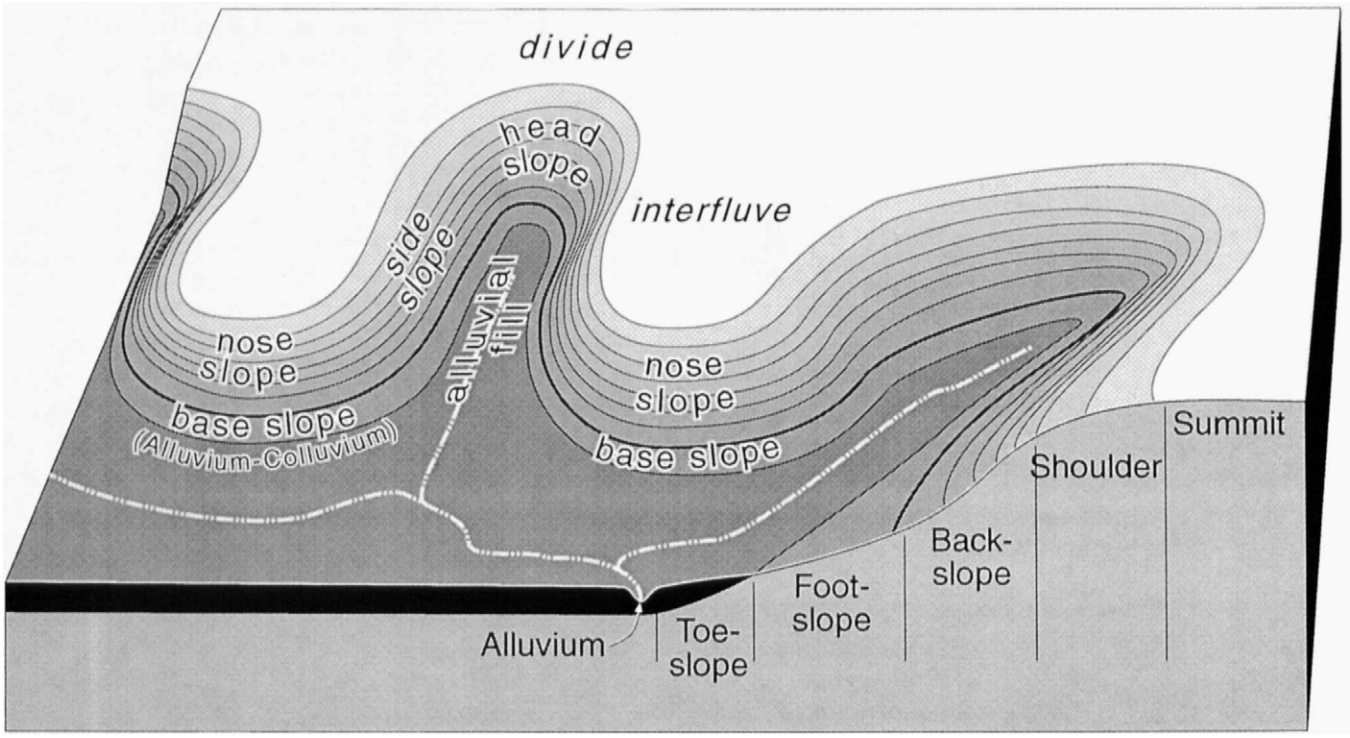

Figure 5.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

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

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

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

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a 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.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

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.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

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.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

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.

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.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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.

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 surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its 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.

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

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.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

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, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

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 or high 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 most field crops are affected. 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 under natural conditions. 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. Poor drainage is 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 for rice) under natural conditions.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and

includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a 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 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

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.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

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. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that 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 generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Footslope. The geomorphic component that forms

the inner, gently inclined surface at the base of a hillslope. The surface is dominantly concave. In terms of gradational processes, a footslope is a transition zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

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.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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. Water filling all the unblocked pores of underlying 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.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. The concave surface at the head of a drainageway where the flow of water converges downward toward the center and contour lines form concave curves.

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-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

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 6 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.
E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.
Cr horizon.—Soft, consolidated bedrock beneath the soil.
R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

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.

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

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

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.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

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 moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

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.

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.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

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.

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.

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.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform 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. 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).

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.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. The projecting end of an interfluve, where contour lines connecting the opposing side slopes form convex curves around the projecting end and lines perpendicular to the contours diverge downward. Overland flow of water is divergent.

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.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent

Moderate ..... 2.0 to 4.0 percent
High ..... 4.0 to 8.0 percent
Very high ..... more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

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.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects 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:

Extremely slow ..... less than 0.01 inch
Very slow ..... 0.01 to 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.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low ..... less than 7.5 ppm
Low ..... 7.5 to 13.0 ppm
Medium ..... 13.0 to 22.5 ppm
High ..... more than 22.5 ppm

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.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses; many are found in Wisconsin and Minnesota.

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.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, 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.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low ..... less than 50 ppm
Low ..... 50 to 79 ppm

Medium	79 to 125 ppm
High	more than 125 ppm

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. Burning an area under conditions of weather and soil moisture and at the time of day that 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.

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	less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

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.

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.

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.

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.

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.

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.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

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.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

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. 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.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluve. It is generally linear along the slope width, and overland flow is parallel down the slope.

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 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 and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

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.

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.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

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.

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 substratum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock 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.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion 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 restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope profile and exhibiting a nearly level surface. A general term for the top, or highest level, of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluve area of gentler slope that is flanked by steeper hillslopes, for example, mountain fronts or tableland escarpments.

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."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

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). Otherwise suitable soil material too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

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 salts, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

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 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.

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.

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 uprooting and tipping over of trees by the wind.

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