United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Kansas Agricultural Experiment Station

Soil Survey of Brown County, Kansas

Part I

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area, descriptions of the general soil map units and soil series in the area, and a description of how the soils formed. Part II includes detailed soil map unit descriptions and 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**, which is the color map preceding the detailed soil maps, 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** follow the general soil map. These maps can be useful in planning the use and management of small areas.

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

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

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

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 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Kansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Brown County Conservation District.

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

Cover: Terraces, contour farming, and a grassed waterway in an area of Aksarben soils.

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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Issued 1998

Foreword

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

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

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

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

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Soil Survey of Brown County, Kansas

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

General Nature of the County

BROWN COUNTY is in the northeastern part of Kansas (fig. I-1). It is bordered on the north by Nebraska, on the south by Atchison and Jackson Counties, on the west by Nemaha County, and on the east by Doniphan County. It has a total land area of 366,234 acres, or about 572 square miles. In 1993, the population of the county was 11,128. Hiawatha, the county seat, is in the central part of the county along Highway 36.

The county is in two major land resource areas—the Nebraska and Kansas Loess-Drift Hills and the Iowa and Missouri Deep Loess Hills (USDA, 1981). The soils in the Nebraska and Kansas Loess-Drift Hills formed under grassland vegetation. These soils range from shallow to very deep over bedrock. The soils in the Iowa and Missouri Deep Loess Hills are in the extreme northeastern part of Brown County along the Missouri River. These soils are very deep over bedrock and formed under grassland and forest vegetation. The soils on the steep bluff near the Missouri River are light in color and support forest vegetation.

This soil survey updates the survey of Brown County, Kansas, published in 1960 (USDA, 1960). It provides additional information and has larger maps, which show the soils in greater detail.

The survey area was originally inhabited by Indians. The first European settlements were in wooded areas near streams, where logs with which to build homes were plentiful. Settlement progressed slowly; only a few pioneers had settled on Indian land prior to 1855. The boundaries of Brown County were established in 1855 by an act of the first legislature of the Territory of Kansas.

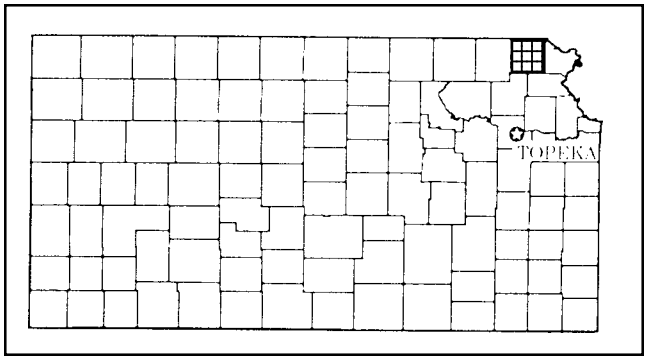

Figure I-1.—Location of Brown County in Kansas.

After the Civil War, many immigrants made homes in the county. The Missouri Pacific Railroad obtained control of 127,832 acres of the Kickapoo Indian Reservation, most of which was located in the county. An advertising campaign carried on by the railroad company induced many people to establish homes on this land.

Soil is the most important natural resource in the county. It provides a growing medium for cash crops, for grasses grazed by livestock, and for trees that provide wildlife habitat.

Ground water is the principal source of water in the county. Horton is the only city in the county that receives its water supply from surface water. Glacial drift is the principal source of ground water in the area.

Most of Brown County is in the Nebraska and Kansas Loess-Drift Hills major land resource area. The northeast tip of the county is in the Iowa and Missouri Deep Loess Hills major land resource area. The soils in the county generally are deep or moderately deep, are

nearly level to strongly sloping, and have a silty, clayey, or loamy subsoil. The highest elevation, more than 1,300 feet above sea level, is in the western part of the county west of Morrill. The lowest, about 930 feet, is along the Wolf River in the eastern part near Robinson.

Most of the eastern part of Brown County is drained by the Wolf River and its tributaries, which flow in a northern and eastern direction across the county. The northeast corner of the county is drained by Pony Creek, Walnut Creek, and Roys Creek. The Delaware River and its tributaries drain much of the southwestern portion of the county.

Many upland areas do not have adequate water for domestic and livestock use. Rural water districts distribute water to these areas. The water supply generally is better in the valleys of major streams. The source of water for livestock is from wells, local streams, or surface water impounded by dams.

Farming, ranching, and services related to these activities are some of the main enterprises in the county. About 17 percent of the county is pastureland and rangeland, 73 percent is cropland, 5 percent is woodland, and 5 percent is small water areas, farmsteads, roads, and urban and other areas. Wheat, corn, alfalfa, red clover, soybeans, and grain sorghum are the principal crops.

Climate

The three tables at the end of this section give climate data as recorded at Horton, Kansas, in the period 1961 to 1990.

In winter, the average temperature is 29 degrees F and the average daily minimum temperature is 18 degrees. The lowest temperature on record, which occurred on January 4, 1947, is -30 degrees. In summer, the average temperature is 77 degrees and the average daily maximum temperature is 89 degrees. The highest recorded temperature, which occurred on August 14, 1936, is 112 degrees.

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

The total annual precipitation is about 36 inches. Of this, 26 inches, or about 72 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 7.15 inches on October 11, 1973. Thunderstorms occur on about 56 days each year, and most occur in June.

The average seasonal snowfall is about 17.4 inches. The greatest snow depth at any one time during the period of record was 23 inches. On the average, 7 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 59 percent. Humidity is higher at night, and the average at dawn is about 82 percent. The sun shines 68 percent of the time possible in summer and 54 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in March.

How This Survey Was Made

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

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

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-

landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

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

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

Survey Procedures

The general procedures followed in making this survey are described in the “National Soil Survey Handbook” of the Natural Resources Conservation Service and the “Soil Survey Manual.” The soil survey of Brown County published in 1960 and “Geology of Brown County” were among the references used.

Sample areas were selected to represent the major landscapes in the county. These areas were investigated more closely than the rest of the county. Extensive notes were taken on the composition of map units in these preliminary study areas. As mapping progressed, these preliminary notes were modified and a final assessment of the composition of the individual map units was made.

As the traverses were made, the soil scientists divided the landscape into landforms or landform segments based on use and management of the soils. For example, a hill would be separated from a flood plain and a gently sloping summit from a very steep back slope of a ridge. In most areas soil examinations along the traverses were made 100 to 800 yards apart, depending on the landscape and soil pattern.

Observations of such items as landform, vegetation, roadbanks, and animal burrows were made without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of truck-mounted hydraulic probes, a hand auger, or a spade to a depth of about 80 inches or to bedrock within a depth of 80 inches. Some of the pedons described as typical were observed and studied in pits that were dug with shovels, spades, or backhoes.

Samples for chemical and physical analyses were taken from representative sites of several of the soils in the survey area. The chemical and physical analyses were made by the Natural Resources Conservation Service Soil Survey Laboratory, Lincoln, Nebraska. The results of the analyses are stored in a computerized data file at the laboratory. A description of the laboratory procedures can be obtained on request from this laboratory.

Temperature and Precipitation Table

(Recorded in the period 1961-90 at Horton, Kansas)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	36.6	14.7	25.7	64	-16	14	0.94	0.46	1.55	2	4.2
February----	42.5	19.6	31.1	73	-12	39	1.01	.40	1.58	2	4.4
March-------	55.0	30.8	42.9	84	1	188	2.37	.80	3.66	4	3.5
April-------	68.0	42.4	55.2	90	18	463	3.18	1.77	4.43	5	.8
May---------	77.4	52.5	65.0	92	32	773	4.84	2.75	6.69	7	.0
June--------	86.1	62.0	74.0	100	44	1,020	5.62	2.97	7.94	7	.0
July--------	91.1	66.8	79.0	103	51	1,207	3.67	1.47	5.53	6	.0
August------	88.9	64.2	76.6	103	48	1,134	4.13	1.88	6.06	6	.0
September---	80.7	56.0	68.3	97	34	850	4.50	1.77	6.80	6	.0
October-----	69.8	44.0	56.9	90	23	525	2.99	.89	4.69	4	.2
November----	53.7	31.8	42.8	77	8	165	1.82	.65	3.01	3	.8
December----	40.0	19.6	29.8	68	-12	26	1.28	.50	1.92	2	3.3
Yearly:											
Average---	65.8	42.0	53.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	105	-19	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,405	36.35	28.53	43.70	54	17.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Freeze Dates in Spring and Fall Table

(Recorded in the period 1961-90 at Horton, Kansas)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 13	Apr. 25	May 5
2 years in 10 later than--	Apr. 8	Apr. 19	May 1
5 years in 10 later than--	Mar. 28	Apr. 10	Apr. 22
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 20	Oct. 10	Sept. 28
2 years in 10 earlier than--	Oct. 24	Oct. 15	Oct. 2
5 years in 10 earlier than--	Nov. 2	Oct. 24	Oct. 10

Growing Season Table

(Recorded in the period 1961-90 at Horton, Kansas)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	183	172	152
8 years in 10	191	178	158
5 years in 10	206	191	170
2 years in 10	221	204	181
1 year in 10	229	211	187

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Pawnee-Wymore-Padonia Association

Moderately deep to very deep, gently sloping to strongly sloping, moderately well drained and well drained soils that have a clayey subsoil; on glaciated uplands

Setting

Composite landscape: Glaciated uplands (fig. I-2)
Composite slopes: 2 to 12 percent

Composition

Percent of survey area: 12 percent
Extent of components in the map unit:
Pawnee soils—30 percent
Wymore soils—25 percent
Padonia soils—20 percent
Minor soils—25 percent

Soil Properties and Qualities

Pawnee
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Summits, shoulders, and back slopes
Parent material: Till
Surface texture: Clay loam and clay
Slope: Gently sloping and moderately sloping

Wymore
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Summits, shoulders, and back slopes
Parent material: Loess
Surface texture: Silty clay loam
Slope: Gently sloping and moderately sloping

Padonia
Depth class: Moderately deep
Drainage class: Well drained
Landform element: Back slopes
Parent material: Residuum
Surface texture: Silty clay loam
Slope: Moderately sloping and strongly sloping
Distinctive properties: Moderately deep to shale

Minor Soils

- The very deep, moderately well drained Kennebec soils on low flood plains and in drainageways
- The shallow, somewhat excessively drained Kipson soils, which formed in shale; on back slopes
- The deep and very deep, moderately well drained Martin soils, which formed in shale; on foot slopes
- The shallow, somewhat excessively drained Sogn soils, which formed in limestone; on back slopes
- The moderately deep, well drained Wamego soils, which formed in acid shale; on shoulders and back slopes
- The shallow, somewhat excessively drained Vinland soils, which formed in acid shale; on back slopes

Use and Management

Major uses: Cropland, pasture, and woodland
Management concerns: Water erosion, soil tilth and fertility, pasture and hayland productivity, woodland productivity
Management considerations:
- Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control water erosion.
- Returning crop residue to the soil and adding other

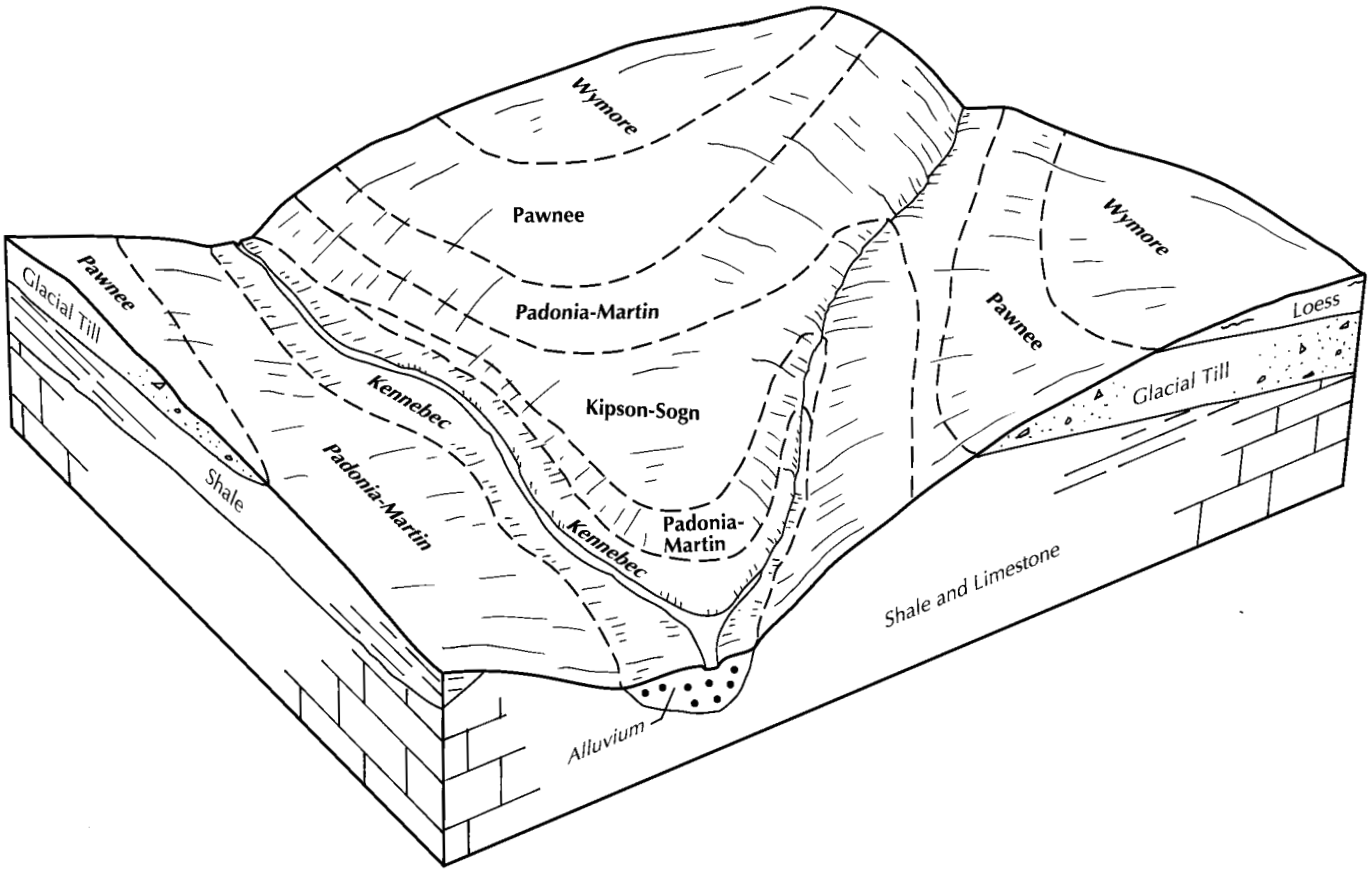

Figure I-2.—Typical pattern of soils and underlying material in the Pawnee-Wymore-Padonia association.

organic material improve fertility and tilth and increase the rate of water infiltration.

- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.
- Measures that control brush increase pasture productivity.
- Site preparation by spraying, cutting, or girdling helps to control plant competition.

2. Wymore-Pawnee Association

Very deep, gently sloping and moderately sloping, moderately well drained soils that have a clayey subsoil; on glaciated uplands

Setting

Composite landscape: Glaciated uplands (fig. I-3)
Composite slopes: 2 to 9 percent

Composition

Percent of survey area: 38 percent
Extent of components in the map unit:
Wymore soils—45 percent
Pawnee soils—30 percent
Minor soils—25 percent

Soil Properties and Qualities

Wymore
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Summits, shoulders, and back slopes
Parent material: Loess
Surface texture: Silty clay loam
Slope: Gently sloping and moderately sloping

Pawnee
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Back slopes

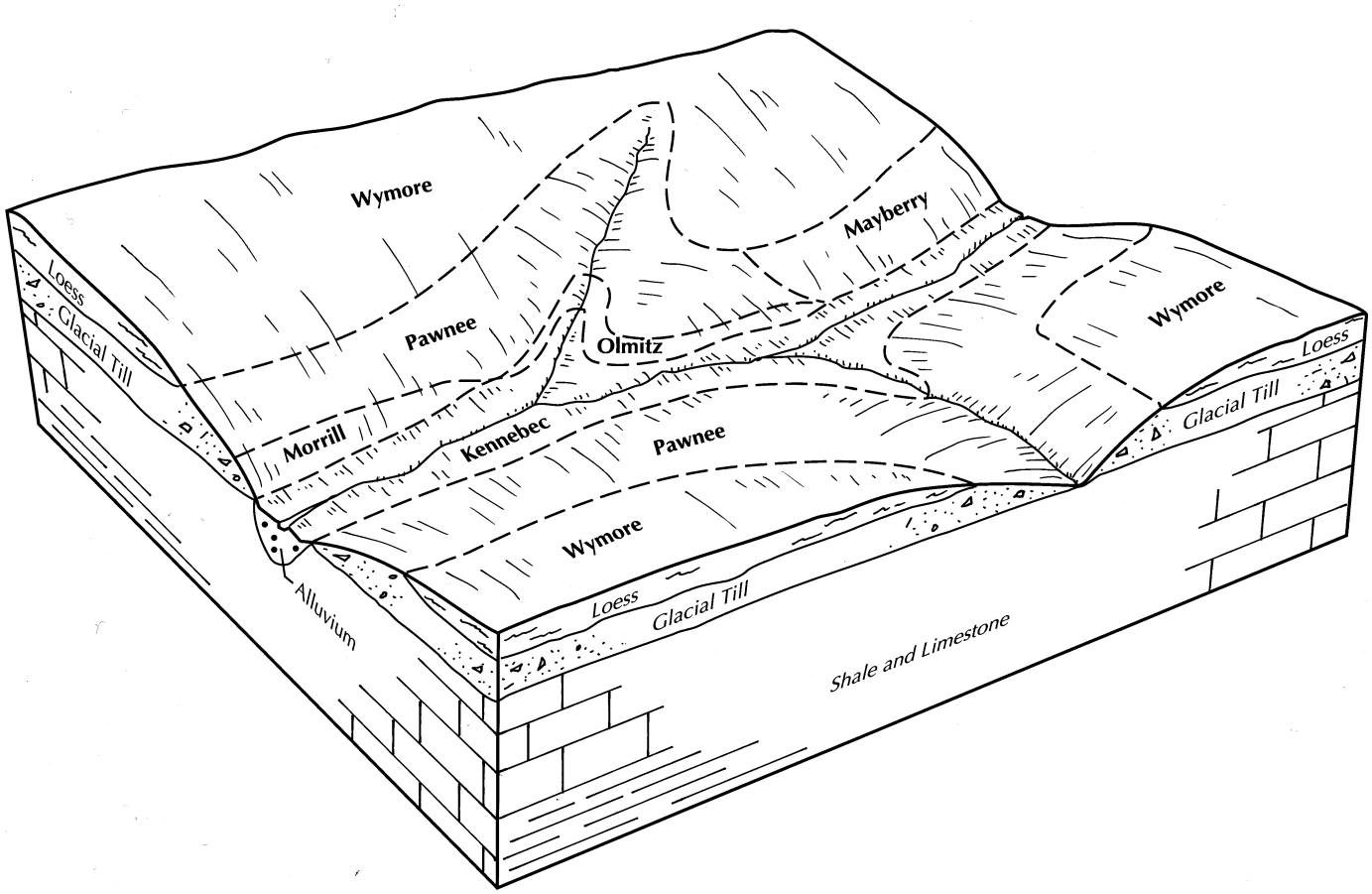

Figure I-3.—Typical pattern of soils and underlying material in the Wymore-Pawnee association.

Parent material: Till
Surface texture: Clay loam or clay
Slope: Gently sloping and moderately sloping

Minor Soils

- The very deep, somewhat poorly drained Grundy soils, which formed in loess; on broad ridgetops and summits
- The very deep, moderately well drained Kennebec soils in drainageways and on low flood plains
- The deep and very deep, moderately well drained Martin soils on foot slopes
- The very deep, moderately well drained Mayberry soils, which formed in till; on back slopes
- The very deep, well drained Morrill soils, which formed in till; on back slopes
- The very deep, well drained Olmitz soils, which formed in alluvium; on foot slopes
- The moderately deep, well drained Padonia soils, which formed in calcareous shale; on back slopes

Use and Management

Major uses: Cropland and pasture
Management concerns: Water erosion, soil tilth and fertility, pasture and hayland productivity
Management considerations:
- Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control water erosion.
- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.
- Measures that control brush increase pasture productivity.

3. Muscotah-Kennebec-Chase Association

Very deep, nearly level, somewhat poorly drained and moderately well drained soils that have a silty or clayey subsoil; on flood plains

Setting

Composite landscape: Flood plains
Composite slopes: 0 to 2 percent

Composition

Percent of survey area: 10 percent
Extent of components in the map unit:
Muscotah soils—30 percent
Kennebec soils—25 percent
Chase soils—20 percent
Minor soils—25 percent

Soil Properties and Qualities

Muscotah
Depth class: Very deep
Drainage class: Somewhat poorly drained
Landform element: High flood plains
Parent material: Alluvium
Surface texture: Silty clay loam or silt loam
Slope: Nearly level

Kennebec
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Low flood plains
Parent material: Alluvium
Surface texture: Silt loam
Slope: Nearly level

Chase
Depth class: Very deep
Drainage class: Somewhat poorly drained
Landform element: High flood plains
Parent material: Alluvium
Surface texture: Silty clay loam
Slope: Nearly level

Minor Soils

- The very deep, well drained Judson soils on foot slopes
- The very deep, moderately well drained Nodaway soils on flood plains
- The very deep, well drained Olmitz soils on foot slopes
- The very deep, moderately well drained Reading soils, which formed in alluvium; on high flood plains

Use and Management

Major uses: Cropland
Management concerns: Occasional flooding during periods of heavy rainfall; ponded water from upland drainage; soil tilth and fertility
Management considerations:
- Diversions and dikes help to control flooding and ponding.
- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.

4. Marshall-Morrill Association

Very deep, gently sloping to strongly sloping, well drained soils that have a silty or loamy subsoil; on uplands

Setting

Composite landscape: Uplands (fig. I-4)
Composite slopes: 2 to 12 percent

Composition

Percent of survey area: 12 percent
Extent of components in the map unit:
Marshall soils—65 percent
Morrill soils—20 percent
Minor soils—15 percent

Soil Properties and Qualities

Marshall
Depth class: Very deep
Drainage class: Well drained
Landform element: Shoulders and back slopes
Parent material: Loess
Surface texture: Silt loam or silty clay loam
Slope: Gently sloping and moderately sloping

Morrill
Depth class: Very deep
Drainage class: Well drained
Landform element: Back slopes
Parent material: Till
Surface texture: Loam
Slope: Moderately sloping and strongly sloping

Minor Soils

- The very deep, well drained Contrary soils on back slopes
- The very deep, well drained Judson soils on foot slopes
- The very deep, moderately well drained Kennebec soils in upland drainageways and on low flood plains
- The very deep, moderately well drained Nodaway soils on low flood plains

Use and Management

Major uses: Cropland

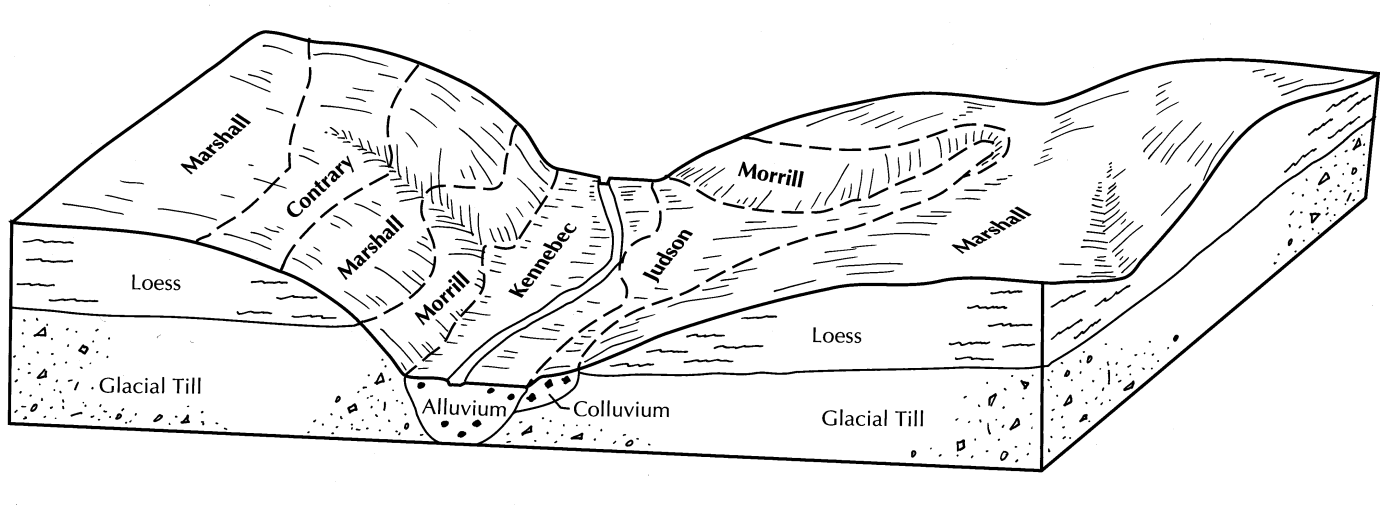

Figure I-4.—Typical pattern of soils and underlying material in the Marshall-Morrill association.

Management concerns: Water erosion, soil tilth and fertility
Management considerations:
• Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control water erosion.
• Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.

5. Monona-Pohocco-Netawaka Association

Very deep, gently sloping to moderately steep, well drained soils that have a silty subsoil; on uplands

Setting

Composite landscape: Loess uplands (fig. I-5)
Composite slopes: 2 to 30 percent

Composition

Percent of survey area: 2 percent
Extent of components in the map unit:
Monona soils—40 percent
Pohocco soils—30 percent
Netawaka soils—15 percent
Minor soils—15 percent

Soil Properties and Qualities

Monona
Depth class: Very deep
Drainage class: Well drained
Landform element: Summits and shoulders
Parent material: Loess
Surface texture: Silt loam
Slope: Gently sloping to strongly sloping

Pohocco
Depth class: Very deep
Drainage class: Well drained
Landform element: Shoulders and back slopes
Parent material: Loess
Surface texture: Silt loam
Slope: Strongly sloping to moderately steep

Netawaka
Depth class: Very deep
Drainage class: Well drained
Landform element: Back slopes
Parent material: Loess
Surface texture: Silt loam
Slope: Strongly sloping to moderately steep

Minor Soils

• The very deep, well drained Judson soils on foot slopes
• The very deep, moderately well drained Kennebec soils in very narrow drainageways and on low flood plains
• The very deep, moderately well drained Nodaway soils on flood plains

Use and Management

Major uses: Cropland and pasture

Management concerns: Water erosion, soil tilth and fertility, pasture productivity
Management considerations:
• Terraces, grassed waterways or underground tile

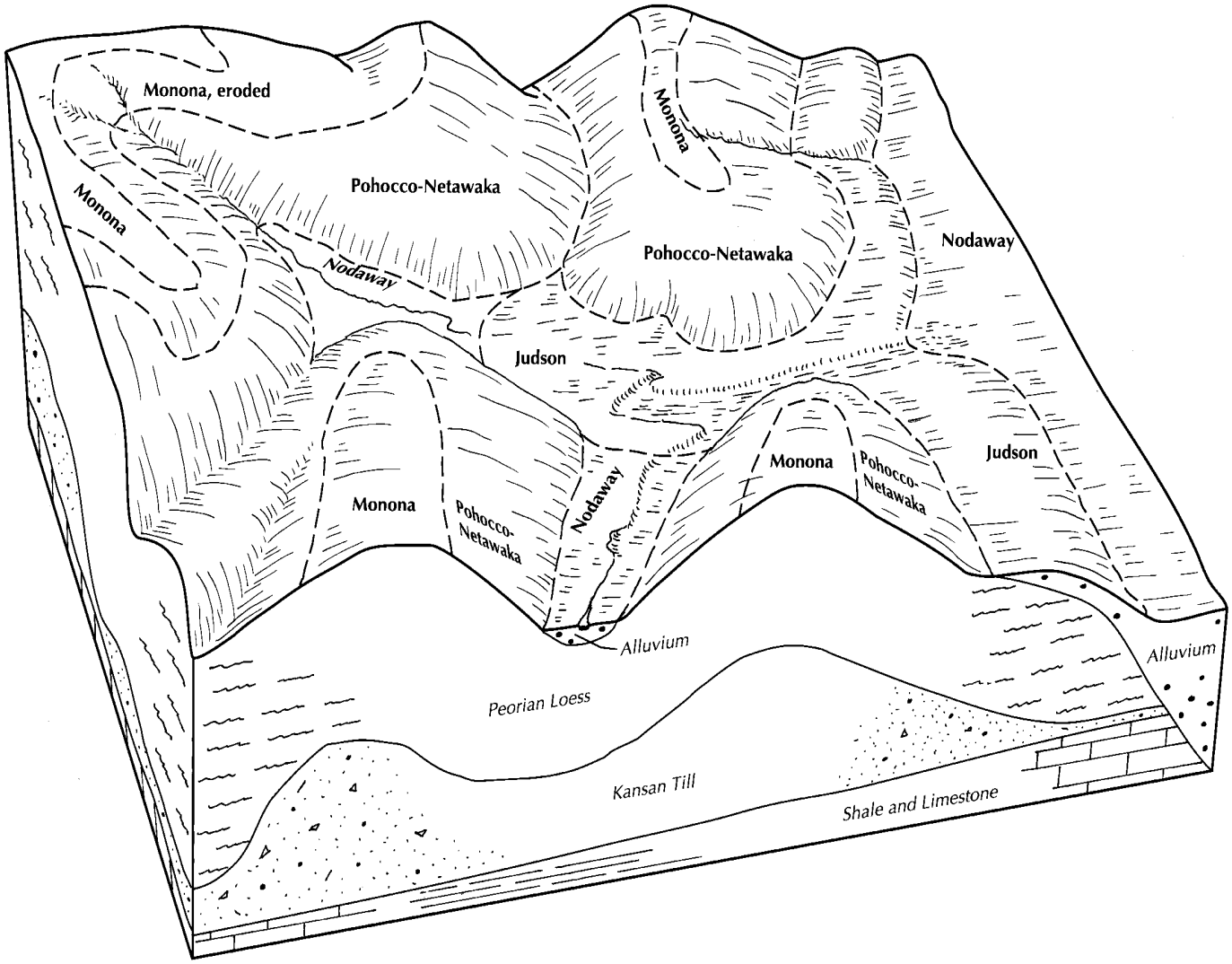

Figure I-5.—Typical pattern of soils and underlying material in the Monona-Pohocco-Netawaka association.

outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control water erosion.

- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
- Measures that control brush increase pasture productivity.

6. Aksarben-Morrill Association

Very deep, nearly level to moderately sloping, moderately well drained and well drained soils that have a clayey or loamy subsoil; on uplands

Setting

Composite landscape: Uplands (fig. I-6)
Composite slopes: 2 to 12 percent

Composition

Percent of survey area: 20 percent
Extent of components in the map unit:

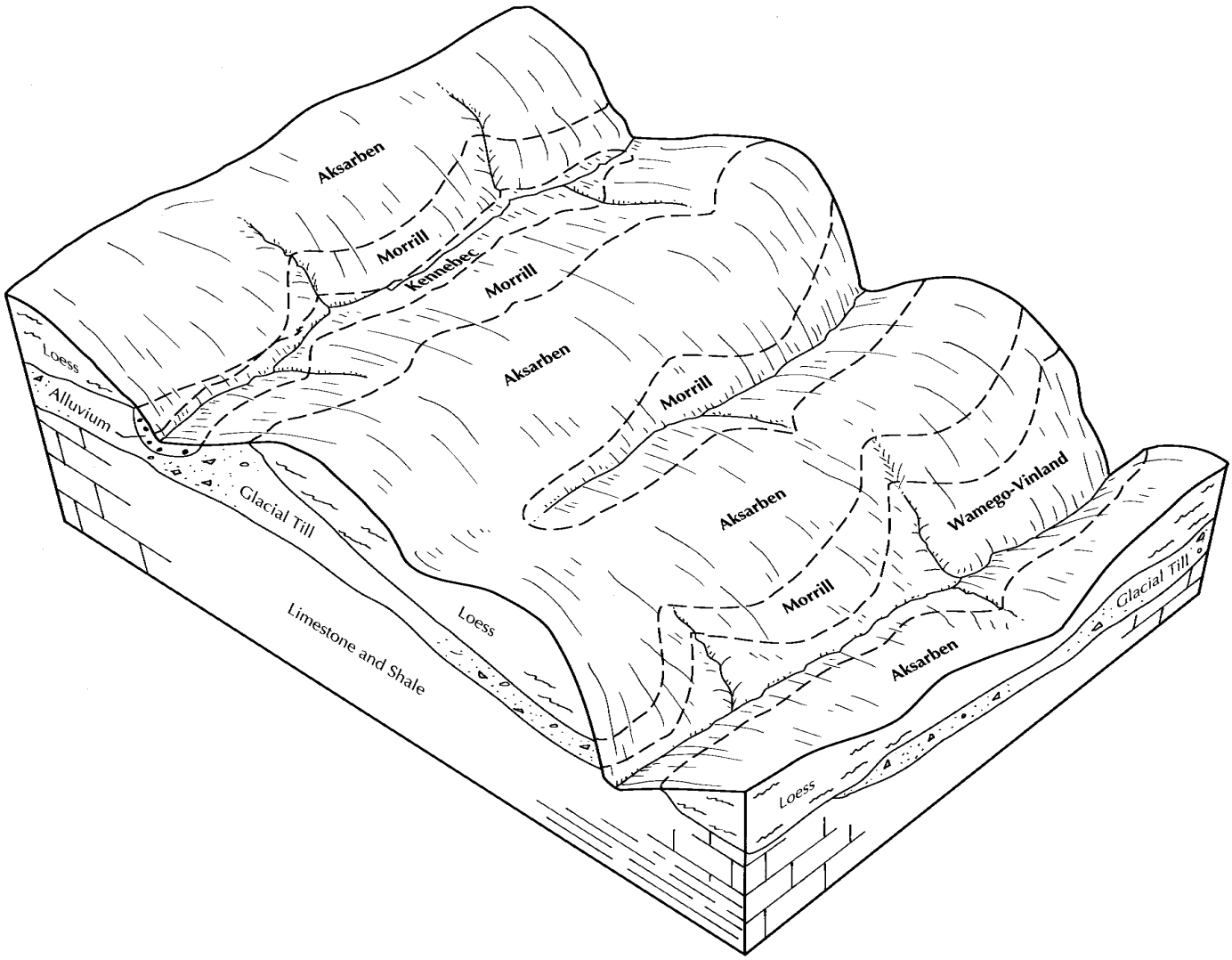

Figure I-6.—Typical pattern of soils and underlying material in the Aksarben-Morrill association.

Aksarben soils—55 percent
Morrill soils—25 percent
Minor soils—20 percent

Soil Properties and Qualities

Aksarben
Depth class: Very deep
Drainage class: Well drained
Landform element: Summits, shoulders, and back slopes
Parent material: Loess
Surface texture: Silty clay loam
Slope: Nearly level to moderately sloping

Morrill
Depth class: Very deep
Drainage class: Well drained
Landform element: Back slopes
Parent material: Till
Surface texture: Loam
Slope: Moderately sloping and strongly sloping

Minor Soils

- The very deep, moderately well drained Kennebec soils in very narrow drainageways and on low flood plains
- The very deep, well drained Shelby soils, which formed in till; on shoulders and back slopes

• The moderately deep, well drained Wamego soils, which formed in shale; on shoulders and back slopes
• The shallow, somewhat excessively drained Vinland soils, which formed in shale; on back slopes

Use and Management

Major uses: Cropland
Management concerns: Water erosion, soil tilth and fertility
Management considerations:
• Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control water erosion.
• Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.

7. Pawnee-Burchard-Steinauer Association

Very deep, gently sloping to moderately steep, moderately well drained and well drained soils; on uplands

Setting

Composite landscape: Uplands
Composite slopes: 2 to 18 percent

Composition

Percent of survey area: 3 percent
Extent of components in the map unit:
Pawnee soils—35 percent
Burchard soils—25 percent
Steinauer soils—20 percent
Minor soils—20 percent

Soil Properties and Qualities

Pawnee
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Shoulders and back slopes
Parent material: Glacial till
Surface texture: Clay loam and clay
Slope: Gently sloping to moderately steep

Burchard
Depth class: Very deep
Drainage class: Well drained
Landform element: Head slopes, nose slopes, and back slopes
Parent material: Till
Surface texture: Clay loam
Slope: Moderately sloping to moderately steep
Distinctive properties: Calcareous at a depth of 20 to 40 inches

Steinauer
Depth class: Very deep
Drainage class: Well drained
Landform element: Back slopes and nose slopes
Parent material: Till
Surface texture: Clay loam
Slope: Strongly sloping and moderately steep
Distinctive properties: Calcareous

Minor Soils

• The very deep, moderately well drained Kennebec soils on flood plains and in narrow drainageways
• The very deep, well drained Olmitz soils on foot slopes
• The very deep, moderately well drained Wymore soils on summits, shoulders, and back slopes

Use and Management

Major uses: Cropland and woodland
Management concerns: Soil tilth and fertility, water erosion, woodland productivity, pasture and hayland productivity
Management considerations:
• Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control erosion.
• Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Site preparation by spraying, cutting, or girdling helps to control plant competition.

8. Wymore-Pawnee-Grundy Association

Very deep, nearly level to moderately sloping, moderately well drained and somewhat poorly drained soils that have a clayey subsoil; on glaciated uplands

Setting

Composite landscape: Uplands
Composite slopes: 0 to 9 percent

Composition

Percent of survey area: 3 percent
Extent of components in the map unit:
Wymore soils—40 percent
Pawnee soils—30 percent
Grundy soils—25 percent
Minor soils—5 percent

Soil Properties and Qualities

Wymore
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Summits, shoulders, and back slopes
Parent material: Loess
Surface texture: Silty clay loam
Slope: Gently sloping and moderately sloping

Pawnee
Depth class: Very deep
Drainage class: Moderately well drained
Landform element: Back slopes
Parent material: Till
Surface texture: Clay loam or clay
Slope: Gently sloping and moderately sloping

Grundy
Depth class: Very deep
Drainage class: Somewhat poorly drained
Landform element: Broad divides
Parent material: Loess
Surface texture: Silt loam
Slope: Nearly level

Minor Soils

- The very deep, well drained Morrill soils, which formed in till; on back slopes
- The very deep, well drained Olmitz soils, which formed in alluvium; on foot slopes
- The very deep, moderately well drained Kennebec soils, which formed in alluvium; in narrow drainageways on low flood plains
- The deep and very deep, moderately well drained Martin soils on foot slopes
- The very deep, moderately well drained Mayberry soils, which formed in till; on back slopes

Use and Management

Major uses: Cropland
Management concerns: Water erosion, soil tilth and fertility
Management considerations:
- Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control erosion.
- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.

Formation and Classification of the Soils

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

Formation of the Soils

Soil-forming processes act on deposited or accumulated geologic material. The characteristics of the soil at any given place are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material accumulated and has existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material. Each of these factors affects the formation of every soil, and each modifies the effects of the other four factors. The effects of each vary from location to location.

Parent Material

Parent material is the consolidated material in which soils form. It forms as rocks are broken down by chemical weathering and by physical weathering, which involves freezing and thawing, wind action, and the grinding action of rivers and glaciers. In part of the county, glacial action increased the rate of weathering by scouring and grinding the rock. Wind action has also greatly influenced the type of parent material in which the soils formed.

Parent material influences the kind of soil that forms and the rate of formation. Many chemical and physical properties of the soils are inherited from the parent material.

The parent materials in Brown County are residuum derived from limestone and shale, glacial sediments, alluvial sediments, and loess.

About 7 percent of the soils in the survey area formed in material weathered from interbedded limestone and shale of the Upper Pennsylvanian period. In the southeastern and south-central parts of the county, the Wabaunsee Group, which consists of the shallow Kipson, Sogn, and Vinland soils, occurs along moderately sloping to moderately steep areas adjacent to intermittent streams. In the western one-third of the county, the Council Grove Group, which consists of the moderately deep Padonia, Oska, and Wamego soils and the deep Martin soils, occurs in moderately sloping to moderately steep areas along intermittent streams.

About 21 percent of the soils in the county formed in outwash from the Kansas glacial till. These are the very deep Burchard, Mayberry, Morrill, Olmitz, Pawnee, Shelby, and Steinauer soils. Except for the Steinauer soils, all of these soils are leached of lime to a depth of about 30 inches. The till contains various amounts of gravel- and sand-sized fragments of granite and quartz and various other rocks. Till can be found in all but the northeastern part of the county.

About 13 percent of the soils in the county formed in alluvial sediments on flood plains along the rivers and their tributaries. These sediments are silty or clayey. Along the Delaware and Wolf Rivers and Roys Creek and Walnut Creek, the Chase, Muscotah, and Wabash soils formed in clayey alluvium. Kennebec, Nodaway, and Reading soils formed in silty alluvium along the smaller tributaries.

About 59 percent of the soils in the county formed in loess. The loess is more than 100 feet thick near the Missouri River in the northeastern part of the county. It thins out and is more clayey with increasing distance from the Missouri River. The Contrary, Monona, Netawaka, and Pohocco soils formed in deep, silty loess in the northeastern part of the county, near the Missouri River. The Aksarben, Grundy, Judson, Marshall, and Wymore soils formed in silty loess that is more clayey than the other loess soils. They are considerably farther from the Missouri River.

Climate

Climate influences both the physical and chemical weathering processes and the biological forces at work in the soil material. Temperature affects the decomposition of the organic matter, the growth of organisms, and the rate of chemical reaction in the

soils. If the supply of moisture is adequate, the soil-forming process becomes more active as the soil temperature increases. These processes are limited by inadequate or excessive moisture.

The soils in Brown County formed under a moist, humid or subhumid climate. Summers are hot, and winters are moderately cold. The average annual precipitation is about 35 inches.

The moderate amount of precipitation in the county has favored the growth of tall grasses. The downward movement of water is one of the main factors affecting the transformation of loess into a soil that has distinctive horizons. As water moves through the soil, calcium carbonate and salts are leached from the upper part of the soil and either form a lower horizon of enrichment or are carried out of the soil profile entirely. Also, the translocation of clay is partly caused by the downward movement of water.

Plant and Animal Life

Plants and animals furnish organic matter to the soil and transport soil and plant material from one layer to another. Organic matter creates a favorable environment for biological activity within the soil by providing food for micro-organisms. These organisms affect the chemical, physical, and biological processes of soil formation.

Most of the soils in Brown County formed under tall prairie grasses. These grasses added much organic matter to the soils, darkened the upper layers, and strengthened soil structure.

Relief

Relief influences soil formation through its effect on runoff, drainage, erosion, soil temperature, and plant cover. The amount of water that enters the soil depends partly on topography. In areas of moderately steep soils, such as Shelby soils, the loss of water through runoff and the continuous removal of surface soil slow down the rate of soil formation. The rate of soil formation is more rapid in the moderately sloping to strongly sloping Martin soils, which are dark to a greater depth than the Shelby soils. The rate of soil formation is most rapid in the nearly level to gently sloping soils, such as Wymore soils.

Time

The length of time that is needed for the formation of a soil depends mainly on the other factors of soil formation. Soils form slowly if the climate is dry and the vegetation is sparse, but they form much more rapidly if the climate is moist and the vegetation is dense.

Some soils in Brown County do not have distinct horizons because they have not been subject to the processes of soil formation for a long enough period. The moderately steep Shelby soils constantly lose soil material. As a result, they show minimal evidence of horizon differentiation. Nodaway soils have weakly expressed horizons because they formed in recently deposited alluvial sediments. The nearly level and gently sloping Aksarben soils have been in place long enough to have developed well defined, genetically related horizons.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975; USDA, 1994). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludolls (*Hapl*, meaning minimal horizonation, plus *udoll*, the suborder of the Mollisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil.

Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Classification of the Soils Table

Soil name	Family or higher taxonomic class
Aksarben	Fine, montmorillonitic, mesic Typic Argiudolls
Burchard	Fine-loamy, mixed, mesic Typic Argiudolls
Chase	Fine, montmorillonitic, mesic Aquertic Argiudolls
Contrary	Fine-silty, mixed, mesic Dystric Eutrochrepts
Grundy	Fine, montmorillonitic, mesic Aquertic Argiudolls
Judson	Fine-silty, mixed, mesic Cumulic Hapludolls
Kennebec	Fine-silty, mixed, mesic Cumulic Hapludolls
Kipson	Loamy, mixed, mesic, shallow Udorthentic Haplustolls
Marshall	Fine-silty, mixed, mesic Typic Hapludolls
Martin	Fine, montmorillonitic, mesic Aquertic Argiudolls
Mayberry	Fine, montmorillonitic, mesic Aquertic Argiudolls
Monona	Fine-silty, mixed, mesic Typic Hapludolls
Morrill	Fine-loamy, mixed, mesic Typic Argiudolls
Muscotah	Fine, montmorillonitic, mesic Cumulic Hapludolls
Netawaka	Coarse-silty, mixed (calcareous), mesic Typic Udorthents
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Olmitz	Fine-loamy, mixed, mesic Cumulic Hapludolls
Oska	Fine, montmorillonitic, mesic Vertic Argiudolls
Padonia	Fine, mixed, mesic Typic Argiudolls
Pawnee	Fine, montmorillonitic, mesic Aquertic Argiudolls
Pohocco	Fine-silty, mixed, mesic Typic Eutrochrepts
Reading	Fine-silty, mixed, mesic Pachic Argiudolls
Shelby	Fine-loamy, mixed, mesic Typic Argiudolls
Sogn	Loamy, mixed, mesic Lithic Haplustolls
Steinauer	Fine-loamy, mixed (calcareous), mesic Typic Udorthents
Vinland	Loamy, mixed, mesic, shallow Typic Hapludolls
Wabash	Fine, montmorillonitic, mesic Cumulic Vertic Endoaquolls
Wamego	Fine, mixed, mesic Typic Argiudolls
Wymore	Fine, montmorillonitic, mesic Aquertic Argiudolls

Acreage and Proportionate Extent of the Soils Table

Map symbol	Soil name	Acres	Percent
Ac	Aksarben silty clay loam, 0 to 2 percent slopes	170	*
Ad	Aksarben silty clay loam, 2 to 5 percent slopes	15,290	4.2
Ae	Aksarben silty clay loam, 5 to 11 percent slopes	30,120	8.3
Bs	Burchard clay loam, 6 to 12 percent slopes	1,650	0.5
Bx	Burchard-Steinauer clay loams, 12 to 18 percent slopes	1,610	0.4
Ch	Chase silty clay loam, occasionally flooded	5,160	1.4
Co	Contrary silty clay loam, 5 to 9 percent slopes, eroded	570	0.2
Ga	Grundy silt loam, 0 to 2 percent slopes	2,820	0.8
Ju	Judson silt loam, 2 to 5 percent slopes	2,690	0.7
Kd	Kennebec silt loam, channeled	2,200	0.6
Ke	Kennebec silt loam, occasionally flooded	31,130	8.5
Kp	Kipson-Sogn silty clay loams, 5 to 30 percent slopes	3,020	0.8
M-W	Miscellaneous water	3	*
Ma	Marshall silt loam, 2 to 5 percent slopes	10,730	2.9
Mb	Marshall silty clay loam, 5 to 11 percent slopes	20,680	5.6
Md	Martin silty clay loam, 1 to 4 percent slopes	800	0.2
Mf	Martin silty clay loam, 4 to 12 percent slopes	140	*
Mh	Mayberry clay loam, 2 to 6 percent slopes	1,840	0.5
Mk	Monona silt loam, 2 to 5 percent slopes	440	0.1
Mn	Monona silt loam, 5 to 11 percent slopes, moderately eroded	2,470	0.7
Mt	Morrill loam, 6 to 12 percent slopes	22,450	6.1
Mw	Muscotah silt loam, occasionally flooded, overwash	1,450	0.4
My	Muscotah silty clay loam, occasionally flooded	4,300	1.2
No	Nodaway silt loam, occasionally flooded	1,700	0.5
Om	Olmitz loam, 2 to 5 percent slopes	1,220	0.3
Or	Orthents, earthen dam	30	*
Pd	Padonia-Martin silty clay loams, 5 to 9 percent slopes	10,650	2.9
Pe	Padonia-Martin silty clay loams, 9 to 25 percent slopes	2,730	0.7
Pf	Padonia-Oska silty clay loams, 5 to 9 percent slopes	630	0.2
Pm	Pawnee clay loam, 2 to 6 percent slopes	250	0.1
Pn	Pawnee clay loam, 6 to 12 percent slopes	37,830	10.4
Po	Pawnee clay, 6 to 12 percent slopes, moderately eroded	2,260	0.6
Pt	Pits, quarries	110	*
Pw	Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded	2,330	0.6
Px	Pohocco-Netawaka silt loams, 17 to 30 percent slopes, eroded	180	*
Re	Reading silt loam, moderately wet, rarely flooded	1,120	0.3
Sg	Shelby clay loam, 6 to 12 percent slopes	6,000	1.6
Sm	Shelby clay loam, 12 to 18 percent slopes, moderately eroded	1,490	0.4
Wa	Wabash silty clay, occasionally flooded	250	0.1
We	Wamego silty clay loam, 3 to 7 percent slopes	4,210	1.1
Wg	Wamego-Vinland silty clay loams, 3 to 15 percent slopes	4,820	1.3
Wm	Wymore silty clay loam, 2 to 5 percent slopes	56,970	15.7
Wn	Wymore silty clay loam, 5 to 9 percent slopes	68,217	18.7
	Water	1,504	0.4
	Total	366,234	100.0

* Less than 0.1 percent.

Soil Series Descriptions

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetical order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975) and "Keys to Soil Taxonomy" (USDA, 1994). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units" in Part II of this survey.

Aksarben Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landscape: Glaciated uplands
Parent material: Loess
Slope range: 0 to 11 percent

Taxonomic class: Fine, montmorillonitic, mesic Typic Argiudolls

Typical Pedon

Aksarben silty clay loam (fig. I-7), 0 to 2 percent slopes, in an area of cropland 1,000 feet north and 450 feet east of the southwest corner of sec. 18, T. 2 S., R. 18 E.; USGS Robinson topographic quadrangle; lat. 39 degrees 52 minutes 24 seconds N. and long. 95 degrees 27 minutes 3 seconds W.

Ap1—0 to 2 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium platy structure; slightly hard, friable, sticky and plastic; common fine roots throughout; moderately acid; clear smooth boundary.

Ap2—2 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium platy structure parting to moderate fine and medium granular; hard, friable, sticky and plastic; common fine roots throughout; moderately acid; clear smooth boundary.

A—9 to 13 inches; very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; strong very fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots throughout; gradual smooth boundary.

BA—13 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; strong fine subangular blocky structure; hard, firm, sticky and plastic; few faint patchy clay films (cutans) on vertical faces of peds; slightly acid; gradual smooth boundary.

Bt1—19 to 24 inches; dark brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; strong fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots between peds; few streaks of very acid brown (10YR 2/2) material (field cracks); common distinct discontinuous clay films (cutans) on vertical and horizontal faces of peds; slightly acid; clear wavy boundary.

Bt2—24 to 28 inches; dark brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; few fine faint grayish brown (10YR 5/2) irregularly shaped iron depletions; moderate fine prismatic structure parting to strong medium angular blocky; very hard, firm, sticky and plastic; few fine roots between peds; common distinct discontinuous clay films (cutans) on vertical and horizontal faces of peds and few prominent patchy manganese or iron-manganese stains; slightly acid; gradual smooth boundary.

Bt3—28 to 39 inches; brown (10YR 5/3) silty clay loam, pale brown (10YR 6/3) dry; few fine distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations and common fine distinct grayish brown (2.5Y 5/2) irregularly shaped iron depletions; moderate fine prismatic structure parting to strong medium angular blocky; very hard, firm, sticky and plastic; few fine roots between peds; few very fine pores; many distinct continuous clay films (cutans) on vertical faces of peds and common prominent patchy manganese or iron-manganese stains; few fine rounded soft masses of iron-manganese; slightly acid; gradual wavy boundary.

BC—39 to 47 inches; brown (10YR 5/3) silty clay loam, pale brown (10YR 6/3) dry; common fine distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations and common fine distinct grayish brown (2.5Y 5/2) irregularly shaped iron depletions; weak fine prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; few fine roots between peds; few very fine pores; few distinct continuous clay films (cutans) on vertical faces of peds and common prominent patchy manganese or iron-manganese stains; slightly acid; gradual wavy boundary.

C1—47 to 63 inches; grayish brown (2.5Y 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; common medium prominent strong brown (7.5YR 4/6) irregularly shaped iron accumulations; weak medium prismatic structure; hard, friable, slightly sticky and slightly plastic; few fine roots throughout; many very fine pores; common prominent patchy manganese or iron-manganese stains; neutral; diffuse smooth boundary.

C2—63 to 80 inches; silt loam, 50 percent grayish brown (2.5Y 5/2) and 50 percent yellowish brown (10YR 5/6); light brownish gray (2.5Y 6/2) and brownish yellow (10YR 6/6) dry; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; many very fine pores; few prominent patchy manganese or iron-manganese stains; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Content of clay in the control section: 35 to 42 percent

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—silty clay loam or silt loam

BA horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—2 or 3
Texture—silty clay loam
Texture of the fine-earth fraction—27 to 34 percent

Bt horizon:
Value—3 to 5 moist; 4 to 6 dry
Chroma—3 or 4
Texture—silty clay loam or silty clay

BC horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 4

C horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 4
Texture—silty clay loam or silt loam

Burchard Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landscape: Glaciated uplands
Parent material: Calcareous till
Slope range: 6 to 18 percent

Taxonomic class: Fine-loamy, mixed, mesic Typic Argiudolls

Typical Pedon

Burchard clay loam, 6 to 12 percent slopes, in an area of range 200 feet east and 35 feet north of the southwest corner of sec. 29, T. 4 S., R. 15 E.; USGS Wetmore topographic quadrangle; lat. 39 degrees 40 minutes 3 seconds N. and long. 95 degrees 46 minutes 3 seconds W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; slightly hard, friable, sticky and plastic; moderately acid; clear smooth boundary.

Bt—9 to 20 inches; dark brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common prominent clay films on faces of peds; slightly acid; gradual wavy boundary.

Btk—20 to 26 inches; olive brown (2.5Y 4/4) clay loam, light olive brown (2.5Y 5/4) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common prominent clay films on faces of peds; few fine and medium masses of lime; 1 percent pebbles, mostly quartz; strong effervescence; moderately alkaline; gradual wavy boundary.

BCk—26 to 33 inches; light yellowish brown (2.5Y 6/3) clay loam, pale yellow (2.5Y 7/3) dry; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium masses of lime; 1 percent pebbles, mostly gravel; strong effervescence; moderately alkaline; diffuse smooth boundary.

C—33 to 80 inches; light yellowish brown (2.5Y 6/3) clay loam, pale yellow (2.5Y 7/3) dry; common fine prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations throughout; massive; hard, firm, sticky and plastic; common fine and medium masses of lime; strong effervescence; 1 percent pebbles, mostly gravel; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 18 inches
Depth to carbonates: 13 to 30 inches

A horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2
Texture—clay loam or loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 5 or 6 dry
Chroma—3 to 6

Btk horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 5 or 6 dry
Chroma—3 to 6

BCk horizon:
Hue—10YR or 2.5Y
Value—6 or 7 moist or dry
Chroma—2 or 3
Texture—clay loam

C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 moist or dry
Chroma—2 or 3

Chase Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landscape: Valleys
Parent material: Alluvium
Slope range: 0 to 1 percent

Taxonomic class: Fine, montmorillonitic, mesic Aquertic Argiudolls

Typical Pedon

Chase silty clay loam, occasionally flooded, in an area of cropland 2,400 feet south and 100 feet east of the northwest corner of sec. 16, T. 3 S., R. 17 E.; USGS Hiawatha topographic quadrangle; lat. 39 degrees 47 minutes 29 seconds N. and long. 95 degrees 31 minutes 37 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; slightly hard, friable, sticky and plastic; slightly acid; abrupt smooth boundary.
BA—9 to 19 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; slightly acid; gradual smooth boundary.
Bt1—19 to 30 inches; very dark brown (10YR 2/2) silty clay, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few prominent clay films on faces of peds; slightly acid; gradual smooth boundary.
Bt2—30 to 41 inches; very dark brown (10YR 2/2) silty clay, dark gray (10YR 4/1) dry; few fine distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron accumulations throughout; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few distinct clay films on faces of peds; slightly acid; gradual smooth boundary.
BC—41 to 47 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; few fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulations throughout; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; neutral; gradual smooth boundary.
C—47 to 80 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulations throughout; massive; very hard, firm, sticky and plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: Greater than 36 inches
Content of clay in the control section: 35 to 55 percent

Ap horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2

BA horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2

Bt horizon:
Hue—10YR or 2.5Y
Value—2 to 5 moist; 4 to 6 dry
Chroma—1 or 2
Texture—silty clay, clay, or silty clay loam

BC horizon:
Hue—10YR or 2.5Y
Value—2 to 5 moist; 4 to 6 dry
Chroma—1 or 2
Texture—silty clay or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—2 to 5 moist; 4 to 6 dry
Chroma—1 or 2
Texture—silty clay or silty clay loam

Contrary Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Loess uplands
Parent material: Loess
Slope range: 5 to 9 percent

Taxonomic class: Fine-silty, mixed, mesic Dystric Eutrochrepts

Typical Pedon

Contrary silty clay loam, 5 to 9 percent slopes, eroded, in an area of cropland 350 feet north and 1,550 feet west of the southeast corner of sec. 14, T. 1 S., R. 17 E.; USGS Highland Northwest topographic quadrangle; lat. 39 degrees 57 minutes 30 seconds N. and long. 95 degrees 28 minutes 34 seconds W.

Ap—0 to 6 inches; dark brown (10YR 3/3) silty clay loam, dark brown (10YR 4/3) dry; weak fine granular structure; slightly hard, friable, sticky and plastic; slightly acid; clear smooth boundary.
Bw1—6 to 15 inches; dark brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; neutral; gradual smooth boundary.
Bw2—15 to 32 inches; yellowish brown (10YR 5/4) silty clay loam, light yellowish brown (10YR 6/4) dry; few fine faint grayish brown (10YR 5/2) irregularly shaped iron depletions in the matrix throughout; the iron depletions are relict redoximorphic features; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; neutral; gradual smooth boundary.
C—32 to 80 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; common fine faint grayish brown (10YR 5/2) irregularly shaped iron depletions in the matrix throughout; the iron depletions are redoximorphic features; massive; hard, friable, slightly sticky and slightly plastic; neutral.

Range in Characteristics

Content of clay in the control section: 20 to 28 percent

Ap horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—2 or 3
Texture—silty clay loam

Bw horizon:
Hue—2.5Y or 10YR
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6 moist; 6 or 7 dry
Chroma—2 to 4
Texture—silt loam or silty clay loam

Grundy Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landscape: Glaciated uplands
Parent material: Loess
Slope range: 0 to 2 percent

Taxonomic class: Fine, montmorillonitic, mesic Aquertic Argiudolls

Typical Pedon

Grundy silt loam, 0 to 2 percent slopes, in an area of cropland 250 feet south and 1,000 feet west of the northeast corner of sec. 32, T. 4 S., R. 18 E.; USGS Everest topographic quadrangle; lat. 39 degrees 40 minutes 1 second N. and long. 95 degrees 25 minutes 10 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.
A—7 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; hard, firm, sticky and plastic; slightly acid; clear smooth boundary.
Btg1—14 to 24 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common fine distinct yellowish brown (10YR 5/4) irregularly shaped iron accumulations throughout; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.
Btg2—24 to 31 inches; dark grayish brown (2.5Y 4/2) silty clay, grayish brown (2.5Y 5/2) dry; common medium prominent yellowish brown (10YR 5/4) irregularly shaped iron accumulations throughout; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.
Btg3—31 to 41 inches; dark grayish brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) dry; common medium prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations throughout; moderate medium prismatic structure parting to

moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; common distinct clay films on faces of peds; neutral; gradual smooth boundary.

BCg—41 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam, light brownish gray (2.5Y 6/2) dry; common medium prominent strong brown (7.5YR 5/8) irregularly shaped iron accumulations throughout; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; neutral; gradual smooth boundary.

Cg—48 to 80 inches; olive gray (5Y 5/2) silty clay loam, light olive gray (5Y 6/2) dry; common medium prominent strong brown (7.5YR 5/8) irregularly shaped masses of iron accumulation throughout; hard, firm, sticky and plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to mottles: 14 to 30 inches
Content of clay in the control section: 42 to 48 percent

Ap horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

Btg horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—1 or 2

BCg horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—1 or 2
Texture—silty clay loam or silty clay

Cg horizon:
Hue—10YR to 5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—1 or 2

Haig Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Very slow
Landscape: Upland
Parent material: Loess
Slope range: 0 to 1 percent

Taxonomic class: Fine, smectitic, mesic Vertic Argiaquolls

Typical Pedon

Haig silt loam, 0 to 1 percent slopes, in an area of cropland 200 feet west and 800 feet north of the southeast corner of sec. 6, T. 2 S., R. 15 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam; moderate fine granular structure; slightly hard, friable, moderately sticky and moderately plastic; abrupt smooth boundary.

BA—7 to 15 inches; black (N 2/0) silty clay loam; moderate medium granular structure; slightly hard, friable, moderately sticky and moderately plastic; clear smooth boundary.

Bt1—15 to 27 inches; very dark grayish brown (10YR 3/2) silty clay; common fine distinct yellowish brown (10YR 5/4) redoximorphic concentrations; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; clear smooth boundary.

Bt2—27 to 44 inches; grayish brown (2.5Y 5/2) silty clay; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; clear smooth boundary.

BC—44 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (7.5YR 5/6) redoximorphic concentrations; weak medium angular blocky structure; hard, firm, sticky and plastic; clear smooth boundary.

C—50 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; weak coarse angular blocky structure; hard, firm, sticky and plastic.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 28 inches
Depth to mottles: 12 to 22 inches
Content of clay in the control section: 42 to 48 percent

Ap horizon:
Hue—10YR
Value—2 or 3 moist; 4 or 5 dry
Chroma—0 or 1
Texture—silt loam or silty clay loam
Texture of the fine earth fraction—18 to 40 percent

BA horizon:
Hue—10YR
Value—2 or 3 moist; 4 or 5 dry
Chroma—0 or 1
Texture—silty clay loam or silty clay
Texture of the fine earth fraction—38 to 48 percent

Bt horizon:
Hue—10YR or 2.5Y
Value—3 or 4 moist; 5 or 6 dry
Chroma—1
Texture—silty clay or silty clay loam
Texture of the fine earth fraction—42 to 50 percent

Btg horizon:
Hue—10YR to 5Y
Value—4 to 8 moist; 6 to 8 dry
Chroma—1
Texture—silty clay loam or silty clay
Texture of the fine earth fraction—42 to 50 percent

Judson Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Glaciated uplands
Parent material: Local alluvium
Slope range: 2 to 5 percent
Taxonomic class: Fine-silty, mixed, mesic Cumulic Hapludolls

Typical Pedon

Judson silt loam, 2 to 5 percent slopes, in an area of cropland 2,350 feet south and 250 feet west of the northeast corner of sec. 32, T. 1 S., R. 18 E.; USGS Highland Northwest topographic quadrangle; lat. 39 degrees 55 minutes 22 seconds N. and long. 95 degrees 24 minutes 57 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.
A—7 to 25 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.
AB—25 to 40 inches; dark brown (10YR 3/3) silty clay loam, dark brown (10YR 4/3) dry; moderate fine granular structure; hard, friable, sticky and plastic; slightly acid; gradual smooth boundary.
Bw—40 to 50 inches; dark brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; neutral; gradual smooth boundary.
BC—50 to 80 inches; dark brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; hard, friable, sticky and plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches
Content of clay in the control section: 27 to 35 percent

A horizon:
Value—2 or 3 moist or dry
Chroma—1 or 2

AB horizon:
Hue—10YR
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—silt loam or silty clay loam

Bw horizon:
Value—3 or 4 moist
Chroma—3 or 4

BC horizon:
Value—3 or 4 moist; 4 or 5 dry
Chroma—3 or 4
Texture—silty clay loam or silt loam

Kennebec Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Valleys and glaciated uplands
Parent material: Alluvium
Slope range: 0 to 1 percent
Taxonomic class: Fine-silty, mixed, mesic Cumulic Hapludolls

Typical Pedon

Kennebec silt loam, occasionally flooded, in an area of cropland 2,200 feet south and 1,000 feet west of the northeast corner of sec. 10, T. 3 S., R. 18 E.; USGS Robinson topographic quadrangle; lat. 39 degrees 48 minutes 23 seconds N. and long. 95 degrees 22 minutes 52 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.
A1—7 to 25 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.
A2—25 to 44 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.

AC—44 to 54 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; few fine distinct dark yellowish brown (10YR 4/4) irregularly shaped iron accumulations throughout; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.

C—54 to 80 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct dark yellowish brown (10YR 4/4) irregularly shaped iron accumulations throughout; massive; hard, firm, slightly sticky and slightly plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: Greater than 36 inches
Content of clay in the control section: 18 to 27 percent

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

AC horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4 moist; 4 or 5 dry
Chroma—1 or 2
Texture—silt loam or silty clay loam

Kipson Series

Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Moderate
Landscape: Uplands
Parent material: Calcareous, silty shale
Slope range: 5 to 30 percent
Taxonomic class: Loamy, mixed, mesic, shallow Udorthentic Haplustolls

Typical Pedon

Kipson silty clay loam, in an area of Kipson-Sogn silty clay loams, 5 to 30 percent slopes; in an area of range 50 feet north and 1,100 feet west of the southeast corner of sec. 31, T. 3 S., R. 15 E.; USGS Wetmore topographic quadrangle; lat. 39 degrees 44 minutes 24 seconds N. and long. 95 degrees 46 minutes 28 seconds W.

A—0 to 8 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, friable, sticky and plastic; many fine roots throughout; slightly effervescent; slightly alkaline; gradual smooth boundary.

C—8 to 19 inches; olive brown (2.5Y 4/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry; massive; hard, firm, sticky and plastic; few fine roots throughout; strongly effervescent; moderately alkaline; 1 percent channers, mostly limestone; clear smooth boundary.

Cr—19 inches; partially weathered, calcareous, silty shale.

Range in Characteristics

Depth to paralithic contact: 10 to 20 inches
Thickness of the mollic epipedon: 6 to 12 inches
Content of clay in the control section: 27 to 35 percent

A horizon:
Hue—10YR or 2.5Y
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—silty clay loam

C horizon:
Hue—2.5YR to 2.5Y
Value—4 to 6 moist; 5 to 7 dry
Chroma—4 to 6
Texture—silty clay loam or silt loam
Content of rock fragments—0 to 15 percent by volume

Marshall Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Glaciated uplands
Parent material: Loess
Slope range: 2 to 11 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludolls

Typical Pedon

Marshall silt loam, 2 to 5 percent slopes (fig. I-8), in an area of cropland 150 feet south and 1,200 feet east of the northwest corner of sec. 35, T. 1 S., R. 18 E.; USGS White Cloud topographic quadrangle; lat. 39 degrees 55 minutes 43 seconds N. and long. 95 degrees 22 minutes 23 seconds W.

Ap1—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots throughout; moderately acid; abrupt smooth boundary.

Ap2—6 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure parting to strong fine

blocky; hard, firm, slightly sticky and slightly plastic; many fine roots throughout; moderately acid; clear smooth boundary.

BA—10 to 13 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) crushed silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots throughout; slightly acid; clear smooth boundary.

Bw1—13 to 18 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; slightly acid; gradual smooth boundary.

Bw2—18 to 32 inches; dark yellowish brown (10YR 5/4) silty clay loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots throughout; slightly acid; clear wavy boundary.

BC—32 to 43 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; few fine and medium prominent grayish brown (2.5Y 5/2) irregularly shaped iron depletions; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots throughout; neutral; gradual smooth boundary.

C1—43 to 53 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; common medium distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations and prominent grayish brown (2.5Y 5/2) irregularly shaped iron depletions; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; common fine tubular pores; few prominent patchy manganese or iron-manganese stains; neutral; diffuse smooth boundary.

C2—53 to 67 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; common fine distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations and prominent grayish brown (2.5Y 5/2) irregularly shaped iron depletions; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; many very fine tubular pores; common prominent patchy manganese or iron-manganese stains; neutral; diffuse smooth boundary.

C3—67 to 80 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; common fine distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations and prominent grayish brown (2.5Y 5/2) irregularly shaped iron depletions; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; many very fine pores; clay films on vertical prism faces; few prominent patchy manganese or iron-manganese stains and few distinct brown (10YR 5/3) discontinuous clay films (cutans) on vertical faces of peds; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Content of clay in the control section: 27 to 34 percent

Ap horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2
Texture—silt loam or silty clay loam

BA horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—2 or 3

Bw horizon:
Value—3 to 5 moist; 4 to 6 dry
Chroma—3 or 4

BC horizon:
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 6
Texture—silty clay loam and silt loam

C horizon:
Hue—10YR to 5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 6

Martin Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landscape: Glaciated uplands
Parent material: Colluvium and residuum derived from shale material
Slope range: 1 to 12 percent
Taxonomic class: Fine, montmorillonitic, mesic Aquertic Argiudolls

Typical Pedon

Martin silty clay loam, 1 to 4 percent slopes, in an area of range 2,250 feet north and 250 feet east of the southwest corner of sec. 18, T. 1 S., R. 16 E.; USGS Morrill topographic quadrangle; lat. 39 degrees 57 minutes 48 seconds N. and long. 95 degrees 40 minutes 18 seconds W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; slightly hard, friable, sticky and plastic; moderately acid; clear smooth boundary.

BA—6 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 4/2) dry; weak fine granular structure; hard, firm, sticky and plastic; moderately acid; gradual smooth boundary.
Bt1—12 to 24 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; hard, very firm, sticky and plastic; common distinct clay films on faces of peds; neutral; gradual smooth boundary.
Bt2—24 to 41 inches; olive brown (2.5Y 4/3) silty clay, light olive brown (2.5Y 5/3) dry; few fine prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations; moderate medium subangular blocky structure; very hard, very firm, sticky and very plastic; common distinct clay films on faces of peds; few fine iron-manganese concretions; neutral; gradual smooth boundary.
BC—41 to 53 inches; olive brown (2.5Y 4/3) silty clay, light olive brown (2.5Y 5/3) dry; common fine prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations; weak medium subangular blocky structure; very hard, very firm, sticky and very plastic; few fine iron-manganese concretions; neutral; gradual smooth boundary.
C1—53 to 60 inches; light olive brown (2.5Y 5/3) silty clay, light yellowish brown (2.5Y 6/3) dry; common fine prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations; massive; very hard, very firm, very sticky and very plastic; few fine soft masses of lime; few fine iron-manganese concretions; neutral; gradual smooth boundary.
C2—60 to 80 inches; olive brown (2.5Y 4/4) silty clay, light olive brown (2.5Y 5/4) dry; few fine prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations; massive; very hard, very firm, very sticky and very plastic; common shale fragments; few fine soft masses of lime; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 36 inches
Content of clay in the control section: 40 to 55 percent

Ap horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

BA horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

Bt horizon:
Hue—10YR or 2.5Y
Value—2 to 4 moist; 3 to 5 dry
Chroma—2 to 4

BC horizon:
Hue—5YR to 2.5Y
Value—2 to 4 moist; 3 to 5 dry
Chroma—2 to 4

C horizon:
Hue—5YR or 2.5Y (variegated)
Value—2 to 5 moist; 3 to 6 dry
Chroma—2 to 4

Mayberry Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landscape: Glaciated uplands
Parent material: Till
Slope range: 2 to 6 percent
Taxonomic class: Fine, montmorillonitic, mesic Aquertic Argiudolls

Typical Pedon

Mayberry clay loam (fig. I-9), 2 to 6 percent slopes, in an area of cropland 175 feet south and 250 feet east of the northwest corner of sec. 17, T. 2 S., R. 15 E.; USGS Sabetha topographic quadrangle; lat. 39 degrees 53 minutes 4 seconds N. and long. 95 degrees 46 minutes 11 seconds W.

Ap1—0 to 5 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; hard, friable, sticky and plastic; common fine roots throughout; moderately acid; abrupt smooth boundary.
Ap2—5 to 10 inches; clay loam, 80 percent dark brown (7.5YR 3/2), 10 percent dark reddish brown (5YR 3/3), and 10 percent reddish brown (5YR 4/3); moderate medium angular blocky structure; hard, friable, sticky and plastic; common fine roots throughout; 5YR 4/4 material is mixed from below the tillage line; moderately acid; abrupt smooth boundary.
Bt1—10 to 16 inches; clay, 60 percent dark reddish brown (5YR 3/3) and 40 percent brown (10YR 5/3); weak coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, very sticky and very plastic; few fine roots throughout; common distinct dark brown (10YR 4/3) continuous clay films on vertical and horizontal faces of peds; slightly acid; gradual smooth boundary.
Bt2—16 to 21 inches; clay, 50 percent reddish brown (5YR 4/4) and 50 percent dark reddish brown (5YR 3/3); weak medium prismatic structure parting to weak medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few fine roots

throughout; cracks filled with 10YR 3/2 surface material; common distinct dark brown (10YR 4/3) continuous clay films on vertical and horizontal faces of peds; common fine rounded iron-manganese concretions; 1 percent igneous-granite pebbles; slightly acid; gradual smooth boundary.

Bt3—21 to 32 inches; clay, 60 percent dark reddish brown (5YR 3/3) and 40 percent brown (10YR 5/3); weak medium prismatic structure parting to weak medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few fine roots throughout; slickensides tilted at 30 percent from the horizontal; common distinct dark brown (10YR 4/3) continuous clay films on vertical and horizontal faces of peds and few discontinuous slickensides; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Bt4—32 to 42 inches; clay loam, 60 percent brown (7.5YR 5/4) and 40 percent strong brown (7.5YR 5/6); weak medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots throughout; common faint dark brown (10YR 4/3) discontinuous clay films on vertical and horizontal faces of peds; common fine rounded iron-manganese concretions; 1 percent igneous-granite pebbles; neutral; gradual wavy boundary.

BC—42 to 51 inches; clay loam, 80 percent yellowish brown (10YR 5/6) and 20 percent strong brown (7.5YR 5/6); weak medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots throughout; few prominent patchy manganese or iron-manganese stains; common faint dark brown (10YR 4/3) discontinuous clay films on vertical and horizontal faces of peds; common fine rounded iron-manganese concretions; 1 percent igneous-granite pebbles; neutral; gradual wavy boundary.

2C—51 to 80 inches; clay loam, 40 percent yellowish brown (10YR 5/6), 30 percent light yellowish brown (2.5Y 6/4), and 30 percent light gray (5Y 7/2); massive; extremely hard, very firm, very sticky and very plastic; pebbles smaller than 3 inches at top of stone line; 2 percent igneous-granite pebbles; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 22 inches
Content of clay in the control section: 40 to 50 percent

Ap horizon:
Hue—10YR or 7.5YR
Value—2 or 3 moist; 3 to 5 dry
Chroma—2 or 3

Bt horizon:
Hue—5YR to 10YR
Value—3 to 5 moist; 4 to 6 dry
Chroma—3 to 6
Texture—clay, sandy clay, or clay loam

BC horizon:
Hue—2.5Y, 7.5YR, or 10YR
Value—4 or 5 moist; 4 to 7 dry
Chroma—4 to 6
Texture—clay loam or clay

2C horizon:
Hue—2.5Y, 7.5YR, or 10YR
Value—4 to 6 moist; 5 to 7 dry
Chroma—2 to 6

Monona Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Loess uplands
Parent material: Loess
Slope range: 2 to 11 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludolls

Typical Pedon

Monona silt loam, 5 to 11 percent slopes, in an area of cropland 20 feet south and 1,500 feet west of the northeast corner of sec. 12, T. 1 S., R. 18 E.; USGS White Cloud topographic quadrangle; lat. 39 degrees 59 minutes 13 seconds N. and long. 95 degrees 20 minutes 41 seconds W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; clear smooth boundary.

A—6 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; gradual smooth boundary.

Bw—11 to 30 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.

C—30 to 80 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; few fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine pores; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 18 inches
Content of clay in the control section: 18 to 27 percent

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—2 or 3

Bw horizon:
Value—4 or 5 moist; 5 or 6 dry
Chroma—3 or 4

C horizon:
Value—4 or 5 moist; 5 to 7 dry
Chroma—4 to 6

Morrill Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landscape: Glaciated uplands
Parent material: Till
Slope range: 6 to 12 percent
Taxonomic class: Fine-loamy, mixed, mesic Typic Argiudolls

Typical Pedon

Morrill loam, 6 to 12 percent slopes, 1,400 feet south and 840 feet east of the northwest corner of sec. 9, T. 3 S., R. 18 E.; USGS Robinson topographic quadrangle; lat. 39 degrees 48 minutes 2 seconds N. and long. 95 degrees 24 minutes 43 seconds W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 4/3) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; 2 percent mixed pebbles; very strongly acid; clear smooth boundary.

BAt—6 to 12 inches; dark brown (10YR 3/3 and 7.5YR 3/4) loam, brown (10YR 4/3) dry; moderate medium granular structure; hard, firm, slightly sticky and slightly plastic; common fine roots; 2 percent mixed pebbles; strongly acid; gradual smooth boundary.

Bt1—12 to 22 inches; dark reddish brown (5YR 3/4) loam, strong brown (7.5YR 4/6) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine roots; many faint discontinuous clay films on faces of peds; 2 percent mixed pebbles; moderately acid; gradual smooth boundary.

Bt2—22 to 30 inches; reddish brown (5YR 4/4) sandy clay loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; common fine roots; many faint discontinuous clay films on faces of peds; 2 percent mixed pebbles; moderately acid; gradual wavy boundary.

Bt3—30 to 35 inches; yellowish red and brown (5YR 4/6 and 7.5YR 4/4) sandy clay loam, strong brown (7.5YR 5/6) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; common faint patchy clay films on faces of peds; 2 percent mixed pebbles; slightly acid; gradual wavy boundary.

Bt4—35 to 43 inches; brown and strong brown (7.5YR 4/4 and 4/6) sandy clay loam, strong brown (7.5YR 5/6) dry; mederate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few faint patchy clay films on faces of peds; few medium yellowish red (5YR 4/6) relict iron stains; 2 percent mixed pebbles; slightly acid; clear wavy boundary.

BC—43 to 52 inches; strong brown (7.5YR 4/4) fine sandy loam, reddish yellow (7.5YR 6/6) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common medium yellowish red (5YR 4/6) relict iron stains; 2 percent mixed pebbles; slightly acid; clear wavy boundary.

2C1—52 to 59 inches; strong brown (7.5YR 4/6) fine sandy loam, reddish yellow (7.5YR 6/6) dry; massive; slightly hard, very friable, slightly sticky and nonplastic; many fine yellowish red (5YR 4/6) relict iron stains; 2 percent mixed pebbles; slightly acid; clear wavy boundary.

2C2—59 to 73 inches; strong brown (7.5YR 4/6) loamy fine sand, reddish yellow (7.5YR 6/6) dry; single grain; loose, nonsticky and nonplastic; common coarse strong brown and yellowish red (7.5YR 5/8 and 5YR 5/6) relict iron stains; 2 percent mixed pebbles; slightly acid; gradual smooth boundary.

2C3—73 to 80 inches; strong brown (7.5YR 5/6) sand, reddish yellow (7.5YR 6/6) dry; single grain; loose, nonsticky and nonplastic; common coarse and very coarse rounded clay bodies throughout; 2 percent mixed pebbles; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Content of clay in the control section: 25 to 35 percent

A horizon:
Hue—10YR or 7.5YR
Value—2 or 3 moist; 3 to 5 dry
Chroma—2 or 3
Texture—loam

BA horizon:

Hue—10YR or 7.5YR
Value—2 or 3 moist; 3 to 5 dry
Chroma—2 or 3
Texture—clay loam or loam

Bt horizon:
Hue—7.5YR or 5YR
Value—3 or 4 moist; 4 or 5 dry
Chroma—4 to 6
Texture—clay loam, sandy clay loam, or gravelly clay loam

BC horizon:
Hue—7.5YR or 5YR
Value—3 to 5 moist; 4 to 6 dry
Chroma—4 to 6
Texture—clay loam, sandy clay loam, gravelly clay loam, loam, or sandy loam

C horizon:
Hue—7.5YR or 5YR
Value—4 or 5 moist; 4 to 6 dry
Chroma—4 to 6
Texture—clay loam, sandy clay loam, loam, or gravelly clay loam

Muscotah Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landscape: Valleys
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, mesic Cumulic Hapludolls

Typical Pedon

Muscotah silty clay loam, occasionally flooded (fig. I-10), 500 feet north and 230 feet west of the southeast corner of sec. 18, T. 4 S., R. 16 E.; USGS Horton Northwest topographic quadrangle; lat. 39 degrees 41 minutes 52 seconds N. and long. 95 degrees 39 minutes 31 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine roots throughout; neutral; clear wavy boundary.
A1—9 to 16 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots throughout; neutral; gradual smooth boundary.
A2—16 to 23 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; few fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots throughout; neutral; clear smooth boundary.
Bw1—23 to 35 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots throughout; few distinct slickensides; neutral; gradual smooth boundary.
Bw2—35 to 44 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct slickensides; neutral; gradual smooth boundary.
Bw3—44 to 60 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common fine faint very dark grayish brown (10YR 3/2) mottles; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct slickensides; few fine rounded iron-manganese concretions; neutral; gradual wavy boundary.
Bw4—60 to 70 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common medium distinct dark grayish brown (2.5Y 4/2) mottles; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct discontinuous intersecting slickensides; few fine rounded iron-manganese concretions and few medium irregular carbonate nodules; neutral; gradual wavy boundary.
Bg—70 to 80 inches; olive gray (5Y 4/2) silty clay, olive gray (5Y 5/2) dry; common fine prominent olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; free water at a depth of 75 inches; common distinct discontinuous intersecting slickensides; few fine rounded iron-manganese concretions and common fine and medium irregular carbonate nodules; neutral.

Range in Characteristics

Thickness of the mollic epipedon: Greater than 36 inches
Depth to mottles: 16 to 32 inches
Depth to mottles that have chroma of 2 or less: 43 to 60 inches
Content of clay in the control section: 35 to 50 percent

Ap horizon:

Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—silty clay loam or silt loam

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 4 moist; 3 to 5 dry
Chroma—1 or 2
Texture—silty clay loam or silty clay

Bg horizon:
Hue—2.5Y or 5Y
Value—2 to 5 moist; 3 to 6 dry
Chroma—1 or 2
Texture—silty clay loam or silty clay

Netawaka Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Loess uplands
Parent material: Loess
Slope range: 10 to 30 percent
Taxonomic class: Coarse-silty, mixed (calcareous), mesic Typic Udorthents

Typical Pedon

Netawaka silt loam (fig. I-11), in an area of Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded; in an area of cropland 150 feet south and 750 feet east of the northwest corner of sec. 12, T. 1 S., R. 18 E.; USGS White Cloud topographic quadrangle; lat. 39 degrees 59 minutes 12 seconds N. and long. 95 degrees 21 minutes 22 seconds W.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots throughout; slightly alkaline; abrupt smooth boundary.
AC—6 to 9 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate medium platy structure parting to moderate medium angular blocky; hard, friable, slightly sticky and slightly plastic; many fine and medium roots between peds; slightly alkaline; clear wavy boundary.
C1—9 to 23 inches; olive brown (2.5Y 4/4) silt loam, light yellowish brown (2.5Y 6/4) dry; common medium and coarse distinct light brownish gray (2.5Y 6/2) and few fine prominent strong brown (7.5YR 5/6) mottles; weak fine and medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; slightly effervescent; moderately alkaline; gradual wavy boundary.
C2—23 to 36 inches; silt loam, 50 percent light olive brown (2.5Y 5/4) and 50 percent grayish brown (2.5Y 5/2); light gray (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) dry; few medium prominent yellowish brown (7.5YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine pores; grays and browns are banded; few medium wormcasts; color bands are tilted somewhat parallel to surface; moderately alkaline; slightly effervescent; gradual smooth boundary.
C3—36 to 46 inches; silt loam, 50 percent light olive brown (2.5Y 5/4) and 50 percent grayish brown (2.5Y 5/2); light gray (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) dry; few medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots throughout; few very fine pores; gray bands contain more carbonates; slightly effervescent; moderately alkaline; clear wavy boundary.
C4—46 to 61 inches; grayish brown (2.5Y 5/2) silt loam, light grayish brown (2.5Y 6/2) dry; few coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; slightly effervescent; slightly alkaline; diffuse smooth boundary.
C5—61 to 80 inches; grayish brown (2.5Y 5/2) silt loam, light grayish brown (2.5Y 6/2) dry; common medium and coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; slightly alkaline; slightly effervescent.

Range in Characteristics

Depth to carbonates: 0 to 9 inches
Content of clay in the control section: 12 to 18 percent

A horizon:
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 or 3

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 6

Nodaway Series

Depth class: Very deep

Figure I-7.—Profile of Aksarben silty clay loam. Depth is marked in feet.

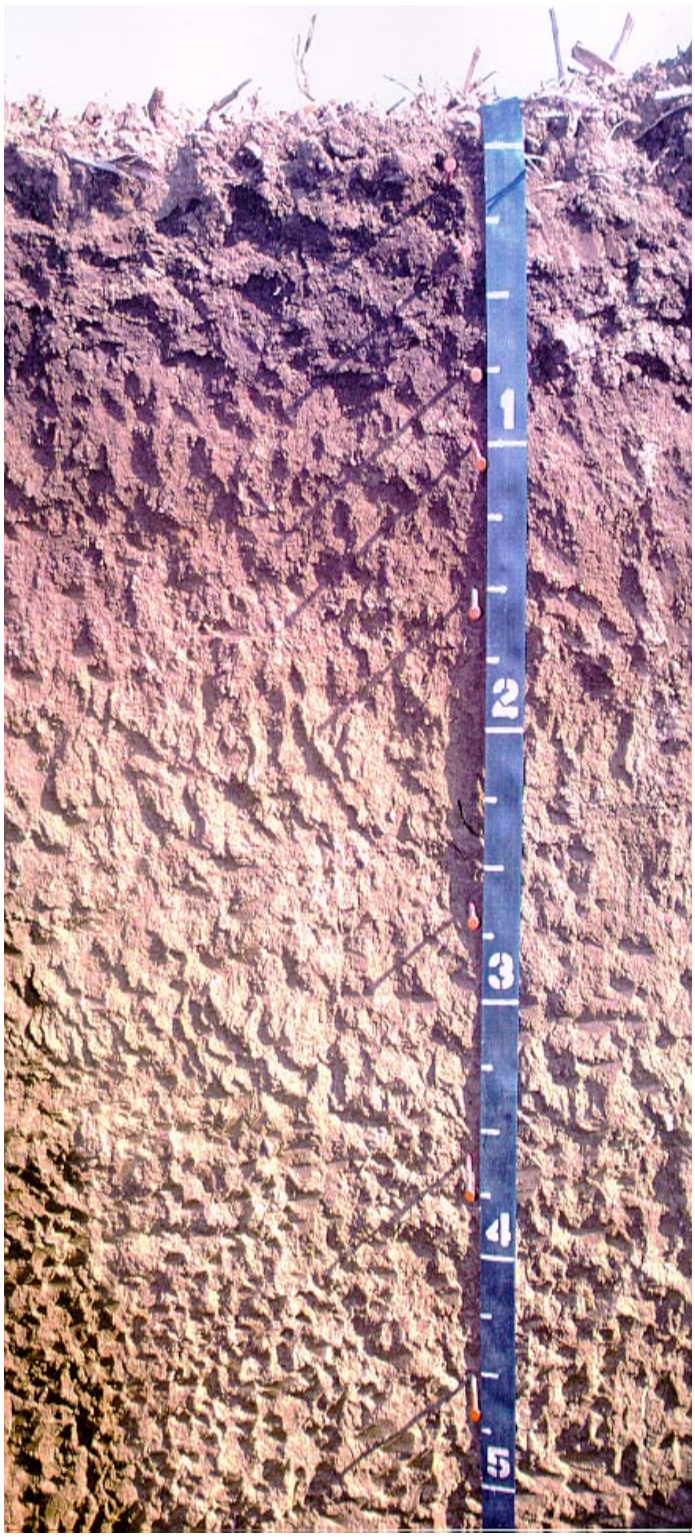

Figure I-8.—Profile of Marshall silt loam. Depth is marked in feet.

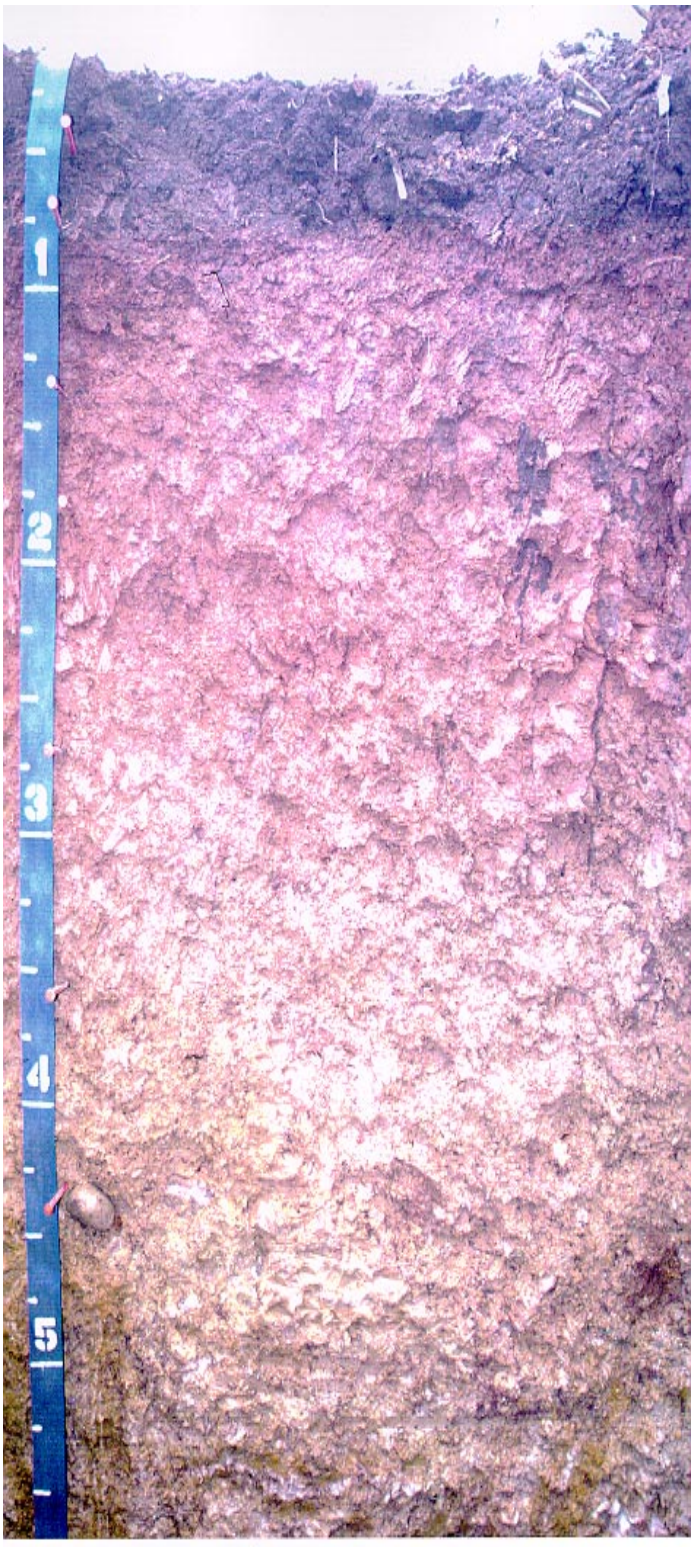

Figure I-9.—Profile of Mayberry clay loam. The dark stains in the upper part of the subsoil are surface material that has moved downward through cracks. This soil has a high shrink-swell potential.

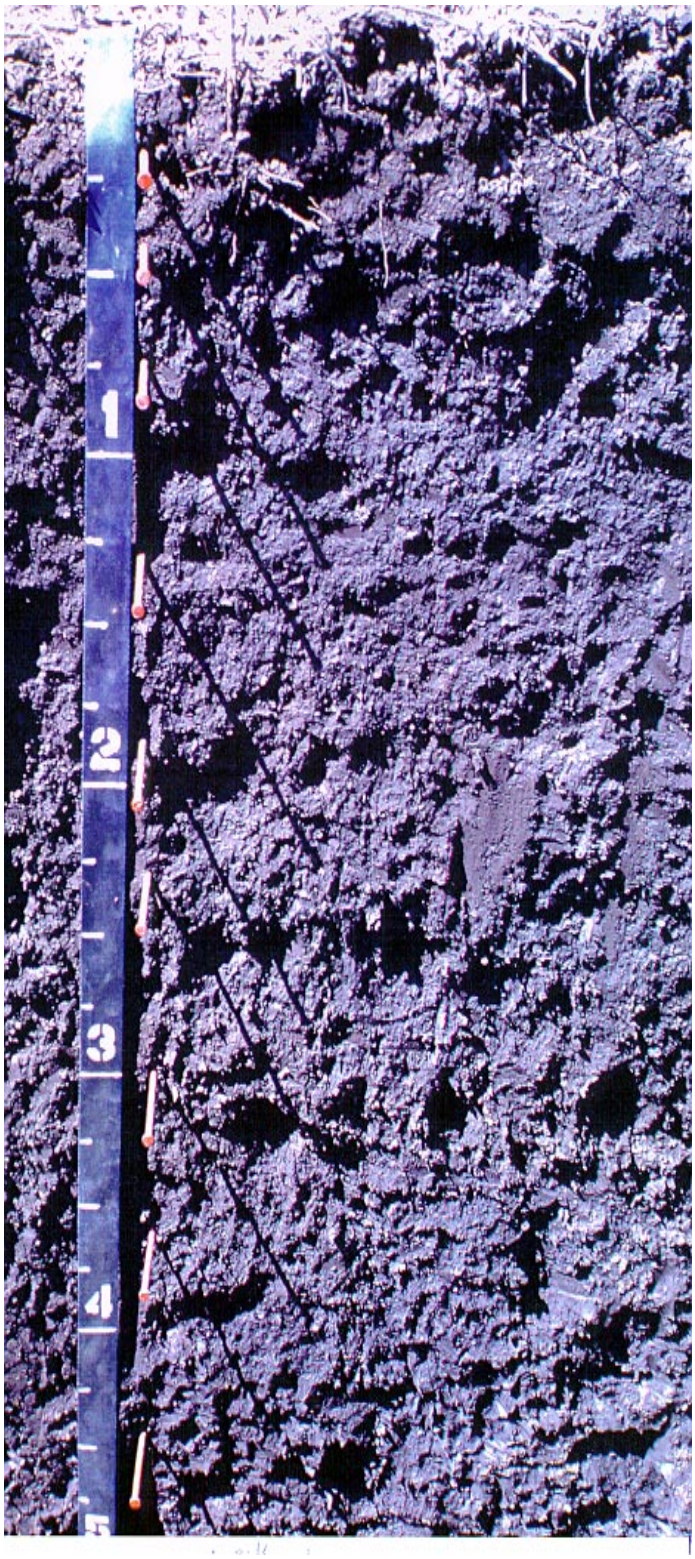

Figure I-10.—Profile of Muscotah silty clay loam. This soil is dark to a depth of about 3.5 feet. Depth is marked in feet.

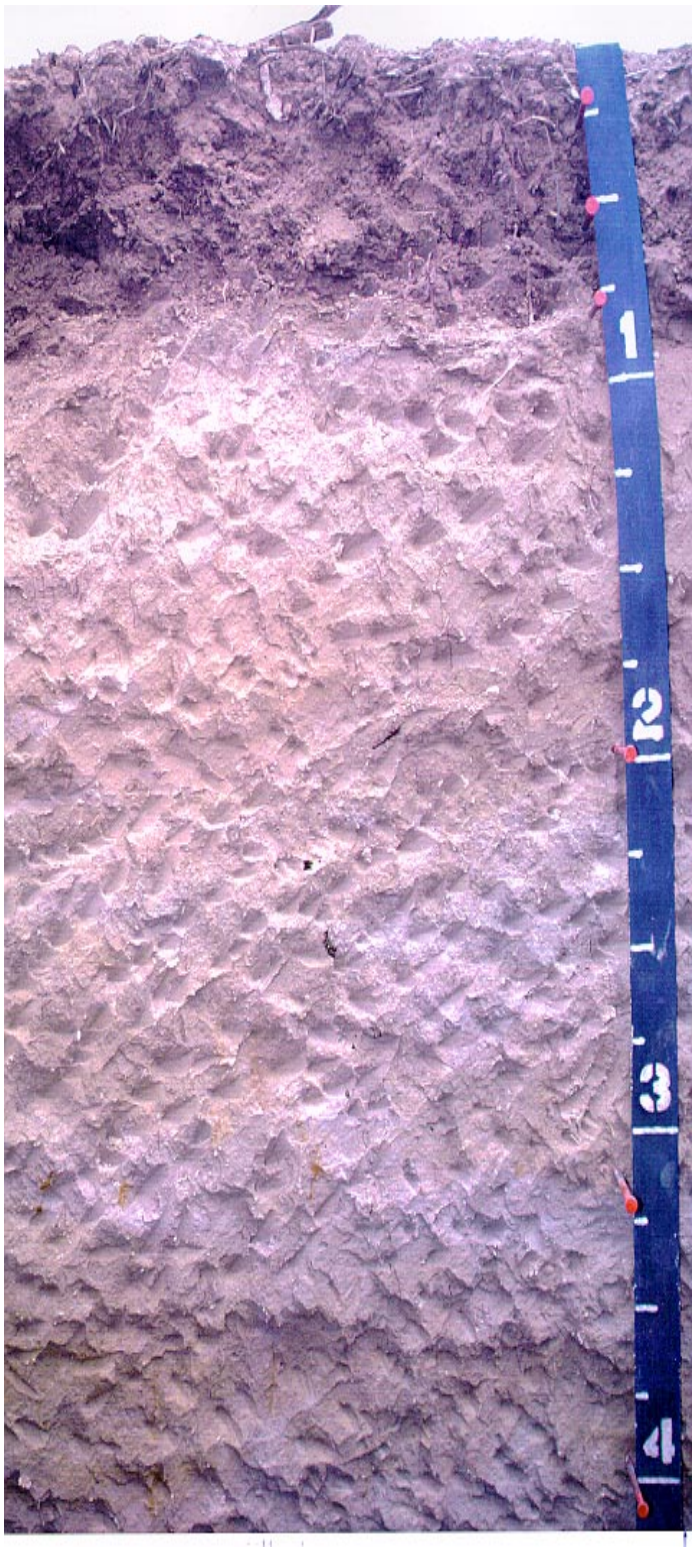

Figure I-11.—Profile of Netawaka silt loam. The yellowish brown colors at a depth of about 2.5 feet are redoximorphic accumulations.

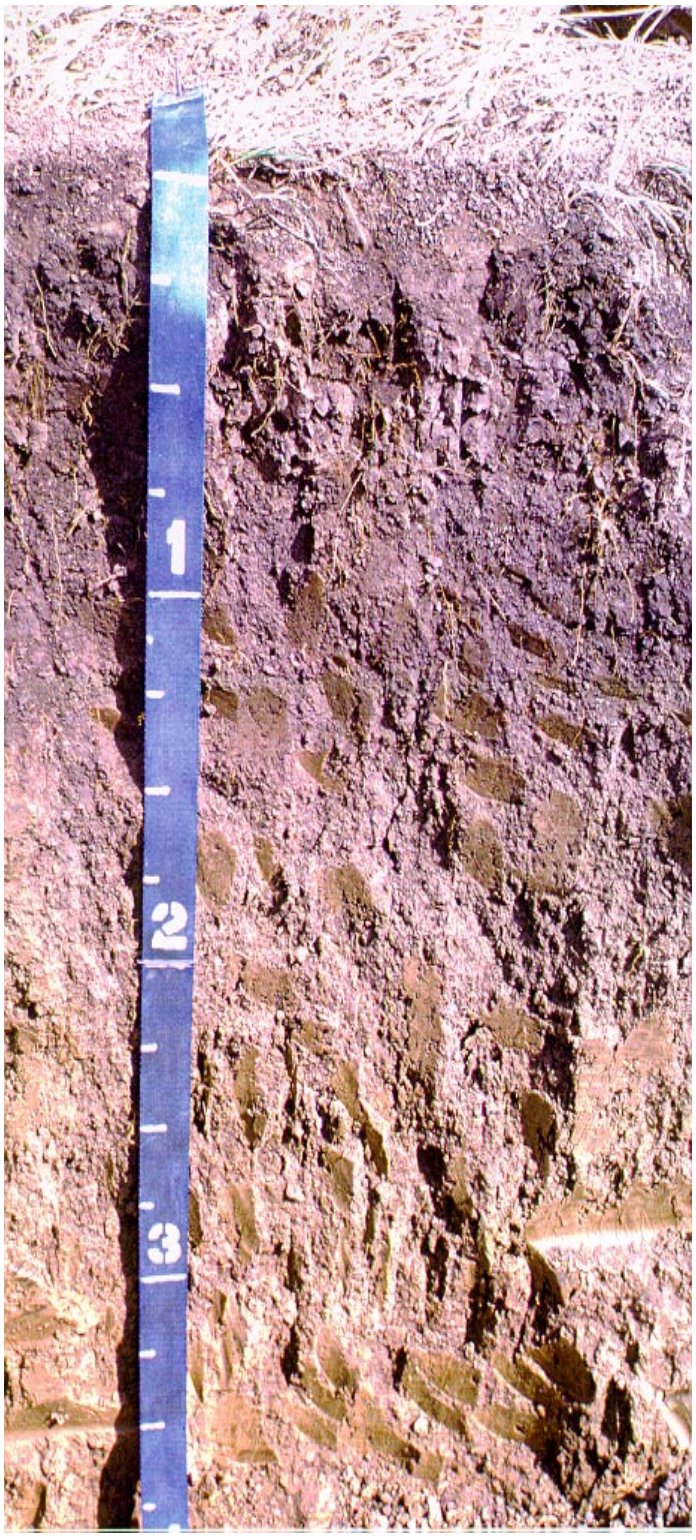

Figure I-12.—Profile of Pawnee clay loam. Depth is marked in feet.

Figure I-13.—Profile of Sogn silty clay loam. Hard bedrock is at a depth of about 15 inches. Depth is marked in feet.

Figure I-14.—Profile of Wamego silty clay loam. Paralithic contact is at a depth of about 2 feet.

Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Valleys, loess uplands
Parent material: Alluvium
Slope range: 0 to 1 percent
Taxonomic class: Fine-silty, mixed, mesic Mollic Udifluvents

Typical Pedon

Nodaway silt loam, occasionally flooded, 100 feet south and 1,900 feet west of the northeast corner of sec. 4, T. 1 S., R. 18 E.; USGS Highland Northwest topographic quadrangle; lat. 39 degrees 59 minutes 58 seconds N. and long. 95 degrees 24 minutes 11 seconds W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.
C1—6 to 12 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; massive with evidence of horizontal cleavage planes; slightly hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.
C2—12 to 53 inches; mixed dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2), stratified silt loam, mixed grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) dry; few faint dark brown (10YR 4/3) irregularly shaped iron accumulations; massive with evidence of horizontal cleavage planes; soft, very friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.
2C3—53 to 80 inches; black (10YR 2/1), stratified silty clay loam, very dark gray (10YR 3/1) dry; massive; hard, firm, sticky and plastic; very few distinct dark brown (10YR 4/3) irregularly shaped iron accumulations; iron stains; neutral.

Range in Characteristics

Depth to mottles: 12 to 36 inches
Content of clay in the control section: 18 to 27 percent

Ap horizon:
Chroma—1 or 2

C horizon:
Value—2 to 5 moist; 3 to 6 dry
Chroma—1 or 2
Texture—stratified silt loam, loam, and silty clay loam

Olmitz Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Glaciated uplands
Parent material: Local alluvium
Slope range: 2 to 5 percent
Taxonomic class: Fine-loamy, mixed, mesic Cumulic Hapludolls

Typical Pedon

Olmitz loam, 2 to 5 percent slopes, in an area of cropland 150 feet north and 1,800 feet east of the southwest corner of sec. 24, T. 4 S., R. 15 E.; USGS Horton Northwest topographic quadrangle; lat. 39 degrees 40 minutes 56 seconds N. and long. 95 degrees 41 minutes 17 seconds W.

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; clear smooth boundary.
A—7 to 20 inches; very dark brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; gradual smooth boundary.
Bw1—20 to 27 inches; dark brown (10YR 3/3) clay loam, dark brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.
Bw2—27 to 42 inches; dark brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.
BC—42 to 80 inches; dark brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; hard, friable, sticky and plastic; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: Greater than 24 inches
Content of clay in the control section: 25 to 34 percent

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

Bw horizon:
Value—3 or 4 moist; 4 or 5 dry
Chroma—2 or 3
Texture—loam or clay loam

BC horizon:

Value—3 or 4 moist; 4 or 5 dry
Chroma—2 or 3
Texture—loam or clay loam

Oska Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Landscape: Uplands
Parent material: Residuum derived from limestone and shale
Slope range: 5 to 9 percent
Taxonomic class: Fine, montmorillonitic, mesic Typic Argiudolls

Typical Pedon

Oska silty clay loam, in an area of Padonia-Oska silty clay loams, 5 to 9 percent slopes, 2,000 feet south and 650 feet west of the northeast corner of sec. 17, T. 2 S., R. 15 E.; USGS Sabetha topographic quadrangle; lat. 39 degrees 52 minutes 47 seconds N. and long. 95 degrees 45 minutes 8 seconds W.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; strong medium granular structure; slightly hard, friable, sticky and plastic; many fine roots throughout; slightly acid; clear smooth boundary.
BA—5 to 11 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; strong fine subangular blocky structure; hard, friable, sticky and plastic; many fine roots throughout; slightly acid; clear smooth boundary.
Bt1—11 to 19 inches; dark brown (7.5YR 3/2) silty clay, brown (7.5YR 4/2) dry; strong fine and medium subangular blocky structure; very hard, firm, sticky and plastic; many fine roots throughout; few faint discontinuous clay films (cutans) on vertical and horizontal faces of peds; slightly acid; gradual smooth boundary.
Bt2—19 to 29 inches; silty clay, 50 percent brown (7.5YR 4/4) and 50 percent dark brown (7.5YR 3/3); weak medium subangular blocky structure; very hard, very firm, sticky and plastic; many fine roots throughout; common distinct continuous clay films (cutans); few fine rounded soft masses of iron-manganese; moderately acid; gradual smooth boundary.
Bt3—29 to 35 inches; dark brown (7.5YR 3/3) and brown (7.5YR 4/3) silty clay; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots throughout; common distinct continuous clay films (cutans); 1 percent pebbles, mostly limestone; moderately acid; abrupt wavy boundary.
R—35 to 38 inches; limestone bedrock.

Range in Characteristics

Depth to lithic contact:: 20 to 40 inches
Thickness of the mollic epipedon: 9 to 20 inches
Content of clay in the control section: 35 to 52 percent

Ap horizon:
Hue—10YR or 7.5YR
Value—2 or 3 moist; 3 or 4 dry

BA horizon:
Hue—7.5YR or 10YR
Value—2 to 4 moist; 3 to 5 dry
Texture—silty clay or silty clay loam

Bt horizon:
Hue—7.5YR or 5YR
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 to 6
Texture—silty clay loam or silty clay

Padonia Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Landscape: Uplands
Parent material: Residuum derived from calcareous shale
Slope range: 5 to 25 percent
Taxonomic class: Fine, mixed, mesic Typic Argiudolls

Typical Pedon

Padonia silty clay loam, in an area of Padonia-Oska silty clay loams, 5 to 9 percent slopes, 400 feet north and 1,250 feet east of the southwest corner of sec. 6, T. 1 S., R. 15 E.; USGS Sabetha topographic quadrangle; lat. 39 degrees 59 minutes 16 seconds N. and long. 95 degrees 46 minutes 58 seconds W.

A1—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots throughout; slightly acid; clear smooth boundary.
A2—6 to 11 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; very hard, firm, sticky and plastic; common fine roots throughout; neutral; gradual smooth boundary.
Bt—11 to 22 inches; dark brown (10YR 4/3) silty clay, brown (10YR 5/3) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few prominent clay films on faces of peds;

few fine roots throughout; neutral; gradual smooth boundary.
Btk—22 to 32 inches; mixed dark yellowish brown (10YR 4/4) and olive gray (5Y 4/2) silty clay, yellowish brown (10YR 5/4) and olive gray (5Y 5/2) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct clay films on faces of peds; few fine roots throughout; few fine soft masses of lime; moderately alkaline; gradual wavy boundary.
BCk—32 to 37 inches; olive gray (5Y 5/2) silty clay loam, light olive gray (5Y 6/2) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; few fine roots throughout; strongly effervescent; moderately alkaline; gradual wavy boundary.
Cr—37 inches; unweathered, calcareous shale.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Thickness of the mollic epipedon: 7 to 20 inches
Content of clay in the control section: 35 to 50 percent

A horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2

Bt horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 to 6
Texture—silty clay or silty clay loam

BCk horizon:
Hue—5YR to 5Y
Value—4 to 6 moist; 5 to 7 dry
Chroma—2 to 4
Texture—silty clay loam
Texture of the fine-earth fraction—27 to 40 percent

Pawnee Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landscape: Glaciated uplands
Parent material: Till
Slope range: 2 to 12 percent
Taxonomic class: Fine, montmorillonitic, mesic Aquertic Argiudolls

Typical Pedon

Pawnee clay loam (fig. I-12), 2 to 6 percent slopes, in an area of cropland 200 feet north and 1,600 feet west of the southeast corner of sec. 19, T. 4 S., R. 15 E.; USGS Wetmore topographic quadrangle; lat. 39 degrees 40 minutes 57 seconds N. and long. 95 degrees 46 minutes 33 seconds W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, sticky and plastic; slightly acid; clear smooth boundary.
BA—7 to 12 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; hard, firm, sticky and plastic; slightly acid; gradual smooth boundary.
Bt1—12 to 26 inches; dark brown (10YR 4/3) clay, brown (10YR 5/3) dry; few fine distinct brown (7.5YR 4/4) irregularly shaped iron accumulations; moderate fine angular blocky structure; very hard, very firm, very sticky and very plastic; common distinct clay films on faces of peds; neutral; gradual smooth boundary.
Bt2—26 to 38 inches; olive brown (2.5Y 4/4) clay, light olive brown (2.5Y 5/4) dry; few fine and medium prominent dark brown (7.5YR 4/4) irregularly shaped iron accumulations; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common prominent clay films on faces of peds; neutral; gradual smooth boundary.
BC—38 to 48 inches; light olive brown (2.5Y 5/4) clay loam, light brown (2.5Y 6/3) dry; many medium prominent strong brown (7.5YR 5/6) irregularly shaped iron accumulations; weak medium angular blocky structure; very hard, very firm, sticky and plastic; few fine pebbles; slightly alkaline; gradual smooth boundary.
C—48 to 80 inches; grayish brown (2.5Y 5/2) clay loam, light brownish gray (2.5Y 6/2) dry; few medium prominent strong brown (7.5YR 5/6) irregularly shaped iron accumulations; weak angular blocky structure; very hard, very firm, sticky and plastic; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 19 inches
Depth to mottles: 12 to 30 inches
Content of clay in the control section: 40 to 48 percent

Ap horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2
Texture—clay or clay loam

BA horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—clay or clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 to 4

BC horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 to 4
Texture—clay or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 moist; 6 or 7 dry
Chroma—2 to 4
Texture—clay loam or sandy clay loam

Pohocco Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Loess uplands
Parent material: Loess
Slope range: 11 to 30 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Eutrochrepts

Typical Pedon

Pohocco silt loam, in an area of Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded; in an area of cropland 2,050 feet north and 1,700 feet west of the southeast corner of sec. 1, T. 1 S., R. 18 E.; USGS White Cloud topographic quadrangle; lat. 39 degrees 59 minutes 35 seconds N. and long. 95 degrees 20 minutes 44 seconds W.

Ap1—0 to 2 inches; dark brown (10YR 3/3) silt loam, light yellowish brown (10YR 6/4) dry; strong medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; moderately acid; clear smooth boundary.

Ap2—2 to 5 inches; brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and few medium roots throughout; moderately acid; clear smooth boundary.

Bw1—5 to 20 inches; yellowish brown (10YR 5/4) silt loam, brownish yellow (10YR 6/6) dry; weak medium prismatic structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine and few medium roots throughout; neutral; clear wavy boundary.

Bw2—20 to 39 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (2.5Y 6/4) dry; many medium and coarse prominent light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and few medium roots throughout; common prominent patchy manganese or iron-manganese stains; slightly effervescent; moderately alkaline; diffuse smooth boundary.

C1—39 to 59 inches; light yellowish brown (10YR 6/4) silt loam, pale yellow (2.5Y 7/4) dry; common medium and coarse prominent light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots throughout; many very fine pores; few old root channels (voids) 2 centimeters in diameter; common prominent patchy manganese or iron-manganese stains; few medium cylindrical iron-manganese concretions; few medium irregular carbonate concretions; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—59 to 67 inches; light yellowish brown (10YR 6/4) silt loam, pale yellow (2.5Y 7/4) dry; common medium prominent light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; few fine pores; iron-manganese concretions appear to follow old root channels; common prominent patchy manganese or iron-manganese stains; few medium cylindrical iron-manganese concretions; few medium irregular carbonate concretions; slightly effervescent; moderately alkaline; clear wavy boundary.

C3—67 to 80 inches: light yellowish brown (10YR 6/4) silt loam, pale yellow (2.5Y 7/4) dry; common medium prominent light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine pores; carbonate threads on vertical prism faces; few prominent patchy manganese or iron-manganese stains; common cylindrical carbonate threads; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to mottles: 20 to 40 inches (relict features)
Depth to carbonates: 12 to 30 inches
Content of clay in the control section: 20 to 30 percent

Ap horizon:
Hue—10YR or 2.5Y
Value—3 or 4 moist; 5 or 6 dry
Chroma—2 to 4

Bw horizon:

Hue—10YR or 2.5Y
Value—4 to 6 moist; 5 to 7 dry
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 5Y
Value—4 to 6 moist; 5 to 7 dry
Chroma—2 to 6

Reading Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landscape: Valleys
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Pachic Argiudolls

Typical Pedon

Reading silt loam, moderately wet, rarely flooded, in an area of cropland 700 feet north and 2,550 feet east of the southwest corner of sec. 4, T. 3 S., R. 15 E.; USGS Fairview topographic quadrangle; lat. 39 degrees 48 minutes 52 seconds N. and long. 95 degrees 44 minutes 28 seconds W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; abrupt smooth boundary.
A—6 to 18 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; gradual smooth boundary.
Bt1—18 to 28 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; hard, firm, sticky and plastic; few prominent clay films on faces of peds; slightly acid; gradual smooth boundary.
Bt2—28 to 48 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few prominent clay films on faces of peds; slightly acid; gradual smooth boundary.
BC—48 to 54 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine prominent reddish brown (5YR 5/4) irregularly shaped iron accumulations; weak fine subangular blocky structure; hard, firm, sticky and plastic; slightly acid; gradual smooth boundary.
C—54 to 80 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine prominent reddish brown (5YR 5/4) irregularly shaped iron accumulations; massive; hard, firm, sticky and plastic; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: Greater than 24 inches
Depth to mottles: 48 to 60 inches
Content of clay in the control section: 27 to 35 percent

A horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2

Bt horizon:
Hue—10YR or 7.5YR
Value—2 to 4 moist; 3 to 5 dry
Chroma—2 to 4

BC horizon:
Hue—10YR or 7.5YR
Value—2 to 4 moist; 3 to 5 dry
Chroma—2 to 4

C horizon:
Hue—10YR or 7.5YR
Value—4 or 5 moist; 5 or 6 dry
Chroma—2 to 4
Texture—silty clay or silty clay loam

Shelby Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landscape: Glaciated uplands
Parent material: Till
Slope range: 6 to 18 percent
Taxonomic class: Fine-loamy, mixed, mesic Typic Argiudolls

Typical Pedon

Shelby clay loam, 6 to 12 percent slopes, in an area of cropland 1,100 feet north and 820 feet west of the southeast corner of sec. 7, T. 2 S., R. 18 E.; USGS Highland Northwest topographic quadrangle; lat. 39 degrees 53 minutes 28 seconds N. and long. 95 degrees 26 minutes 12 seconds W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; slightly hard, friable, sticky and plastic; moderately acid; clear smooth boundary.

AB—8 to 13 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; moderately acid; gradual smooth boundary.
Bt1—13 to 21 inches; dark brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common prominent clay films on faces of peds; slightly acid; gradual smooth boundary.
Bt2—21 to 36 inches; dark yellowish brown (10YR 4/4) clay loam, yellowish brown (10YR 5/4) dry; common medium prominent strong brown (7.5YR 5/6) irregularly shaped iron accumulations and distinct grayish brown (10YR 5/2) irregularly shaped iron depletions; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common prominent clay films on faces of peds; slightly acid; gradual smooth boundary.
BC—36 to 48 inches; dark yellowish brown (10YR 4/4) clay loam, yellowish brown (10YR 5/4) dry; common medium prominent strong brown (7.5YR 5/6) irregularly shaped iron accumulations; weak medium subangular blocky structure; hard, firm, sticky and plastic; slightly acid; diffuse smooth boundary.
C—48 to 80 inches; light olive brown (2.5Y 5/4) clay loam, light yellowish brown (2.5Y 6/4) dry; common coarse prominent strong brown (7.5YR 5/6) irregularly shaped iron accumulations and grayish brown (10YR 5/2) irregularly shaped iron depletions; massive; hard, firm, sticky and plastic; few fine pebbles; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to carbonates: 40 to 60 inches
Content of clay in the control section: 30 to 35 percent

Ap horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—clay loam or loam
Content of rock fragments—0 to 20 percent

AB horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—2 or 3
Texture—clay loam or loam
Content of rock fragments—0 to 20 percent

Bt horizon:
Value—3 to 5 moist; 4 to 6 dry
Chroma—3 or 4
Texture—clay loam
Content of rock fragments—0 to 20 percent

BC horizon:
Value—3 to 5 moist; 4 to 6 dry
Chroma—3 or 4
Texture—clay loam or loam
Content of rock fragments—0 to 20 percent

C horizon:
Value—4 or 5 moist; 5 or 6 dry
Chroma—3 or 4
Texture—clay loam or loam
Content of rock fragments—0 to 20 percent

Sogn Series

Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Moderate
Landscape: Glaciated uplands
Parent material: Residuum derived from limestone
Slope range: 5 to 30 percent
Taxonomic class: Loamy, mixed, mesic Lithic Haplustolls

Typical Pedon

Sogn silty clay loam (fig. I-13), in an area of Kipson-Sogn silty clay loams, 5 to 30 percent slopes; in an area of range 10 feet north and 1,100 feet west of the southeast corner of sec. 31, T. 3 S., R. 15 E.; USGS Wetmore topographic quadrangle; lat. 39 degrees 44 minutes 23 seconds N. and long. 95 degrees 46 minutes 28 seconds W.

A—0 to 12 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots throughout; neutral; 12 percent channers; abrupt smooth boundary.
R—12 inches; limestone.

Range in Characteristics

Thickness of the mollic epipedon: 4 to 20 inches
Content of clay in the control section: 27 to 35 percent
Content of rock fragments in the control section: 0 to 35 percent
Depth to bedrock: 10 to 20 inches

A horizon:
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 to 3

Steinauer Series

Depth class: Very deep
Drainage class: Well drained

Permeability: Moderately slow
Landscape: Glaciated uplands
Parent material: Calcareous glacial till
Slope range: 12 to 18 percent
Taxonomic class: Fine-loamy, mixed (calcareous), mesic Typic Udorthents.

Typical Pedon

Steinauer clay loam, in an area of Burchard-Steinauer clay loams, 12 to 18 percent slopes; in an area of range 2,000 feet north and 100 feet west of the southeast corner of sec. 31, T. 4 S., R. 15 E.; USGS Wetmore topographic quadrangle; lat. 39 degrees 39 minutes 32 seconds N. and long. 95 degrees 46 minutes 12 seconds W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, grayish brown (10YR 5/2) dry; weak medium granular structure; slightly hard, friable, sticky and plastic; slightly effervescent; slightly alkaline; abrupt smooth boundary.
AC—6 to 14 inches; yellowish brown (10YR 5/4) clay loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline; clear smooth boundary.
C1—14 to 38 inches; grayish brown (10YR 5/2) clay loam, light brownish gray (10YR 6/2) dry; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; diffuse smooth boundary.
C2—38 to 80 inches; yellowish brown (10YR 5/4) clay loam, light yellowish brown (10YR 6/4) dry; massive; hard, firm, sticky and plastic; common fine and medium soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Content of clay in the control section: 24 to 35 percent
Content of rock fragments in the control section: 0 to 10 percent

A horizon:
Value—4 or 5 moist; 5 or 6 dry
Texture—clay loam or loam
Content of rock fragments—0 to 10 percent
Calcium carbonate equivalent—0 to 5

AC horizon:
Hue—10YR or 2.5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—1 to 4
Texture—clay loam or loam
Content of rock fragments—0 to 10 percent
Calcium carbonate equivalent—5 to 15

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6 moist; 6 or 7 dry
Chroma—2 to 4
Texture—clay loam or loam
Content of rock fragments—0 to 10 percent
Calcium carbonate equivalent—5 to 15

Vinland Series

Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Moderate
Landscape: Glaciated uplands
Parent material: Shale
Slope range: 3 to 15 percent
Taxonomic class: Loamy, mixed, mesic shallow Typic Hapludolls

Typical Pedon

Vinland silty clay loam, in an area of Wamego-Vinland silty clay loams, 3 to 15 percent slopes, 350 feet north and 500 feet west of the southeast corner of sec. 34, T. 4 S., R. 17 E.; USGS Everest topographic quadrangle; lat. 39 degrees 39 minutes 14 seconds N. and long. 95 degrees 29 minutes 29 seconds W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium angular blocky structure; hard, friable, sticky and plastic; slightly acid; gradual smooth boundary.
Bw—8 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; 10 percent shale fragments; hard, firm, sticky and plastic; slightly acid; gradual smooth boundary.
C—12 to 19 inches; light olive brown (2.5Y 5/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry; massive; 20 percent shale fragments; hard, firm, sticky and plastic; slightly acid; clear smooth boundary.
Cr—19 to 23 inches; partially weathered shale.

Range in Characteristics

Depth to paralithic contact: 10 to 20 inches
Thickness of the mollic epipedon: 7 to 15 inches
Content of clay in the control section: 24 to 35 percent
Content of rock fragments in the control section: 0 to 15 percent

A horizon:
Hue—10YR or 7.5YR

Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2
Texture—silty clay loam or silt loam
Content of rock fragments—0 to 15 percent

Bw horizon:
Hue—7.5YR to 5Y
Value—2 to 5 moist; 3 to 6 dry
Chroma—2 to 4
Texture—silty clay loam or silt loam
Content of rock fragments—0 to 15 percent

C horizon:
Hue—7.5YR to 5Y
Value—4 to 7 moist; 5 to 8 dry
Chroma—2 to 4
Texture—fine sandy loam, loam, silt loam, or silty clay loam
Content of rock fragments—0 to 15 percent

Wabash Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landscape: Valleys
Parent material: Alluvium
Slope range: 0 to 1 percent
Taxonomic class: Fine, montmorillonitic, mesic Vertic Endoaquolls

Typical Pedon

Wabash silty clay, occasionally flooded, 500 feet north and 230 feet west of the southeast corner of sec. 18, T. 4 S., R. 16 E.; USGS White Cloud topographic quadrangle; lat. 39 degrees 59 minutes 35 seconds N. and long. 95 degrees 20 minutes 44 seconds W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) and very dark gray (10YR 3/1) silty clay; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine roots throughout; neutral; clear smooth boundary.
A—7 to 15 inches; black (10YR 2/1) and very dark gray (2.5Y 3/0) silty clay; moderate coarse blocky structure; extremely hard, firm, sticky and plastic; few fine dark accumulations; very fine roots throughout; neutral; gradual smooth boundary.
Bg1—15 to 30 inches; very dark gray (10YR 3/1 and 2.5YR 3/0) silty clay; moderate fine subangular blocky structure; very hard, very firm, sticky and plastic; few dark accumulations of iron or manganese; very fine roots throughout; neutral; clear smooth boundary.
Bg2—30 to 50 inches; black (10YR 3/1) silty clay; few fine faint dark brown (10YR 3/3) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots throughout; few distinct discontinuous slickensides; neutral; gradual smooth boundary.
Bg3—50 to 60 inches; very dark gray (10YR 3/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct discontinuous slickensides; neutral; gradual smooth boundary.
Bg4—60 to 80 inches; very dark gray (10YR 3/1) silty clay; few very fine very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few pockets of 10YR 4/2 material up to 3 centimeters in size (krotovinas); common distinct discontinuous slickensides; neutral.

Range in Characteristics

Thickness of the mollic epipedon: Greater than 36 inches
Depth to mottles: 16 to 32 inches
Depth to mottles that have chroma of 2 or less: 43 to 60 inches
Content of clay in the control section: 35 to 55 percent

Ap horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2
Texture—silty clay loam or silt loam

A horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

Bg horizon:
Hue—10YR to 5Y
Value—2 to 5 moist; 3 to 6 dry
Chroma—1 or 2

Wamego Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Landscape: Glaciated uplands
Parent material: Residuum derived from acid shale
Slope range: 3 to 15 percent
Taxonomic class: Fine, mixed, mesic Typic Argiudolls

Typical Pedon

Wamego silty clay loam (fig. I-14), 3 to 7 percent slopes, 2,500 feet south and 150 feet west of the northeast corner of sec. 28, T. 4 S., R. 17 E.; USGS Horton topographic

quadrangle; lat. 39 degrees 40 minutes 29 seconds N. and long. 95 degrees 30 minutes 32 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam; strong medium granular structure; hard, friable, slightly sticky and slightly plastic; many fine and few medium roots throughout; slightly acid; clear smooth boundary.

Bt1—9 to 16 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; many fine roots throughout; black stains on faces of peds and very few clay films on vertical and horizontal faces of peds; 2 percent shale pebbles; slightly acid; clear wavy boundary.

Bt2—16 to 20 inches; olive brown (2.5Y 4/4) silty clay loam; few fine distinct light brownish gray (2.5Y 6/2) and common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; few fine roots throughout; few discontinuous distinct clay films on vertical and horizontal faces of peds; 5 percent shale; slightly acid; gradual wavy boundary.

BC—20 to 25 inches; silty clay loam, 30 percent brownish yellow (10YR 6/6) and 70 percent light brownish gray (2.5Y 6/2); moderate medium subangular blocky structure parting to moderate thin platy; very hard, firm, sticky and plastic; few fine roots throughout; very few patchy distinct manganese or iron-manganese stains; 5 percent pebbles; slightly acid; clear wavy boundary.

Cr1—25 to 33 inches; weathered bedrock, 50 percent olive gray (5Y 5/2), 30 percent light olive brown (2.5Y 5/4), and 20 percent yellowish brown (10YR 5/6); moderate thin platy structure; few fine roots between peds; partially weathered clayey shale; clay flows along vertical rock fractures (2.5Y 4/0); slightly acid; gradual wavy boundary.

Cr2—33 to 36 inches; weathered bedrock, 70 percent light olive brown (2.5Y 5/3) and 30 percent light olive brown (2.5Y 5/6); clay films partially weathered from clayey shale.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Thickness of the mollic epipedon: 7 to 18 inches
Content of clay in the control section: 35 to 45 percent

Ap horizon:
Hue—10YR or 7.5YR
Value—2 or 3 moist; 3 to 5 dry
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bt horizon:
Hue—5YR to 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 to 4
Texture—silty clay loam, silty clay, or clay loam
Content of rock fragments—0 to 35 percent

BC horizon:
Hue—5Y to 2.5Y
Value—5 moist; 6 dry
Chroma—1 or 2
Texture—silty clay loam or silty clay
Content of rock fragments—0 to 35 percent

Wymore Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landscape: Glaciated uplands
Parent material: Loess
Slope range: 2 to 9 percent
Taxonomic class: Fine, montmorillonitic, mesic Aquertic Argiudolls

Typical Pedon

Wymore silty clay loam, 2 to 5 percent slopes, in an area of cropland 300 feet north and 1,400 feet west of the southeast corner of sec. 19, T. 3 S., R. 15 E.; USGS Woodlawn topographic quadrangle; lat. 39 degrees 46 minutes 10 seconds N. and long. 95 degrees 46 minutes 32 seconds W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; hard, friable, sticky and plastic; moderately acid; abrupt smooth boundary.

BA—7 to 12 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; slightly acid; gradual smooth boundary.

Bt1—12 to 22 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; moderate fine angular blocky structure; very hard, very firm, very sticky and very plastic; few distinct clay films on faces of peds; neutral; gradual smooth boundary.

Bt2—22 to 39 inches; dark grayish brown (10YR 4/2) silty clay, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; few distinct clay films on faces of peds; neutral; gradual smooth boundary.

BC—39 to 47 inches; grayish brown (2.5Y 5/2) silty clay loam, light brownish gray (2.5Y 6/2) dry; few fine distinct yellowish brown (10YR 5/6) irregularly shaped iron accumulations; weak coarse angular blocky

structure; very hard, firm, sticky and plastic; neutral; gradual smooth boundary.
C—47 to 80 inches; grayish brown (2.5Y 5/2) silty clay loam, light brownish gray (2.5Y 6/2) dry; many fine and medium prominent yellowish brown (10YR 5/6) irregularly shaped iron accumulations; massive; hard, firm, sticky and plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Content of clay in the control section: 42 to 55 percent

Ap horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

BA horizon:
Value—2 or 3 moist; 3 or 4 dry
Chroma—1 or 2

Bt horizon:
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 or 4

BC horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist; 4 to 6 dry
Chroma—2 or 4

C horizon:
Hue—5Y or 2.5Y
Value—5 or 6 moist; 6 or 7 dry
Chroma—1 or 2

Zook Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landscape: Stream valleys
Parent material: Silty and clayey alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine, smectitic, mesic Cumulic Vertic Endoaqolls

Typical Pedon

Zook silty clay loam, 0 to 2 percent slopes, in an area of cropland south and east of the northwest corner os sec. 22, T. 3 S., R. 19 E.; USGS Highland topographic quadrangle.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; abrupt smooth boundary.
A1—8 to 18 inches; very dark brown (10YR 2/2) silty clay loam, weak medium granular structure; slightly hard, friable, sticky and plastic; common smooth boundary.
A2—18 to 24 inches; very dark brown (10YR 2/2) silty clay loam, moderate medium granular structure; common fine yellowish brown (10YR 5/6) masses of iron accumulation throughout; hard, firm, sticky and plastic; common smooth boundary.
Bw—24 to 42 inches; black (10YR 2/1) silty clay loam, weak fine subangular blocky structure; few fine dark brown (10YR 3/3) masses of iron accumulation throughout; hard, firm, sticky and plastic; common smooth boundary.
Bg—42 to 53 inches; very dark gray (10YR 3/1) silty clay loam, weak medium subangular blocky structure; few fine dark brown (10YR 3/3) masses of iron accumulation throughout; hard, firm, sticky and plastic; common smooth boundary.
C—53 to 80 inches; dark grayish brown (2.5Y 4/2) silty clay loam, common fine dark yellowish brown (10YR 4/4) masses of iron accumulation throughout; hard, firm, sticky and plastic.

Range in Characteristics

Thickness of the mollic epipedon: 36 to 60 inches
Content of clay in the control section: 36 to 45 percent

Ap horizon:
Hue—10YR or N
Value—2 or 3 moist; 4 or 5 dry
Chroma—0 or 1
Texture—silt loam or silty clay loam
Texture of the fine earth fraction—18 to 44 percent

Bw horizon:
Hue—10YR or N
Value—2 moist; 4 dry
Chroma—1
Texture—silty clay loam or silty clay
Texture of the fine earth fraction—36 to 45 percent

Bg horizon:
Hue—10YR to 5Y
Value—2 to 5 moist; 4 to 7 dry
Chroma—1
Texture—silty clay loam or silty clay
Texture of the fine earth fraction—36 to 45 percent

C horizon:
Hue—10YR to 5Y
Value—2 to 5 moist; 4 to 7 dry
Chroma—1
Textire—silty clay loam or silty clay
Texture of the fine earth fraction—20 to 45 percent

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Glossary

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.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

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

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

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

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.

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

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

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.

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

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

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

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

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

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

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

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.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

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

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

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

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

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

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.

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.

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.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

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.

Fine textured soil. Sandy clay, silty clay, or clay.

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

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

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

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

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

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

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35

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 the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." 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.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

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.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration 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.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

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.

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-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.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

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.

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).

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 of 6.6 to 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.

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

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

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

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

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water

through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 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 flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

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.

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. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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.

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.

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.

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

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

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.

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.

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.

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.

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.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the slope classes are as follows:

Nearly level	0 to 2 percent
Gently sloping	1 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 17 percent
Moderately steep	17 to 30 percent

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

Slow 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 material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

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).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

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

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.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

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 that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related

to tillage, seedbed preparation, seedling emergence, and root penetration.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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.

United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Kansas Agricultural Experiment Station

Soil Survey of Brown County, Kansas

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 and soil series in the area, and a description of how the soils formed. Part II includes detailed soil map unit descriptions and 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**, which is the color map preceding the detailed soil maps, 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** follow the general soil map. These maps can be useful in planning the use and management of small areas.

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

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

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

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 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Kansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Brown County Conservation District.

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

Cover: Terraces, contour farming, and a grassed waterway in an area of Aksarben soils.

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").

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

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

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

This soil survey is a subset of a larger geographical area, and thus some map units have inclusions of soils that are not mapped in the county. More detailed information about these included soils is available in the soil surveys of adjacent counties.

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Aksarben silty clay loam, 2 to 5 percent slopes, is a phase of the Aksarben series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be

shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Kipson-Sogn silty clay loams, 5 to 30 percent slopes, is an example.

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

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 in Part I of this survey. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

The soil interpretations and properties tables provide information for up to three components in a map unit, including both major and minor components. Some map unit descriptions show more than three components, but because of computer limitations, the tables provide information for only the first three components in the map unit.

Soil Descriptions

Ac—Aksarben silty clay loam, 0 to 2 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Ridge
Landform element: Summits
Slope shape: Plane
Slope range: 0 to 2 percent
Major use: Cropland

Composition

Aksarben soil and similar soils: 90 percent
Contrasting inclusions:
• Marshall soils, 10 percent

Typical Profile

Surface layer:
0 to 2 inches—very dark brown, friable silty clay loam
2 to 9 inches—black, friable silty clay loam
Subsurface layer:
9 to 13 inches—very dark brown, friable silty clay loam
Subsoil:
13 to 19 inches—very dark grayish brown, firm silty clay loam
19 to 24 inches—dark brown, firm silty clay loam
24 to 28 inches—dark brown, firm, mottled silty clay loam
28 to 47 inches—brown, firm, mottled silty clay loam
Substratum:
47 to 80 inches—grayish brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (11 inches)
Permeability: Moderately slow
Shrink-swell potential: Moderate
Parent material: Loess
Surface runoff: Slow
Hazard of water erosion: Slight

Inclusions

Contrasting inclusions:
• Marshall soils, which contain less clay in the subsoil than the Aksarben soil; on shoulders
Similar inclusions:
• Soils that have a surface layer of silt loam

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Moderately well suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with suitable porous material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to prevent the damage caused by wetness in areas used for dwellings with basements.

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; well suited to sewage lagoons
Management considerations:
• Enlarging the absorption field helps to overcome the moderately slow permeability.

Interpretive Groups

Land capability classification: I

Ad—Aksarben silty clay loam, 2 to 5 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Shoulders and summits
Slope shape: Convex linear
Slope range: 2 to 5 percent
Major use: Cropland

Composition

Aksarben soil and similar soils: 95 percent
Contrasting inclusions:
• Morrill soils, 5 percent

Typical Profile

Surface layer:
0 to 2 inches—very dark brown, friable silty clay loam
2 to 9 inches—black, friable silty clay loam
Subsurface layer:
9 to 13 inches—very dark brown, friable silty clay loam
Subsoil:
13 to 19 inches—very dark grayish brown, firm silty clay loam
19 to 24 inches—dark brown, firm silty clay loam
24 to 28 inches—dark brown, firm, mottled silty clay loam
28 to 47 inches—brown, firm, mottled silty clay loam
Substratum:
47 to 80 inches—grayish brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (11 inches)
Permeability: Moderately slow
Shrink-swell potential: Moderate
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• Morrill soils, which contain more sand in the subsoil than the Aksarben soil; on back slopes
Similar inclusions:
• Soils that have a surface layer of silt loam

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Moderately well suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with suitable porous material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to overcome the wetness on sites for dwellings with basements.

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; well suited to sewage lagoons
Management considerations:
• Enlarging the absorption field helps to overcome the moderate permeability.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIe

Ae—Aksarben silty clay loam, 5 to 11 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 5 to 11 percent
Major use: Cropland

Composition

Aksarben soil and similar soils: 85 percent
Contrasting inclusions:

- Morrill soils, 8 percent
- Kennebec soils, 7 percent

Typical Profile

Surface layer:
0 to 5 inches—very dark brown, friable silty clay loam
Subsurface layer:
5 to 11 inches—very dark brown, friable silty clay loam
Subsoil:
11 to 21 inches—very dark grayish brown, firm silty clay loam
21 to 34 inches—dark yellowish brown, firm, mottled silty clay loam
34 to 42 inches—brown, friable, mottled silty clay loam
Substratum:
42 to 80 inches—brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (11 inches)
Permeability: Moderately slow
Shrink-swell potential: Moderate
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Morrill soils, which contain more sand in the subsoil than the Aksarben soil; on low back slopes
- Kennebec soils in drainageways

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Moderately well suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with suitable porous material help to prevent the structural damage caused by shrinking and swelling.
- Installing sealed foundation drains helps to overcome the wetness on sites for dwellings with basements.

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; well suited to sewage lagoons
Management considerations:
- Enlarging the absorption field helps to overcome the moderate permeability.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Bs—Burchard clay loam, 6 to 12 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Back slopes, head slopes, and nose slopes
Slope shape: Convex linear
Slope range: 6 to 12 percent
Major uses: Cropland and pastureland

Composition

Burchard soil and similar soils: 85 percent
Contrasting inclusions:
- Steinauer soils, 5 percent
- Pawnee soils, 10 percent

Typical Profile

Surface layer:
0 to 9 inches—very dark brown, friable clay loam
Subsoil:
9 to 20 inches—dark brown, firm clay loam
20 to 26 inches—olive brown, firm, calcareous clay loam
26 to 33 inches—light yellowish brown, firm, calcareous clay loam
Substratum:
33 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate

Drainage class: Well drained
Available water capacity: High (9.5 inches)
Permeability: Moderately slow
Parent material: Calcareous till
Surface runoff: Rapid
Hazard of water erosion: Moderate
Distinctive properties: Calcareous at a depth of 20 inches

Inclusions

Contrasting inclusions:
- Steinauer soils, which are calcareous at the surface; on the steeper side slopes
- The moderately well drained Pawnee soils, which have more clay in the subsoil than the Burchard soil; on summits and the upper shoulders

Similar inclusions:
- Soils that are not calcareous in the profile

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Water erosion is a hazard.
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Pasture and hay
Suitability: Well suited
Management considerations:
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Moderately well suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
- Land shaping helps to overcome the slope. Also, dwellings can be constructed in the less sloping areas.

Sanitary facilities
Suitability: Poorly suited
Management considerations:
- Enlarging the septic tank absorption field or adding suitable fill material helps to overcome the restricted permeability.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Bx—Burchard-Steinauer clay loams, 12 to 18 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Burchard—shoulders and head slopes; Steinauer—back slopes and nose slopes
Slope shape: Convex linear
Slope range: Burchard—12 to 18 percent; Steinauer—12 to 18 percent
Major use: Pasture

Composition

Burchard soil and similar soils: 50 percent
Steinauer soil and similar soils: 40 percent
Contrasting inclusions:
- Padonia soils, 5 percent
- Shale outcrop, 5 percent

Typical Profile

Burchard
Surface layer:
0 to 8 inches—very dark brown, friable clay loam
Subsoil:
8 to 16 inches—dark brown, firm clay loam
16 to 22 inches—olive brown, firm clay loam
22 to 28 inches—light yellowish brown, firm, calcareous clay loam
Substratum:
28 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Steinauer
Surface layer:
0 to 6 inches—dark grayish brown, friable, calcareous clay loam
Transitional layer:

6 to 14 inches—yellowish brown, firm, calcareous clay loam
Substratum:
14 to 38 inches—grayish brown, calcareous clay loam
38 to 80 inches—yellowish brown, calcareous clay loam

Soil Properties and Qualities

Burchard
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (9.5 inches)
Permeability: Moderately slow
Parent material: Glacial till
Surface runoff: Rapid
Hazard of water erosion: Severe
Distinctive properties: Calcareous at a depth of 22 inches

Steinauer
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (9.5 inches)
Permeability: Moderately slow
Parent material: Calcareous glacial till
Surface runoff: Rapid
Hazard of water erosion: Severe
Distinctive properties: Calcareous throughout

Inclusions

Contrasting inclusions:
- Padonia soils, which have less sand in the subsoil than the major soils and are moderately deep; in landscape positions similar to those of the major soils
- Shale outcrops on nose slopes

Similar inclusions:
- Soils that are similar to the Burchard soil but are not calcareous in the profile
- Soils that are similar to the Steinauer soil but are deep to bedrock

Use and Management

Pasture and hay
Suitability: Well suited
Management considerations:
- A planned grazing system that includes proper grazing use and timely deferment of grazing improves or helps to maintain pasture condition.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Generally unsuited because of the restricted permeability and the slope

Sanitary facilities
Suitability: Generally unsuited because of the restricted permeability and the slope

Interpretive Groups

Land capability classification: VIe

Ch—Chase silty clay loam, occasionally flooded

Setting

Landscape: Valleys
Landform: High flood plains
Slope shape: Linear
Slope range: 0 to 1 percent
Major uses: Cropland and woodland

Composition

Chase soil and similar soils: 90 percent
Contrasting inclusions:
- Kennebec soils, 5 percent
- Muscotah soils, 5 percent

Typical Profile

Surface layer:
0 to 9 inches—black, friable silty clay loam
Subsurface layer:
9 to 19 inches—black, firm silty clay loam
Subsoil:
19 to 30 inches—very dark brown, firm silty clay
30 to 41 inches—very dark brown, firm, mottled silty clay
41 to 47 inches—very dark brown, firm, mottled silty clay loam
Substratum:
47 to 80 inches—dark grayish brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 2 to 4 feet from February through May
Available water capacity: High (10 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Alluvium
Surface runoff: Slow

Hazard of flooding: Occasional

Inclusions

Contrasting inclusions:
• The moderately well drained Kennebec soils on low flood plains
• Muscotah soils in small swales and depressions on the flood plains

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Flooding or ponding often delays spring planting.
• Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.
• Tilling when the soil is wet can result in surface compaction.

Woodland
Suitability: Suited
Management considerations:
• Site preparation by spraying, cutting, or girdling helps to control plant competition.
• Proper site preparation reduces the seedling mortality rate.

Building site development
Suitability: Generally unsuited because of flooding, wetness, and the shrink-swell potential

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; well suited to sewage lagoons
Management considerations:
• This soil is generally unsuited to septic tank absorption fields because of flooding, wetness, and the slow permeability.

Interpretive Groups

Land capability classification: IIw

Co—Contrary silty clay loam, 5 to 9 percent slopes, eroded

Setting

Landscape: Loess uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 5 to 9 percent
Major use: Cropland

Composition

Contrary soil and similar soils: 85 percent
Contrasting inclusions:
• Kennebec soils, 7 percent
• Morrill soils, 8 percent

Typical Profile

Surface layer:
0 to 6 inches—dark brown, friable silty clay loam
Subsoil:
6 to 15 inches—dark brown, friable silty clay loam
15 to 32 inches—yellowish brown, friable, mottled silty clay loam
Substratum:
32 to 80 inches—yellowish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (10 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• Kennebec soils in drainageways
• Morrill soils, which have more sand throughout than the Contrary soil; on back slopes
Similar inclusions:
• Soils that have more clay in the subsoil

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Well suited

Management considerations:
• If the less sloping areas are selected for building site development, less land shaping will be needed during construction.

Sanitary facilities
Suitability: Well suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• Sealing the lagoon helps to control seepage.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Ga—Grundy silt loam, 0 to 2 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Ridges
Landform element: Broad divides
Slope shape: Linear
Slope range: 0 to 2 percent
Major use: Cropland

Composition

Grundy soil and similar soils: 90 percent
Contrasting inclusions:
• Haig soils, 10 percent

Typical Profile

Surface layer:
0 to 7 inches—black silt loam
Subsurface layer:
7 to 14 inches—black, firm silty clay loam
Subsoil:
14 to 24 inches—very dark gray, firm, mottled silty clay
24 to 31 inches—dark grayish brown, firm, mottled silty clay
31 to 41 inches—grayish brown, very firm, mottled silty clay
41 to 48 inches—grayish brown, firm, mottled silty clay loam

Substratum:
48 to 80 inches—olive gray, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 1.5 to 2.5 feet from November through April
Available water capacity: Very high (10 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Loess
Surface runoff: Slow
Hazard of water erosion: Slight

Inclusions

Contrasting inclusions:
• The poorly drained Haig soils in depressional areas
Similar inclusions:
• Soils that are moderately well drained

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Wetness may delay spring planting.
• The soil is droughty in summer because the clayey subsoil releases water slowly.
• Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.
• Crop rotations help to control weeds, plant diseases, and insects.
• Tilling when the soil is wet can result in compaction.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to prevent the damage caused by wetness.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; well suited to sewage lagoons
Management considerations:
• This soil is generally unsuited to septic tank absorption fields because of the slow permeability.

Interpretive Groups

Land capability classification: IIe (dryland)

Ju—Judson silt loam, 2 to 5 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Foot slopes
Slope shape: Concave linear
Slope range: 2 to 5 percent
Major use: Cropland

Composition

Judson soil and similar soils: 95 percent
Contrasting inclusions:
- Kennebec soils, 5 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark grayish brown, friable silt loam
Subsurface layer:
7 to 25 inches—very dark brown, friable silt loam
Subsoil:
25 to 80 inches—dark brown, friable silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: High
Drainage class: Well drained
Available water capacity: Very high (13 inches)
Permeability: Moderate
Shrink-swell potential: Moderate
Parent material: Colluvium
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Kennebec soils on low flood plains

Similar inclusions:
- Soils that have more clay in the subsoil

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Moderately well suited to dwellings with basements; well suited to dwellings without basements
Management considerations:
- Properly designing and reinforcing walls and floors and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
- Installing sealed foundation drains helps to prevent the damage caused by wetness.

Sanitary facilities
Suitability: Well suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
- Sealing the lagoon helps to control seepage.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIe

Kd—Kennebec silt loam, channeled

Setting

Landscape: Glaciated uplands
Landform: Drainageways
Landform element: Meanderbelts
Slope shape: Concave linear
Slope range: 0 to 1 percent
Major uses: Pasture and woodland

Composition

Kennebec soil and similar soils: 90 percent
Contrasting inclusions:
- Chase soils, 4 percent
- Muscotah soils, 3 percent
- Nodaway soils, 3 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, friable silt loam
Subsurface layer:
7 to 44 inches—very dark brown, friable silt loam
Transitional layer:
44 to 54 inches—very dark grayish brown, friable, mottled silt loam
Substratum:
54 to 80 inches—dark grayish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: High
Drainage class: Moderately well drained
Depth to seasonal high water table: 3 to 5 feet from November through July
Available water capacity: Very high (13.5 inches)
Permeability: Moderate
Parent material: Alluvium
Surface runoff: Slow
Hazard of flooding: Frequent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chase soils, which have more clay in the subsoil than the Kennebec soil; on high flood plains
- The somewhat poorly drained Muscotah soils, which have more clay in the subsoil than the Kennebec soil; in depressions on high flood plains
- Nodaway soils, which have a dark surface layer less than 20 inches thick; in landscape positions similar to those of the Kennebec soil

Use and Management

Woodland
Suitability: Well suited
Management considerations:
- Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Unsuited
Management considerations:
- This soil is generally unsuited to dwellings because of flooding. Overcoming this hazard is difficult unless major flood-control measures are used. A suitable alternative site should be selected.

Sanitary facilities
Suitability: Unsuited
Management considerations:
- This soil is generally unsuited to sanitary facilities because of flooding and wetness. Overcoming these limitations is difficult unless major flood-control measures are used. A suitable alternative site should be selected.

Interpretive Groups

Land capability classification: VIw

Ke—Kennebec silt loam, occasionally flooded

Setting

Landscape: Valleys and glaciated uplands
Landform: Low flood plains and drainageways
Landform element: Meanderbelts
Slope shape: Plane
Slope range: 0 to 1 percent
Major uses: Cropland and woodland

Composition

Kennebec soil and similar soils: 90 percent
Contrasting inclusions:
- Chase soils, 6 percent
- Nodaway soils, 2 percent
- Zook soils, 2 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, friable silt loam
Subsurface layer:
7 to 44 inches—very dark brown, friable silt loam
Transitional layer:
44 to 54 inches—very dark grayish brown, friable, mottled silt loam
Substratum:
54 to 80 inches—dark grayish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: High
Drainage class: Moderately well drained
Depth to seasonal high water table: 3 to 5 feet from November through July
Available water capacity: Very high (13.5 inches)
Permeability: Moderate
Parent material: Alluvium
Surface runoff: Slow
Hazard of flooding: Occasional

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Muscotah soils, which have more clay in the subsoil than the Kennebec soil; in depressions on high flood plains
- The somewhat poorly drained Chase soils, which have more clay in the subsoil than the Kennebec soil; on high flood plains
- Nodaway soils in the lower positions on the landscape
- The poorly drained Zook soils, which have more clay in the subsoil than the Kennebec soil; in depressional areas

Use and Management

Cultivated crops
Suitability: Well suited to corn and soybeans
Management considerations:
• Flooding may delay planting or harvesting in some years.
• Returning crop residue to the soil and adding other organic material improve fertility and increase the rate of water infiltration.
• Crop rotations help to control weeds, plant diseases, and insects.

Woodland
Suitability: Well suited
Management considerations:
• Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Unsuited
Management considerations:
• This soil is generally unsuited to dwellings because of flooding. Overcoming this hazard is difficult unless major flood-control measures are used. A suitable alternative site should be selected.

Sanitary facilities
Suitability: Unsuited
Management considerations:
• This soil is generally unsuited to septic tank absorption fields and sewage lagoons because of flooding. Overcoming this hazard is difficult unless major flood-control measures are used.

Interpretive Groups

Land capability classification: IIw

Kp—Kipson-Sogn silty clay loams, 5 to 30 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Kipson—shoulders and back slopes; Sogn—back slopes
Slope shape: Convex linear
Slope range: Kipson—5 to 30 percent; Sogn—5 to 30 percent
Major uses: Pasture and woodland

Composition

Kipson soil and similar soils: 45 percent
Sogn soil and similar soils: 30 percent
Contrasting inclusions:
• Kennebec soils, 10 percent
• Padonia soils, 10 percent
• Steinauer soils, 5 percent

Typical Profile

Kipson
Surface layer:
0 to 8 inches—very dark brown, friable, calcareous silty clay loam
Substratum:
8 to 19 inches—olive brown, firm, calcareous silty clay loam
Bedrock:
19 to 22 inches—calcareous, silty shale

Sogn
Surface layer:
0 to 12 inches—very dark brown silty clay loam
Bedrock:
12 inches—limestone

Soil Properties and Qualities

Kipson
Depth to paralithic contact: 10 to 20 inches
Potential rooting depth: Shallow
Organic matter content: Moderately low
Drainage class: Somewhat excessively drained
Available water capacity: Low (4 inches)
Permeability: Moderate
Parent material: Calcareous, silty shale
Surface runoff: Rapid
Hazard of water erosion: Severe

Sogn
Depth to unconsolidated material with rock fragments: 10 to 20 inches
Potential rooting depth: Very shallow
Organic matter content: Moderately low
Drainage class: Somewhat excessively drained
Available water capacity: Very low (2.5 inches)
Permeability: Moderate
Parent material: Residuum derived from limestone
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
• The moderately well drained Kennebec soils on low flood plains
• Padonia soils, which are moderately deep; in landscape positions similar to those of the major soils
• Steinauer soils, which are very deep; on the lower back slopes

Use and Management

Pasture and hay

Suitability: Suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.

Building site development
Suitability: Unsuited to dwellings because of the slope, the depth to bedrock, and the hazard of seepage

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields and sewage lagoons because of the slope, the depth to bedrock, the hazard of seepage, and the thin surface layer

Interpretive Groups

Land capability classification: Kipson—VIe; Sogn—VIIs

M-W—Miscellaneous water

Description: Areas used as sewage lagoons or for other waste disposal systems

Land capability classification: VIIIs

Ma—Marshall silt loam, 2 to 5 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Summits and shoulders
Slope shape: Convex linear
Slope range: 2 to 5 percent
Major use: Cropland

Composition

Marshall soil and similar soils: 85 percent
Contrasting inclusions:
• Wymore soils, 15 percent

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown, friable silt loam
Subsurface layer:
10 to 13 inches—very dark grayish brown, friable silty clay loam
Subsoil:
13 to 18 inches—dark brown, friable silty clay loam
18 to 32 inches—yellowish brown, friable silty clay loam
32 to 43 inches—yellowish brown, friable, mottled silt loam
Substratum:
43 to 80 inches—yellowish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Very high (12 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• Wymore soils, which have more clay in the subsoil than the Marshall soil; on summits
• Soils that have a dark surface layer less than 7 inches thick; on the lower shoulders and back slopes

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion (fig. II-1).
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development

Suitability: Moderately well suited
Management considerations:
• Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities
Suitability: Well suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• Sealing the lagoon helps to control seepage.
• If the less sloping areas are selected as sites for

Figure II-1.—Contour farming helps to control erosion in an area of Marshall silt loam, 2 to 5 percent slopes.

lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIe

Mb—Marshall silty clay loam, 5 to 11 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 5 to 11 percent
Major use: Cropland

Composition

Marshall soil and similar soils: 85 percent
Contrasting inclusions:
- Contrary soils, 8 percent
- Morrill soils, 7 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsoil:
6 to 12 inches—very dark grayish brown, friable silty clay loam
12 to 20 inches—dark yellowish brown, friable silty clay loam
20 to 44 inches—yellowish brown, friable silty clay loam
Substratum:
44 to 80 inches—yellowish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Very high (12 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Contrary soils, which are dark to a depth of less than 7 inches; on shoulders and back slopes
- Morrill soils, which have more sand in the subsoil than the Marshall soil; on the lower back slopes

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Moderately well suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities
Suitability: Well suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
- Sealing the lagoon helps to control seepage.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Md—Martin silty clay loam, 1 to 4 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Foot slopes
Slope shape: Concave linear
Slope range: 1 to 4 percent
Major uses: Cropland, pasture, and woodland

Composition

Martin soil and similar soils: 85 percent
Contrasting inclusions:
- Chase soils, 10 percent
- Pawnee soils, 5 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsurface layer:
6 to 12 inches—very dark grayish brown, firm silty clay loam
Subsoil:
12 to 24 inches—very dark grayish brown, very firm silty clay
24 to 53 inches—olive brown, very firm, mottled silty clay
Substratum:
53 to 60 inches—light olive brown, mottled silty clay
60 to 80 inches—olive brown, mottled silty clay

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2 to 3 feet from December through April
Available water capacity: Very high (13 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Residuum derived from shale
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chase soils on high flood plains
- Pawnee soils, which contain more sand in the subsoil than the Martin soil; on back slopes

Similar inclusions:
- Soils that are 40 to 60 inches deep over shale

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.
• Tilling when the soil is wet can result in compaction.

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Woodland
Suitability: Suited
Management considerations:
• Proper site preparation reduces the seedling mortality rate.
• Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling and by wetness.
• Constructing dwellings with basements on raised, well compacted fill material increases the depth to the seasonal high water table.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• This soil is generally unsuited to septic tank absorption fields because of wetness and the slow permeability.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIe

Mf—Martin silty clay loam, 4 to 12 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Foot slopes and back slopes
Slope shape: Concave linear
Slope range: 4 to 12 percent
Major uses: Cropland, pasture, and woodland

Composition

Martin soil and similar soils: 90 percent
Contrasting inclusions:
• Padonia soils, 5 percent
• Vinland soils, 5 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsurface layer:
6 to 12 inches—very dark grayish brown, firm silty clay loam
Subsoil:
12 to 24 inches—very dark grayish brown, very firm silty clay
24 to 53 inches—olive brown, very firm, mottled silty clay
Substratum:
53 to 60 inches—light olive brown, mottled silty clay
60 to 80 inches—olive brown, mottled silty clay

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2 to 3 feet from December through April
Available water capacity: Very high (13 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Residuum derived from shale
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:

• Vinland soils, which are moderately deep over shale and contain less clay in the subsoil than the Martin soil; on shoulders and the upper back slopes
• Padonia soils, which are moderately deep over shale; on shoulders
Similar inclusions:
• Soils that are 40 to 60 inches deep over shale

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat and grain sorghum
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.
• Tilling when the soil is wet can result in soil compaction.

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Woodland
Suitability: Suited
Management considerations:
• Proper site preparation reduces the seedling mortality rate.
• Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling and wetness.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• This soil is generally unsuited to septic tank absorption fields because of wetness and the slow permeability.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IVe

Mh—Mayberry clay loam, 2 to 6 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Back slopes
Slope shape: Convex linear
Slope range: 2 to 6 percent
Major uses: Cropland and pasture

Composition

Mayberry soil and similar soils: 85 percent
Contrasting inclusions:
• Morrill soils, 8 percent
• Wymore soils, 7 percent

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown, friable clay loam
5 to 10 inches—mixed dark brown, dark reddish brown, and reddish brown, friable clay loam
Subsoil:
10 to 16 inches—mixed dark reddish brown and brown, firm clay
16 to 21 inches—mixed reddish brown and dark reddish brown, very firm clay
21 to 32 inches—mixed dark reddish brown and brown, very firm clay
32 to 42 inches—mixed brown and strong brown, very firm clay loam
42 to 51 inches—mixed yellowish brown and strong brown, very firm clay loam
Substratum:
51 to 80 inches—mixed yellowish brown, light yellowish brown, and light gray clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)

Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 3 feet from March through May
Available water capacity: High (10 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Till
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• The well drained Morrill soils, which contain less clay in the subsoil than the Mayberry soil; on back slopes
• Wymore soils, which contain less sand in the subsoil than the Mayberry soil; on summits and shoulders
Similar inclusions:
• Soils in which most of the original darkened surface layer has been removed by water erosion and the rest has been mixed with the upper part of the Mayberry subsoil material by tillage

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling and by wetness.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• This soil is generally unsuited to septic tank absorption fields because of the slow permeability and wetness.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Mk—Monona silt loam, 2 to 5 percent slopes

Setting

Landscape: Loess uplands
Landform: Hill slopes
Landform element: Summits and shoulders
Slope shape: Convex linear
Slope range: 2 to 5 percent
Major use: Cropland

Composition

Monona soil and similar soils: 90 percent
Contrasting inclusions:
• Pohocco soils, 10 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark brown, friable silt loam
Subsurface layer:
6 to 11 inches—very dark grayish brown, friable silt loam
Subsoil:
11 to 30 inches—dark brown, friable silt loam
Substratum:
30 to 80 inches—yellowish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Very high (14 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• Pohocco soils on back slopes

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn,

and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Well suited to dwellings with basements; moderately well suited to dwellings without basements
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities
Suitability: Well suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• Sealing the lagoon helps to control seepage.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIe

Mn—Monona silt loam, 5 to 11 percent slopes, moderately eroded

Setting

Landscape: Loess uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 5 to 11 percent
Major use: Cropland

Composition

Monona soil and similar soils: 85 percent
Contrasting inclusions:
• Netawaka soils, 10 percent
• Pohocco soils, 5 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark brown, friable silt loam
Subsoil:
6 to 30 inches—dark brown, friable silt loam
Substratum:
30 to 80 inches—yellowish brown, mottled silt loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderately low
Drainage class: Well drained
Available water capacity: Very high (14 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
• Netawaka soils, which do not have a dark surface layer; on back slopes
• Pohocco soils, which do not have a dark surface layer; on the lower back slopes
Similar inclusions:
• Soils that contain more clay in the subsoil

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Well suited to dwellings with basements; moderately well suited to dwellings without basements
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities

Suitability: Well suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• Sealing the lagoon helps to control seepage.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Mt—Morrill loam, 6 to 12 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Back slopes
Slope shape: Convex linear
Slope range: 6 to 12 percent
Major uses: Cropland and pasture

Composition

Morrill soil and similar soils: 90 percent
Contrasting inclusions:
• Kennebec soils, 5 percent
• Pawnee soils, 5 percent

Typical Profile

Surface layer:
0 to 9 inches—very dark brown, very friable loam
Subsurface layer:
9 to 14 inches—dark brown, friable clay loam
Subsoil:
14 to 40 inches—dark reddish brown, firm clay loam
Substratum:
40 to 80 inches—brown loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (11 inches)
Permeability: Moderately slow
Parent material: Till
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• The moderately well drained Kennebec soils on low flood plains
• The moderately well drained Pawnee soils, which contain more clay in the subsoil than the Morrill soil; on shoulders

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Woodland
Suitability: Suited
Management considerations:
• Proper site preparation reduces the seedling mortality rate.
• Site preparation by spraying, cutting, or girdling helps to control plant competition.
• Using harvest methods that do not leave the remaining trees isolated or widely spaced helps to prevent windthrow.
• Using selective cutting instead of clear cutting, placing haul roads on the contour, and preserving as much of the native vegetation as possible help to control erosion.

Building site development
Suitability: Moderately well suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
• Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient.

Sanitary facilities
Suitability: Poorly suited
Management considerations:
• Enlarging the field helps to overcome the moderately slow permeability.
• Sealing the lagoon helps to control seepage.
• If the less sloping areas are selected as sites for the lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IVe

Mw—Muscotah silt loam, occasionally flooded, overwash

Setting

Landscape: Valleys
Landform: High flood plains
Slope shape: Plane
Slope range: 0 to 2 percent
Major uses: Cropland and woodland

Composition

Muscotah soil and similar soils: 90 percent
Contrasting inclusions:
• Kennebec soils, 5 percent
• Zook soils, 5 percent

Typical Profile

Surface layer:
0 to 16 inches—very dark grayish brown, friable silt loam
Subsurface layer:
16 to 30 inches—black, firm silty clay loam
Subsoil:
30 to 39 inches—black, firm, mottled silty clay
39 to 61 inches—dark gray, very firm, mottled silty clay
61 to 70 inches—gray, very firm, mottled silty clay
70 to 80 inches—light olive gray, very firm, mottled silty clay

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Somewhat poorly drained
Depth to seasonal high water table: 2 to 3 feet from March through June
Available water capacity: Very high (13 inches)
Permeability: Slow
Parent material: Clayey alluvium
Surface runoff: Slow
Shrink-swell potential: High
Hazard of flooding: Occasional

Inclusions

Contrasting inclusions:
• The moderately well drained Kennebec soils, which contain less clay throughout than the Muscotah soil; on low flood plains
• The poorly drained Zook soils in swales, depressions, and oxbows on low flood plains
Similar inclusions:
• Soils that have slopes of more than 2 percent

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Flooding and ponding often delay spring planting.
• Returning crop residue to the soil and adding other organic material improve fertility and increase the rate of water infiltration.
• Tilling when the soil is wet can result in soil compaction.

Woodland
Suitability: Suited
Management considerations:
• Site preparation by spraying, cutting, or girdling helps to control plant competition.
• Equipment is easier to use if the trees are harvested when the soil is relatively dry or is frozen.
• Using harvest methods that do not leave the remaining trees isolated or widely spaced helps to prevent windthrow.

Building site development
Suitability: Generally unsuited to dwellings because of flooding and wetness

Sanitary facilities
Suitability: Generally unsuited because of flooding and wetness

Interpretive Groups

Land capability classification: IIw

My—Muscotah silty clay loam, occasionally flooded

Setting

Landscape: Valleys
Landform: High bottom land

Slope shape: Plane
Slope range: 0 to 1 percent
Major uses: Cropland and woodland

Composition

Muscotah soil and similar soils: 90 percent
Contrasting inclusions:
- Kennebec soils, 5 percent
- Wabash soils, 5 percent

Typical Profile

Surface layer:
0 to 9 inches—black, friable silty clay loam
Subsurface layer:
9 to 23 inches—black, firm silty clay loam
Subsoil:
23 to 35 inches—black, firm, mottled silty clay loam
35 to 44 inches—black, very firm, mottled silty clay
44 to 70 inches—very dark gray, very firm, mottled silty clay
70 to 80 inches—olive gray, very firm, mottled silty clay

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Somewhat poorly drained
Depth to seasonal high water table: 1.5 to 3.0 feet from March through June
Available water capacity: Very high (13 inches)
Permeability: Slow
Parent material: Clayey alluvium
Surface runoff: Slow
Shrink-swell potential: High
Hazard of flooding: Occasional

Inclusions

Contrasting inclusions:
- The moderately well drained Kennebec soils, which contain less clay throughout than the Muscotah soil; on low flood plains
- The poorly drained Wabash soils in swales, depressions, and oxbows on low flood plains

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Flooding or ponding often delays spring planting.
- Returning crop residue to the soil and adding other organic material improve fertility and increase the rate of water infiltration.
- Tilling when the soil is wet can result in soil compaction.

Woodland
Suitability: Suited
Management considerations:
- Site preparation by spraying, cutting, or girdling helps to control plant competition.
- Equipment is easier to use if the trees are harvested when the soil is relatively dry or is frozen.
- Using harvest methods that do not leave the remaining trees isolated or widely spaced helps to prevent windthrow.

Building site development
Suitability: Generally unsuited to dwellings because of flooding and wetness

Sanitary facilities
Suitability: Generally unsuited because of flooding and wetness

Interpretive Groups

Land capability classification: IIw

No—Nodaway silt loam, occasionally flooded

Setting

Landscape: Valleys and loess uplands
Landform: Low flood plains and drainageways
Landform element: Meanderbelts
Slope shape: Plane
Slope range: 0 to 1 percent
Major uses: Cropland and woodland

Composition

Nodaway soil and similar soils: 90 percent
Contrasting inclusions:
- Chase soils, 4 percent
- Zook soils, 3 percent
- Kennebec soils, 3 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark grayish brown, friable silt loam
Substratum:
6 to 12 inches—dark grayish brown, friable silt loam
12 to 53 inches—dark grayish brown and brownish gray, stratified silt loam
53 to 80 inches—black, stratified silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Depth to seasonal high water table: 3 to 5 feet
Available water capacity: Very high (12.6 inches)
Permeability: Moderate
Parent material: Silty alluvium
Surface runoff: Slow
Hazard of flooding: Occasional

Inclusions

Contrasting inclusions:
- Chase soils, which contain more clay in the subsoil than the Nodaway soil; on high flood plains
- The poorly drained Zook soils, which contain more clay throughout than the Nodaway soil; in swales and on high flood plains
- Kennebec soils, which are dark to a depth of more than 20 inches; in the slightly higher positions on low flood plains

Similar inclusions:
- Soils that have a surface layer of silty clay loam

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Flooding delays spring planting and harvesting.
- Returning crop residue to the soil and adding other organic material improve fertility and increase the rate of water infiltration.

Woodland
Suitability: Suited
Management considerations:
- Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Unsuited to dwellings because of flooding and wetness

Sanitary facilities
Suitability: Unsuited
Management considerations:
- This soil is unsuited to septic tank absorption fields and sewage lagoons because of flooding and wetness. Overcoming these limitations is difficult unless major flood-control measures are used.

Interpretive Groups

Land capability classification: IIw

Om—Olmitz loam, 2 to 5 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Foot slopes
Slope shape: Concave linear
Slope range: 2 to 5 percent
Major uses: Cropland and woodland

Composition

Olmitz soil and similar soils: 93 percent
Contrasting inclusions:
- Chase soils, 4 percent
- Pawnee soils, 3 percent

Typical Profile

Surface layer:
0 to 7 inches—black, friable loam
Subsurface layer:
7 to 20 inches—very dark brown, friable loam
Subsoil:
20 to 42 inches—dark brown, friable clay loam
Substratum:
42 to 80 inches—dark brown clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (10.5 inches)
Permeability: Moderate
Shrink-swell potential: Moderate
Parent material: Local alluvium
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chase soils, which contain less sand throughout than the Olmitz soil; on high flood plains
- Pawnee soils, which contain more clay throughout than the Olmitz soil; on shoulders above the Olmitz soil

Similar inclusions:
- Soils that have more silt in the profile

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of

organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Moderately well suited
Management considerations:
• Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities
Suitability: Moderately well suited
Management considerations:
• Enlarging the field helps to overcome the moderate permeability.
• Sealing the lagoon helps to control seepage.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIe

Or—Orthents, earthen dam

Description: Dams constructed from soil material and used to contain runoff from surface water

Land capability classification: VIIIs

Pd—Padonia-Martin silty clay loams, 5 to 9 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Padonia—back slopes; Martin—foot slopes
Slope shape: Complex
Slope range: 5 to 9 percent
Major uses: Cropland, pasture, and woodland

Composition

Padonia soil and similar soils: 50 percent
Martin soil and similar soils: 40 percent
Contrasting inclusions:
• Kipson soils, 10 percent

Typical Profile

Padonia
Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsurface layer:
6 to 11 inches—dark brown, firm silty clay loam
Subsoil:
11 to 22 inches—dark brown, very firm silty clay
22 to 32 inches—dark yellowish brown and olive gray, very firm silty clay
32 to 37 inches—olive gray, very firm, calcareous silty clay loam
Bedrock:
37 inches—unweathered, calcareous shale

Martin
Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsurface layer:
6 to 12 inches—very dark grayish brown, firm silty clay loam
Subsoil:
12 to 24 inches—very dark grayish brown, very firm silty clay
24 to 53 inches—olive brown, very firm, mottled silty clay
Substratum:
53 to 60 inches—light olive brown, mottled silty clay
60 to 80 inches—olive brown, mottled silty clay

Soil Properties and Qualities

Padonia
Depth to paralithic contact: 20 to 40 inches
Potential rooting depth: Moderately deep
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Moderate (6 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Clayey residuum
Surface runoff: Medium
Hazard of water erosion: Moderate

Martin
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2 to 3 feet from December through April
Available water capacity: Moderate (8 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Residuum derived from shale
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• Kipson soils, which are less than 20 inches deep over bedrock; on back slopes

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Woodland
Suitability: Suited
Management considerations:
• Site preparation by spraying, cutting, or girdling helps to control plant competition.
• Proper site preparation reduces the seedling mortality rate.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to prevent the damage caused by wetness on the Martin soil.
• Selecting the less sloping areas helps to overcome the slope.

Sanitary facilities
Suitability: Unsuited
Management considerations:
• These soils are generally unsuited to septic tank absorption fields and sewage lagoons because of the depth to bedrock, the slow permeability, and the slope. The deeper, less sloping adjacent soils on foot slopes are suitable sites for lagoons.

Interpretive Groups

Land capability classification: Padonia—IVe; Martin—IIIe

Pe—Padonia-Martin silty clay loams, 9 to 25 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Padonia—back slopes; Martin—foot slopes
Slope shape: Complex
Slope range: Padonia—9 to 25 percent; Martin—9 to 12 percent
Major uses: Pastureland and woodland

Composition

Padonia soil and similar soils: 46 percent
Martin soil and similar soils: 26 percent
Contrasting inclusions:
• Kipson soils, 10 percent
• Pawnee soils, 10 percent
• Sogn soils, 8 percent

Typical Profile

Padonia
Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsurface layer:
6 to 11 inches—dark brown, firm silty clay loam
Subsoil:
11 to 22 inches—dark brown, very firm silty clay

22 to 32 inches—dark yellowish brown and olive gray, very firm silty clay
32 to 37 inches—olive gray, very firm, calcareous silty clay loam
Bedrock:
37 inches—unweathered, calcareous shale

Martin
Surface layer:
0 to 10 inches—black, friable silty clay loam
Subsurface layer:
10 to 15 inches—very dark brown, firm silty clay loam
Subsoil:
15 to 24 inches—very dark grayish brown, very firm silty clay
24 to 33 inches—olive brown, very firm, mottled silty clay
33 to 45 inches—light olive brown, very firm, mottled silty clay
Bedrock:
45 inches—unweathered, calcareous shale

Soil Properties and Qualities

Padonia
Depth to paralithic contact: 20 to 40 inches
Potential rooting depth: Moderately deep
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Moderate (6 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Clayey residuum
Surface runoff: Rapid
Hazard of water erosion: Severe

Martin
Potential rooting depth: Deep (40 to 60 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2 to 3 feet from December through April
Available water capacity: Moderate (7 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Residuum derived from shale
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
• Kipson and Sogn soils, which are less than 20 inches deep over bedrock; on back slopes
• Pawnee soils, which are more than 60 inches deep over bedrock; on shoulders

Use and Management

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Woodland
Suitability: Suited
Management considerations:
• Proper site preparation reduces the seedling mortality rate.
• Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to prevent the damage caused by wetness.
• Less sloping areas should be considered for building sites.

Sanitary facilities
Suitability: Generally unsuited to septic tank absorption fields and sewage lagoons because of the slow permeability, the depth to bedrock, the slope, and the hazard of seepage

Interpretive Groups

Land capability classification: Padonia—VIe; Martin—IVe

Pf—Padonia-Oska silty clay loams, 5 to 9 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Padonia—shoulders; Oska—back slopes
Slope shape: Convex linear
Slope range: 5 to 9 percent
Major uses: Cropland and pasture

Composition

Padonia soil and similar soils: 50 percent

Oska soil and similar soils: 40 percent
Contrasting inclusions:
- Kipson soils, 5 percent
- Pawnee soils, 5 percent

Typical Profile

Padonia
Surface layer:
0 to 6 inches—very dark brown, friable silty clay loam
Subsurface layer:
6 to 11 inches—dark brown, firm silty clay loam
Subsoil:
11 to 22 inches—dark brown, very firm silty clay
22 to 32 inches—dark yellowish brown and olive gray, very firm silty clay
32 to 37 inches—olive gray, firm, calcareous silty clay loam
Bedrock:
37 inches—unweathered, calcareous shale

Oska
Surface layer:
0 to 5 inches—very dark grayish brown, friable silty clay loam
Subsurface layer:
5 to 11 inches—very dark brown, friable silty clay loam
Subsoil:
11 to 19 inches—dark brown, firm silty clay
19 to 35 inches—brown, very firm silty clay
Bedrock:
35 to 38 inches—limestone

Soil Properties and Qualities

Padonia
Depth to paralithic contact: 20 to 40 inches
Potential rooting depth: Moderately deep
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Moderate (6 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Clayey residuum
Surface runoff: Medium
Hazard of water erosion: Moderate

Oska
Depth to paralithic contact: 20 to 40 inches
Potential rooting depth: Moderately deep
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Moderate (6 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Limestone
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Kipson soils, which are less than 20 inches deep over bedrock; on back slopes
- Pawnee soils, which are more than 60 inches deep over bedrock; on shoulders

Use and Management

Cultivated crops
Suitability: Poorly suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Pasture and hay
Suitability: Well suited
Management considerations:
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Poorly suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities
Suitability: Generally unsuited to septic tank absorption fields and sewage lagoons because of the slow permeability, the depth to bedrock, the slope, and the hazard of seepage

Interpretive Groups

Land capability classification: Padonia—IVe; Oska—IIIe

Pm—Pawnee clay loam, 2 to 6 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Shoulders and summits
Slope shape: Convex linear
Slope range: 2 to 6 percent
Major use: Cropland

Composition

Pawnee soil and similar soils: 80 percent
Contrasting inclusions:
- Morrill soils, 8 percent
- Shelby soils, 7 percent
- Wymore soils, 5 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark brown, friable clay loam
Subsurface layer:
7 to 12 inches—very dark grayish brown, firm clay loam
Subsoil:
12 to 26 inches—dark brown, very firm clay
26 to 38 inches—olive brown, very firm, mottled clay
38 to 48 inches—light olive brown, very firm, mottled clay loam
Substratum:
48 to 80 inches—grayish brown, mottled clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 3 feet from March through May
Available water capacity: High (10 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Till
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- The well drained Morrill and Shelby soils, which contain less clay in the subsoil than the Pawnee soil; on back slopes
- Wymore soils, which contain less sand in the subsoil than the Pawnee soil; on shoulders and summits

Similar inclusions:
- Soils that have a surface layer of loam

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Poorly suited
Management considerations:
- Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse material help to prevent the structural damage caused by shrinking and swelling.
- Installing sealed foundation drains helps to prevent the damage caused by wetness.
- Constructing dwellings on raised, well compacted fill material helps to overcome the wetness caused by the seasonal high water table.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
- This soil is generally unsuited to septic tank absorption fields because of the slow permeability and wetness.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Pn—Pawnee clay loam, 6 to 12 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Back slopes

Slope shape: Convex
Slope range: 6 to 12 percent
Major uses: Cropland and pasture

Composition

Pawnee soil and similar soils: 85 percent
Contrasting inclusions:
- Morrill soils, 8 percent
- Kennebec soils, 7 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark brown, firm clay loam
Subsurface layer:
7 to 12 inches—very dark grayish brown, firm clay loam
Subsoil:
12 to 26 inches—dark brown, very firm, mottled clay
26 to 38 inches—olive brown, very firm, mottled clay
38 to 48 inches—light olive brown, very firm, mottled clay loam
Substratum:
48 to 80 inches—grayish brown, mottled clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 3 feet from March through May
Available water capacity: High (10 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Till
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
- The well drained Morrill soils, which contain less clay throughout than the Pawnee soil; on the lower back slopes
- Kennebec soils on low flood plains

Similar inclusions:
- Soils that have a surface layer of loam

Use and Management

Cultivated crops
Suitability: Poorly suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Poorly suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with suitable coarse material help to prevent the structural damage caused by shrinking and swelling.
- Installing sealed foundation drains helps to prevent the damage caused by wetness.
- Constructing dwellings on raised, well compacted fill material helps to overcome the wetness caused by the seasonal high water table.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
- This soil is generally unsuited to septic tank absorption fields because of the slow permeability and wetness.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IIIe

Po—Pawnee clay, 6 to 12 percent slopes, moderately eroded

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Back slopes
Slope shape: Convex
Slope range: 6 to 12 percent
Major uses: Cropland and pasture

Composition

Pawnee soil and similar soils: 85 percent
Contrasting inclusions:
- Mayberry soils, 8 percent
- Kennebec soils, 7 percent

Typical Profile

Surface layer:
0 to 5 inches—very dark brown, firm clay
Subsurface layer:
5 to 19 inches—dark brown, very firm, mottled clay
Subsoil:
19 to 26 inches—dark brown, very firm, mottled clay
26 to 38 inches—olive brown, very firm, mottled clay
38 to 45 inches—light olive brown, very firm, mottled clay loam
Substratum:
45 to 80 inches—grayish brown, mottled clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderately low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 3 feet from March through May
Available water capacity: Moderate (8 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Till
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
• Mayberry soils, which have a redder subsoil than the Pawnee soil; on the lower back slopes
• Kennebec soils on low flood plains
Similar inclusions:
• Soils that have a surface layer of loam

Use and Management

Cultivated crops
Suitability: Poorly suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with suitable coarse material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to prevent the damage caused by wetness.
• Constructing dwellings on raised, well compacted fill material helps to overcome the wetness caused by the seasonal high water table.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
• This soil is generally unsuited to septic tank absorption fields because of the slow permeability and wetness.
• If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IVe

Pt—Pits, quarries

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Complex
Description: Excavated areas from which soil and limestone have been removed. Gravel and sand also have been removed. The bottom of the pits is level, impervious bedrock surrounded by vertical walls. Pits without outlets are filled with water.

Use and Management

• Areas of this map unit are unsuited to most uses because of the depth to bedrock and the slope.

Interpretive Groups

Land capability classification: VIIIs

Pw—Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded

Setting

Landscape: Loess uplands
Landform: Hill slopes

Landform element: Pohocco—shoulders; Netawaka—back slopes
Slope shape: Complex
Slope range: 11 to 17 percent
Major use: Cropland

Composition

Pohocco soil and similar soils: 50 percent
Netawaka soil and similar soils: 40 percent
Contrasting inclusions:
• Judson soils, 10 percent

Typical Profile

Pohocco
Surface layer:
0 to 5 inches—dark brown and brown, very friable silt loam
Subsoil:
5 to 20 inches—yellowish brown, friable silt loam
20 to 39 inches—yellowish brown, very friable, mottled, calcareous silt loam
Substratum:
39 to 80 inches—light yellowish brown, mottled, calcareous silt loam

Netawaka
Surface layer:
0 to 6 inches—dark brown, very friable silt loam
Transitional layer:
6 to 9 inches—brown silt loam
Substratum:
9 to 23 inches—olive brown, very friable, mottled, calcareous silt loam
23 to 46 inches—mixed light olive brown and grayish brown, very friable, mottled, calcareous silt loam
46 to 80 inches—grayish brown, mottled, calcareous silt loam

Soil Properties and Qualities

Pohocco
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderately low
Drainage class: Well drained
Available water capacity: Very high (12.5 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Rapid
Hazard of water erosion: Severe

Netawaka
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderately low
Drainage class: Well drained
Available water capacity: Very high (12 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
• The well drained Judson soils on foot slopes
Similar inclusions:
• Soils that are similar to the Pohocco soil but have a surface layer of silty clay loam
• Soils that are similar to the Pohocco soil but have a thick dark surface layer
• Soils that are similar to the Netawaka soil but have a surface layer of silty clay loam

Use and Management

Cultivated crops
Suitability: Poorly suited to wheat, grain sorghum, and corn
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Moderately well suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with suitable coarse material help to prevent the structural damage caused by shrinking and swelling in areas of the Pohocco soil.
• If the less sloping areas are selected as building sites, less leveling will be needed during construction.

Sanitary facilities
Suitability: Moderately well suited to septic tank absorption fields; unsuited to sewage lagoons
Management considerations:
• Enlarging the septic tank absorption field helps to overcome the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly.
• Sealing the lagoon helps to control seepage in areas of the Pohocco soil.

Interpretive Groups

Land capability classification: IVe

Px—Pohocco-Netawaka silt loams, 17 to 30 percent slopes, eroded

Setting

Landscape: Loess uplands
Landform: Hill slopes
Landform element: Pohocco—shoulders; Netawaka—shoulders and back slopes
Slope shape: Convex linear
Slope range: 17 to 30 percent
Major uses: Pasture and woodland

Composition

Pohocco soil and similar soils: 50 percent
Netawaka soil and similar soils: 40 percent
Contrasting inclusions:
• Judson soils, 10 percent

Typical Profile

Pohocco
Surface layer:
0 to 5 inches—dark brown and brown, very friable silt loam
Subsoil:
5 to 20 inches—yellowish brown, friable silt loam
20 to 39 inches—yellowish brown, very friable, mottled, calcareous silt loam
Substratum:
39 to 80 inches—light yellowish brown, mottled, calcareous silt loam

Netawaka
Surface layer:
0 to 6 inches—dark brown, very friable silt loam
Transitional layer:
6 to 9 inches—brown silt loam
Substratum:
9 to 23 inches—olive brown, very friable, mottled, calcareous silt loam
23 to 46 inches—mixed light olive brown and grayish brown, very friable, mottled, calcareous silt loam
46 to 80 inches—grayish brown, mottled, calcareous silt loam

Soil Properties and Qualities

Pohocco
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderately low
Drainage class: Well drained
Available water capacity: Very high (12.5 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Rapid
Hazard of water erosion: Severe

Netawaka
Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderately low
Drainage class: Well drained
Available water capacity: Very high (12 inches)
Permeability: Moderate
Parent material: Loess
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
• The well drained Judson soils on foot slopes
Similar inclusions:
• Soils that are similar to the Pohocco soil but have a surface layer of silty clay loam
• Soils that are similar to the Pohocco soil but have a thick dark surface layer
• Soils that are similar to the Netawaka soil but have a surface layer of silty clay loam

Use and Management

Pasture and hay
Suitability: Well suited
Management considerations:
• A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition.
• Measures that control brush increase pasture productivity.
• Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Unsuited
Management considerations:
• A suitable alternative site should be selected.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields and sewage lagoons because of the slope

Interpretive Groups

Land capability classification: VIe

Re—Reading silt loam, moderately wet, rarely flooded

Setting

Landscape: Valleys

Landform: High flood plains
Slope shape: Plane
Slope range: 0 to 2 percent
Major use: Cropland

Composition

Reading soil and similar soils: 90 percent
Contrasting inclusions:
- Zook soils, 5 percent
- Chase soils, 5 percent

Typical Profile

Surface layer:
0 to 6 inches—very dark brown, friable silt loam
Subsurface layer:
6 to 18 inches—black, friable silt loam
Subsoil:
18 to 28 inches—very dark grayish brown, firm silty clay loam
28 to 48 inches—dark grayish brown, firm silty clay loam
48 to 54 inches—dark grayish brown, firm, mottled silty clay loam
Substratum:
54 to 80 inches—dark grayish brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Depth to seasonal high water table: 3.5 feet from December through April
Available water capacity: High (11.5 inches)
Permeability: Moderately slow
Shrink-swell potential: Moderate
Parent material: Alluvium
Surface runoff: Slow
Hazard of flooding: Rare

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chase soils on high flood plains
- The poorly drained Zook soils in swales and depressional areas on low flood plains

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.

Woodland
Suitability: Well suited
Management considerations:
- Site preparation by spraying, cutting, or girdling helps to control plant competition.

Building site development
Suitability: Generally unsuited because of flooding

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
- Enlarging the septic tank absorption field helps to overcome the moderately slow permeability.
- Sealing the lagoon helps to control seepage.

Interpretive Groups

Land capability classification: I

Sg—Shelby clay loam, 6 to 12 percent slopes

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 6 to 12 percent
Major use: Cropland and pasture

Composition

Shelby soil and similar soils: 85 percent
Contrasting inclusions:
- Kennebec soils, 5 percent
- Pawnee soils, 5 percent
- Aksarben soils, 5 percent

Typical Profile

Surface layer:
0 to 8 inches—very dark brown, friable clay loam
Subsurface layer:
8 to 13 inches—very dark grayish brown, firm clay loam
Subsoil:
13 to 21 inches—dark brown, firm clay loam
21 to 48 inches—dark yellowish brown, firm, mottled clay loam
Substratum:
48 to 80 inches—light olive brown, mottled clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Very high (12 inches)
Permeability: Moderately slow
Shrink-swell potential: Moderate
Parent material: Till
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Kennebec soils on flood plains
- Pawnee soils, which contain more clay in the subsoil than the Shelby soil; on the upper shoulders
- Aksarben soils, which contain less sand in the subsoil than the Shelby soil; on summits

Similar inclusions:
- Soils that have a surface layer of loam

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Terraces, grassed waterways or underground tile outlets, contour farming, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to control water erosion.
- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.
- Subsurface tile is needed in the seep areas.

Pasture and hay
Suitability: Well suited
Management considerations:
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Moderately well suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
- Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient.

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; unsuited to sewage lagoons
Management considerations:
- Enlarging the absorption field helps to overcome the moderate permeability.
- Land shaping and installing the absorption field on the contour help to ensure that the system operates properly.
- This soil is not suited to sewage lagoons because of the slope.

Interpretive Groups

Land capability classification: IIIe

Sm—Shelby clay loam, 12 to 18 percent slopes, moderately eroded

Setting

Landscape: Glaciated uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 12 to 18 percent
Major uses: Cropland and pasture

Composition

Shelby soil and similar soils: 85 percent
Contrasting inclusions:
- Padonia soils, 5 percent
- Pawnee soils, 5 percent
- Steinauer soils, 5 percent

Typical Profile

Surface layer:
0 to 8 inches—very dark brown, friable clay loam
Subsoil:
8 to 23 inches—dark brown, firm clay loam
23 to 45 inches—yellowish brown, firm, mottled clay loam
Substratum:
45 to 80 inches—yellowish brown, mottled loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: High (10 inches)
Permeability: Moderately slow
Shrink-swell potential: Moderate
Parent material: Till
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
- The moderately deep Padonia soils on back slopes and shoulders
- Pawnee soils, which contain more clay in the subsoil than the Shelby soil; on the upper shoulders
- Steinauer soils, which are calcareous at the surface; on back slopes

Similar inclusions:
- Soils that are deep over bedrock

Use and Management

Cultivated crops
Suitability: Generally unsuited

Pasture and hay
Suitability: Well suited
Management considerations:
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Generally unsuited because of the slope

Sanitary facilities
Suitability: Generally unsuited because of the slope and the shrink-swell potential

Interpretive Groups

Land capability classification: IVe

Wa—Wabash silty clay, occasionally flooded

Setting

Landscape: Valleys
Landform: High bottom land
Slope shape: Plane
Slope range: 0 to 1 percent
Major uses: Cropland and woodland

Composition

Wabash soil and similar soils: 90 percent
Contrasting inclusions:
- Kennebec soils, 5 percent
- Muscotah soils, 5 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark brown, friable silty clay
Subsurface layer:
7 to 15 inches—black, firm silty clay loam
Subsoil:
15 to 30 inches—very dark gray, firm, mottled silty clay
30 to 50 inches—black, very firm, mottled silty clay
50 to 80 inches—very dark gray, very firm, mottled silty clay

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Poorly drained
Seasonal high water table: At the surface to 1 foot below the surface from November through April
Available water capacity: Very high (12.5 inches)
Permeability: Slow
Parent material: Clayey alluvium
Surface runoff: Slow
Shrink-swell potential: High
Hazard of flooding: Occasional

Inclusions

Contrasting inclusions:
- The moderately well drained Kennebec soils, which contain less clay throughout than the Wabash soil; on low flood plains
- The somewhat poorly drained Muscotah soils in the higher positions on low flood plains

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Flooding or ponding often delays spring planting.
- Returning crop residue to the soil and adding other organic material improve fertility and tilth and increase the rate of water infiltration.

Woodland
Suitability: Suited
Management considerations:
- Site preparation by spraying, cutting, or girdling helps to control plant competition.
- Proper site preparation reduces the seedling mortality rate.
- Equipment is easier to use if the trees are harvested when the soil is relatively dry or is frozen.
- Using harvest methods that do not leave the remaining trees isolated or widely spaced helps to prevent windthrow.

Building site development
Suitability: Generally unsuited to dwellings because of flooding and wetness

Sanitary facilities
Suitability: Generally unsuited because of flooding and wetness

Interpretive Groups

Land capability classification: IIIw

We—Wamego silty clay loam, 3 to 7 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Back slopes
Slope shape: Convex linear
Slope range: 3 to 7 percent
Major uses: Cropland and pasture

Composition

Wamego soil and similar soils: 85 percent
Contrasting inclusions:
- Olmitz soils, 5 percent
- Pawnee soils, 5 percent
- Vinland soils, 5 percent

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown, friable silty clay loam
Subsoil:
9 to 16 inches—brown, firm silty clay loam
16 to 20 inches—olive brown, firm, mottled silty clay loam
20 to 25 inches—mixed brownish yellow and light brownish gray, firm silty clay loam
Bedrock:
25 inches—mixed olive gray, light olive brown, and yellowish brown, partially weathered, acid shale

Soil Properties and Qualities

Depth to paralithic contact: 20 to 40 inches
Potential rooting depth: Moderately deep
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Moderate (6 inches)
Permeability: Slow
Shrink-swell potential: Moderate
Parent material: Acid shale
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Olmitz soils, which are very deep; on foot slopes
- Pawnee soils, which are very deep; on shoulders
- Vinland soils, which are shallow; on back slopes

Similar inclusions:
- Soils that have a surface layer of silt loam
- Soils that are deep over shale

Use and Management

Cultivated crops
Suitability: Poorly suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Pasture and hay
Suitability: Moderately well suited
Management considerations:
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Moderately well suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

Sanitary facilities
Suitability: Unsuited to septic tank absorption fields; poorly suited to sewage lagoons
Management considerations:
- This soil generally is unsuited to septic tank absorption fields because of the slow permeability, the depth to bedrock, and the hazard of seepage.

- Sealing the lagoon helps to prevent seepage.

Interpretive Groups

Land capability classification: IVe

Wg—Wamego-Vinland silty clay loams, 3 to 15 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Wamego—shoulders; Vinland—back slopes
Slope shape: Complex
Slope range: 3 to 15 percent
Major uses: Pasture

Composition

Wamego soil and similar soils: 45 percent
Vinland soil and similar soils: 40 percent
Contrasting inclusions:
- Pawnee soils, 10 percent
- Shale outcrop, 5 percent

Typical Profile

Wamego
Surface layer:
0 to 9 inches—very dark grayish brown, friable silty clay loam
Subsoil:
9 to 16 inches—brown, firm silty clay loam
16 to 20 inches—olive brown, firm, mottled silty clay loam
20 to 25 inches—mixed brownish yellow and light brownish gray, firm silty clay loam
Bedrock:
25 inches—mixed olive gray, light olive gray, and yellowish brown, partially weathered, acid shale

Vinland
Surface layer:
0 to 8 inches—very dark grayish brown, friable silty clay loam
Subsoil:
8 to 12 inches—dark yellowish brown, firm silty clay loam
Substratum:
12 to 19 inches—light olive brown, firm silty clay loam
Bedrock:
19 to 23 inches—acid shale

Soil Properties and Qualities

Wamego
Depth to paralithic contact: 20 to 40 inches
Potential rooting depth: Moderately deep
Organic matter content: Moderate
Drainage class: Well drained
Available water capacity: Moderate (6 inches)
Permeability: Slow
Shrink-swell potential: Moderate
Parent material: Acid shale
Surface runoff: Rapid
Hazard of water erosion: Severe

Vinland
Depth to paralithic contact: 10 to 20 inches
Potential rooting depth: Shallow
Organic matter content: Moderate
Drainage class: Somewhat excessively drained
Available water capacity: Low (3.5 inches)
Permeability: Moderate
Shrink-swell potential: Moderate
Parent material: Partially weathered shale
Surface runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Contrasting inclusions:
- The moderately well drained Pawnee soils, which are very deep over bedrock; on shoulders
- Shale outcrop on shoulders and back slopes

Similar inclusions:
- Soils that are similar to the Wamego soil but have a surface layer of silt loam
- Soils that are similar to the Wamego soil but are deep over shale
- Soils that are similar to the Vinland soil but have a surface layer of silt loam

Use and Management

Pasture and hay
Suitability: Well suited
Management considerations:
- A planned grazing system that includes proper stocking rates and timely deferment of grazing improves pasture condition, helps to control erosion, and increases the available water capacity.
- Measures that control brush increase pasture productivity.
- Properly located fences, salt, and livestock watering facilities improve grazing distribution.

Building site development
Suitability: Moderately well suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.

• If the less sloping areas are selected as sites for dwellings, less leveling will be needed during construction.
• The soft bedrock generally can be easily excavated for construction of houses with basements or of buildings that have deep foundations.

Sanitary facilities
Suitability: Generally unsuited because of the slope, the restricted permeability, and the hazard of seepage

Interpretive Groups

Land capability classification: VIe

Wm—Wymore silty clay loam, 2 to 5 percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Summits
Slope shape: Convex linear
Slope range: 2 to 5 percent
Major use: Cropland

Composition

Wymore soil and similar soils: 90 percent
Contrasting inclusions:
• Pawnee soils, 10 percent

Typical Profile

Surface layer:
0 to 7 inches—very dark brown, friable silty clay loam
Subsurface layer:
7 to 12 inches—black, firm silty clay loam
Subsoil:
12 to 22 inches—very dark grayish brown, very firm silty clay
22 to 39 inches—dark grayish brown, very firm, mottled silty clay
39 to 47 inches—grayish brown, firm, mottled silty clay loam
Substratum:
47 to 80 inches—grayish brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 3 feet from March through April
Available water capacity: High (12 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
• Pawnee soils, which contain more sand in the profile than the Wymore soil; on shoulders
Similar inclusions:
• Soils that have a surface layer of silt loam

Use and Management

Cultivated crops
Suitability: Well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
• Returning crop residue to the soil and adding other organic material improve fertility and tilth.
• Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
• Managing crop residue helps to control sheet and rill erosion.
• Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
• Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Poorly suited
Management considerations:
• Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
• Installing sealed foundation drains helps to prevent the damage caused by wetness.

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; well suited to sewage lagoons
Management considerations:
• Enlarging the absorption field helps to overcome the slow permeability.

Interpretive Groups

Land capability classification: IIIe

Wn—Wymore silty clay loam, 5 to 9

percent slopes

Setting

Landscape: Uplands
Landform: Hill slopes
Landform element: Shoulders and back slopes
Slope shape: Convex linear
Slope range: 5 to 9 percent
Major uses: Cropland and pasture

Composition

Wymore soil and similar soils: 85 percent
Contrasting inclusions:
- Pawnee soils, 8 percent
- Mayberry soils, 7 percent

Typical Profile

Surface layer:
0 to 10 inches—very dark brown, friable silty clay loam
Subsoil:
10 to 18 inches—dark grayish brown, very firm silty clay
18 to 32 inches—brown, very firm, mottled silty clay
32 to 43 inches—light olive brown, very firm, mottled silty clay loam
Substratum:
43 to 80 inches—brown, mottled silty clay loam

Soil Properties and Qualities

Potential rooting depth: Very deep (60 to 80 inches)
Organic matter content: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 1 to 3 feet from March through April
Available water capacity: High (10 inches)
Permeability: Slow
Shrink-swell potential: High
Parent material: Loess
Surface runoff: Medium
Hazard of water erosion: Moderate

Inclusions

Contrasting inclusions:
- Pawnee and Mayberry soils, which contain more sand in the profile than the Wymore soil; on shoulders

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Cultivated crops
Suitability: Moderately well suited to wheat, grain sorghum, corn, and soybeans
Management considerations:
- Returning crop residue to the soil and adding other organic material improve fertility and tilth.
- Minimizing tillage helps to maintain the content of organic matter and increases the rate of water infiltration.
- Managing crop residue helps to control sheet and rill erosion.
- Terraces, grassed waterways or underground tile outlets, and contour farming may be needed to prevent ephemeral and gully erosion.
- Crop rotations help to control weeds, plant diseases, and insects.

Building site development
Suitability: Poorly suited
Management considerations:
- Properly designing and reinforcing foundations and backfilling with porous material help to prevent the structural damage caused by shrinking and swelling.
- Installing sealed foundation drains helps to prevent the damage caused by wetness.

Sanitary facilities
Suitability: Poorly suited to septic tank absorption fields; moderately well suited to sewage lagoons
Management considerations:
- Enlarging the absorption field helps to overcome the slow permeability.
- If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

Interpretive Groups

Land capability classification: IVe

Use and Management of the Soils

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

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

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

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.

Crops

George P. Davis, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

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

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

About 73 percent of the total land area in Brown County was cropland during the period from 1983 to 1992. Corn was grown on 18 percent of this cropland, soybeans on 30 percent, grain sorghum on 16 percent, wheat on 20 percent, and alfalfa and oats on 3 percent.

Soil erosion is the major management concern on about 70 percent of the cropland and pasture in Brown County. It is a hazard in areas where the slope is more than 2 percent. Nearly all of the upland soils have slopes of more than 2 percent.

Loss of the surface layer through erosion is damaging because fertility is reduced when the less fertile subsoil or substratum is incorporated into the plow layer. On many sloping, eroded soils, productivity is reduced and harvesting is difficult because small gullies have formed. Erosion also results in the sedimentation of streams. Control of erosion minimizes the pollution of streams and water-impoundment structures.

Conservation tillage systems and crop rotations that leave part or all of the crop residue on the surface reduce the runoff rate and increase the infiltration rate. Keeping a protective cover on the soil for an extended period helps to prevent losses through erosion that reduce the productive capacity of the soils. On Contrary, Monona, and Morrill soils, a protective plant cover or a close-growing crop is needed unless erosion is controlled through conservation tillage systems.

Conservation tillage systems increase the infiltration rate, reduce the runoff rate, and help to control erosion. They are practical on most soils in the survey area.

Terraces and diversions reduce the length of slopes and thus help to control runoff and erosion . They are

most practical on deep, well drained soils that have regular slopes. Monona and Marshall soils are examples. Some soils are less suitable for terraces, diversions, and grassed waterways because they have steep and irregular slopes.

Contour farming helps to control erosion in many areas in the county. It is especially practical in areas that have been terraced.

In many areas underground tile outlets in combination with terraces are being used in place of grassed waterways. These systems can control erosion on the steeper, friable soils.

Information concerning the design of erosion-control measures and drainage systems for each kind of soil is contained in the Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Soil fertility was naturally high in most soils in the uplands, but erosion has reduced the organic matter content to medium or low. Chase and Kennebec soils and other soils on flood plains, which are dominantly slightly acid or neutral, are naturally higher in content of plant nutrients than most other soils. The Judson and Olmitz soils on terraces and foot slopes are also high in fertility. The upland soils that formed in silty loess are naturally high in content of phosphorus and potassium, but additions of chemical fertilizer are needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Most of the soils used for crops in the survey area have a surface layer of silt loam, silty clay loam, or loam that is moderately dark and has a moderate or low content of organic matter. Generally, the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. The crust reduces the infiltration rate and increases the runoff rate. Regularly adding large amounts of crop residue or leaving large amounts on the surface improves soil structure, helps to prevent surface crusting, and helps to control erosion. Conservation tillage systems help to control erosion on the more sloping soils. Fall plowing generally is not suitable on these soils because it results in extensive erosion.

Poor tilth is a problem on the clayey Grundy, Martin, and Wabash soils, which stay wet for longer periods than other soils. If these soils are plowed or tilled when wet, they tend to be very cloddy when dry. As a result of the cloddiness, preparing a good seedbed is difficult. Plowing the more clayey bottom-land soils in the fall results in good tilth in the spring.

Field crops suited to the soils in the county include many that are not commonly grown. Corn is the main crop. Soybeans, grain sorghum, and wheat are also grown. Alfalfa, clover, barley, oats, and rye are grown less extensively. These crops could be grown more extensively if economic conditions were favorable.

Yields per Acre

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

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

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 include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include

possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless 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.

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

The capability classification of each map unit is given in the section “Detailed Soil Map Units” and in the yields table.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 165,000 acres in the survey area, or nearly 45 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in the table “Prime Farmland” at the end of this section. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite

evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in the table "Acreage and Proportionate Extent of the Soils" in Part I of this survey. The location is shown on the detailed soil maps in Part III. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Rangeland

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

The table "Rangeland Productivity" at the end of this section shows, for each soil that supports rangeland vegetation suitable for grazing, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. An explanation of the column headings in the table follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

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

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

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

Woodland Management and Productivity

Gary A. Kuhn, forester, Natural Resources Conservation Service, helped prepare this section.

Approximately 19,700 acres in Brown County, or about 5 percent of the land area, is woodland. An additional 9,500 acres, or 3 percent of the land area, is composed of wooded strips or of land classified as nonforest covered with trees. The productive woodland capable of producing valuable wood products is along the bottom-land rivercourses and on the north slopes of drainageways.

The potential productivity of a site is influenced by many factors. Soil characteristics, slope, aspect, and frequency of flooding all affect the tree species, composition, and productivity of a particular site. Soils along flood plains, such as Chase, Kennebec, Muscotah, and Nodaway soils, are very productive. Common trees in these areas are eastern cottonwood, green ash, hackberry, red oak, bur oak, black walnut, American sycamore, American basswood, American elm, and red elm. The gentle breaks or foot slopes near flood plains are also productive and support red oak, bur oak, white oak, black walnut, and hackberry. The north aspects, including areas of Padonia and Martin soils, also support these species. Towards the top of the slope on north aspects, in areas of Kipson, Pawnee, Wymore, and Vinland soils, shagbark hickory and bitternut hickory are more predominant along with chinkapin oak and honeylocust. On south- and west-facing slopes, where moisture is limited, honeylocust, Osage-orange, and eastern redcedar tend to encroach into areas of unmanaged pasture. Shelby, Steinauer,

Morrill, and Burchard soils are examples of the drier soils on south and west aspects.

Timber stand improvement activities, such as thinning, weeding, and pruning, can improve the quality and quantity of wood products. Tree planting or natural reseeding may be needed to establish trees that have more timber value. For example, black walnut, which is a high-value species, is commonly only in scattered areas on flood plains. Over the years this species has been cut out, leaving mainly ash, hackberry, cottonwood, or honeylocust. Creating openings and controlling weeds allow the walnut to naturally seed or to be successfully planted. These practices are also beneficial for such species as red oak and bur oak. Timber stand improvement measures should be applied as the new trees are becoming established. Livestock grazing should not be allowed in areas designed for woodland production. The livestock will browse or trample desirable tree seedlings and can cause severe surface compaction, which hinders the infiltration of air and water into the soil. A forester should be consulted when timber harvest or improvement activities are planned.

Much of the woodland on the flood plains and on the gentle slopes has been cleared for crop production. Some of these sites could be replanted to trees depending on the objective of the landowner. Plantings of walnut, oak/ash, and hackberry on deep, well drained soils on flood plains can produce quality timber and firewood if managed properly. Filter strip plantings of green ash, black locust, silver maple, and honeylocust next to cropland adjacent to stream channels can help to protect streambanks and improve water quality. A forester should be consulted if the objective of tree planting is to provide income from timber or firewood.

The table “Woodland Management and Productivity” at the back 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 in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 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; *L*, low strength; 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, L, 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.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

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

Windbreaks and Environmental Plantings

Gary A. Kuhn, forester, Natural Resources Conservation Service, helped prepare this section.

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.

Most windbreak plantings in Brown County provide farmstead protection. The most common tree and shrub species in existing windbreaks are eastern redcedar, Austrian pine, Scotch pine, honeylocust, hackberry, Siberian elm, green ash, cotoneaster, autumn-olive, American plum, and Tatarian honeysuckle. Esthetic plantings around the farmsteads may include such species as eastern white pine, Colorado blue spruce, pin oak, red oak, bur oak, silver maple, and various species of crabapple. Ponderosa pine has been planted in some of the farmstead windbreaks; however, this species is not recommended in this area because of its susceptibility to tip moth and tip blight damage. Height growth is severely affected, and the trees will have a stunted appearance with a “rounded crown.” Healthy pines should have a conical shape. A large number of shrub plantings consisting of Tatarian honeysuckle are infested with the honeysuckle aphid. This insect causes severe loss of growth and vigor in Tatarian honeysuckle. A visual symptom is individual dead branches forming a “witch’s broom” causing an unsightly appearance. No effective treatment is known other than removing the infested branches. New varieties of honeysuckle are now available that are resistant to this insect.

Most of the windbreaks are in upland areas of Grundy, Marshall, Monona, Aksarben, and Wymore

soils. Eastern redcedar, Austrian pine, and Scotch pine grow well on these soils. Better height growth of these species as well as of deciduous trees and shrubs can be expected on Marshall and Monona soils because they have a lower content of clay than the Grundy, Aksarben, and Wymore soils.

A major concern affecting existing windbreaks in Brown County is the encroachment of smooth brome, which is a cool-season grass. This encroachment creates a sodbound condition. Many of the farmstead windbreaks in the area have become sodbound with this grass, especially the leeward rows of deciduous trees, which are unable to shade out the brome as effectively as the windward rows of cedar or pine. Some tree species, such as green ash, honeylocust, black walnut, and hackberry, will stagnate once brome moves in. Smooth brome is a competitive species because it uses moisture and nutrients during the same growing period as the trees and shrubs. Its dense root system uses most of the soil moisture. Most of the tree roots that obtain water and nutrients are in the upper 2 feet of the soil, and thus the trees cannot compete with this grass for moisture. The effects of this competition are amplified during drought conditions. During these periods the trees can become so severely stressed that they are unable to fight off attacks by insects or disease. Also, smooth brome produces toxins that retard tree growth. The most effective method for controlling smooth brome is applying post-emergent herbicides. Typically, two applications are required—once during the spring and once in the fall. Pre-emergent herbicides can also be effective in keeping brome from invading new windbreak plantings. A new product is now being used for tree plantings in Kansas that may prove to be an excellent method of weed control, especially for brome sites. It is a woven polyurethane fabric that is laid down after the seedlings are planted. The fabric provides an effective weed barrier for 5 years. The planting site should be well prepared before the trees are planted and the weed barrier is installed. Such preparation includes killing the brome sod. Ideally, the brome sod should be killed the year before the site is planted and the site should be fallowed so that it can store moisture before the trees are planted.

Establishing windbreaks and environmental plantings requires careful planning. Location, suitability of the soil for the species to be planted, site preparation, planting technique, and maintenance are all essential factors that should be considered before any windbreak is planted. Most windbreaks are established on the north and west sides of farmsteads and placed at a specified distance away. The trees and shrubs to be planted must be suited to the soil and climate of the area. The planting site should be well prepared before planting begins, and a minimum 3- to 5-year weed control schedule should be followed.

More trees and shrubs could be planted in Brown County for wildlife habitat. These plantings can be located along field borders, in corners, or in areas next to cropland that are idle and impractical to farm. They provide valuable cover for wildlife and shelter during winter storms. Clump plantings of evergreens and shrubs are the most suitable for these plantings. Small deciduous trees, such as crabapple, hawthorn, Russian-olive, and mulberry, are also suitable. Commonly, evergreens, such as eastern redcedar, are established to the north and shrubs and small deciduous trees to the south.

Field windbreaks for crop protection can be beneficial on fields that are relatively flat and are subject to severe winds. One to three rows of trees planted at right angles to the prevailing wind can protect winter wheat from winterkill and trap snow for increased crop yields. The windbreaks also protect spring crops from hot southerly winds in the summer and reduce the evaporation rate, thus increasing the available moisture for crop production.

The zone of protection afforded to crops behind a windbreak is generally a distance 10 times the height of the windbreak (10H). Some benefits of windbreaks extend to 20 times the height of the windbreak (20H).

For example, a row of green ash 25 feet tall provides good protection to a distance of 250 feet on the leeward side and some wind reduction to a distance of 500 feet. The benefits are derived by reducing the velocity of the wind. Wind velocity is reduced by 50 to 75 percent by a protection zone of 0-8H, by 30 to 50 percent by a protection zone of 10H, and by 20 to 30 percent by a protection zone of 20H. The intervals used for field windbreaks depend on the soil type, the size of equipment, and the type of crop in a rotation that benefits the most from windbreak protection.

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 the 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 the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Recreation

Kenneth A. Kuiper, biologist, Natural Resources Conservation Service, helped prepare this section.

Brown County has several areas of scenic, geologic, and historic interest. Watershed lakes, farm ponds, and streams provide opportunities for fishing and other water-oriented recreation on privately owned land. Private membership recreation areas within the county provide camping, picnicking, skating, and fishing. Indian reservations for the Kickapoo and the Sac-Fox Indian tribes sponsor annual powwows that attract many visitors.

Brown County is quite diverse geologically. It varies from flat bottom lands dissected by wooded streams to steep loess hills and bluffs that are unique to this corner of Kansas.

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, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In the table, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

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

Camp 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 best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Kenneth A. Kuiper, biologist, Natural Resources Conservation Service, helped prepare this section.

The primary game species of Brown County are bobwhite quail, mourning dove, cottontail rabbit, fox squirrel, white-tailed deer, ring-neck pheasant, turkey, and several species of waterfowl.

Nongame species are numerous because of the diversity of habitat types. Cropland, woodland, and pastureland are intermixed throughout the county, creating the desirable edge effect conducive to many wildlife species. Each of these habitat types can provide food, cover, water, and space for wildlife.

Furbearers are common along many of the streams, and a limited amount of trapping is done.

Stockwater ponds and streams provide good to excellent fishing. Species commonly taken in the county are bass, channel catfish, flathead catfish, carp, and bluegill.

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. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In the table "Wildlife Habitat," the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. These plants provide essential habitat for wetland wildlife species. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas

produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

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

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 are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The

ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, 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 are generally 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, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

The table “Sanitary Facilities” shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally 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.

This table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

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

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

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

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

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench 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.

Soil texture, wetness, coarse 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, a cemented pan, or the water table to permit revegetation. The soil material used as the 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.

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. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, 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 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, only the probability of finding material in suitable quantity 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 up to 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. Coarse 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 is generally 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 are generally 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 this table, 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 greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

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

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

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

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

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of 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 or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Land Capability and Yields Per Acre of Crops and Pasture Table

(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)

Soil name and map symbol	Land capability	Winter wheat	Grain sorghum	Soybeans	Corn	Smooth bromegrass
		Bu	Bu	Bu	Bu	AUM*
Ac—Aksarben	I	42	90	46	115	---
Ad—Aksarben	IIe	38	82	38	110	---
Ae—Aksarben	IIIe	34	75	30	95	---
Bs—Burchard	IIIe	31	66	22	60	3.1
Bx—Burchard-Steinauer-Padonia	VIe	---	---	---	---	3.0
Ch—Chase	IIw	43	87	36	82	8.0
Co—Contrary	IIIe	40	---	36	105	8.0
Ga—Grundy	IIe	42	89	38	114	5.7
Ju—Judson	IIe	50	90	53	159	6.5
Kd—Kennebec	VIw	---	---	---	---	---
Ke—Kennebec	IIw	46	87	54	162	6.6
Kp—Kipson-Sogn	VIe	---	---	---	---	2.5
M-W—Miscellaneous water	VIIIs	---	---	---	---	---
Ma—Marshall	IIe	43	79	50	150	6.2
Mb—Marshall	IIIe	42	78	49	145	6.0
Md—Martin	IIe	35	60	40	80	5.5
Mf—Martin	IVe	27	47	30	70	5.0
Mh—Mayberry	IIIe	30	70	25	55	---

See footnote at end of table.

Land Capability and Yields Per Acre of Crops and Pasture Table--Continued

Soil name and map symbol	Land capability	Winter wheat	Grain sorghum	Soybeans	Corn	Smooth bromegrass
		Bu	Bu	Bu	Bu	AUM*
Mk--- Monona	IIe	43	78	48	142	---
Mn--- Monona	IIIe	40	74	33	133	---
Mt--- Morrill	IVe	36	60	30	75	6.0
Mw--- Muscotah	IIw	40	90	36	125	---
My--- Muscotah	IIw	41	90	34	120	---
No--- Nodaway	IIw	42	88	51	153	---
Om--- Olmitz	IIe	48	87	46	137	5.6
Or--- Orthents	VIIIs	---	---	---	---	---
Pd--- Padonia-Martin	IVe	25	44	70	78	4.9
Pe--- Padonia-Martin	VIe	---	---	---	---	4.3
Pf--- Padonia-Oska	IVe	27	46	71	80	5.0
Pm--- Pawnee	IIIe	33	75	26	64	---
Pn--- Pawnee	IVe	27	62	21	49	---
Po--- Pawnee	IVe	23	48	19	42	---
Pt. Pits						
Pw--- Pohocco-Netawaka	IVe	---	60	25	98	---
Px--- Pohocco-Netawaka	VIe	---	---	---	---	4.0
Re--- Reading	I	52	94	44	92	---
Sg--- Shelby	IIIe	35	64	40	119	4.9
Sm--- Shelby	IVe	34	62	33	98	4.0

See footnote at end of table.

Land Capability and Yields Per Acre of Crops and Pasture Table--Continued

Soil name and map symbol	Land capability	Winter wheat	Grain sorghum	Soybeans	Corn	Smooth bromegrass
		Bu	Bu	Bu	Bu	AUM*
Wa---------- Wabash	IIIw	39	80	32	90	---
We---------- Wamego	IVe	30	65	22	60	6.0
Wg---------- Wamego-Vinland-Pawnee	IVe	---	---	---	---	2.0
Wm---------- Wymore	IIIe	35	80	30	70	---
Wn---------- Wymore	IVe	35	68	26	58	---

* 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 Table

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
Ac	Aksarben silty clay loam, 0 to 2 percent slopes
Ad	Aksarben silty clay loam, 2 to 5 percent slopes
Ch	Chase silty clay loam, occasionally flooded
Ga	Grundy silt loam, 0 to 2 percent slopes
Ju	Judson silt loam, 2 to 5 percent slopes
Ke	Kennebec silt loam, occasionally flooded
Ma	Marshall silt loam, 2 to 5 percent slopes
Md	Martin silty clay loam, 1 to 4 percent slopes
Mh	Mayberry clay loam, 2 to 6 percent slopes
Mk	Monona silt loam, 2 to 5 percent slopes
Mw	Muscotah silt loam, occasionally flooded, overwash
My	Muscotah silty clay loam, occasionally flooded
No	Nodaway silt loam, occasionally flooded
Om	Olmitz loam, 2 to 5 percent slopes
Pm	Pawnee clay loam, 2 to 6 percent slopes
Re	Reading silt loam, moderately wet, rarely flooded
Wa	Wabash silty clay, occasionally flooded (where drained)
We	Wamego silty clay loam, 3 to 7 percent slopes
Wm	Wymore silty clay loam, 2 to 5 percent slopes
Wn	Wymore silty clay loam, 5 to 9 percent slopes

Rangeland Productivity Table

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Ac:				
Aksarben	Loamy Upland	4,500	4,000	3,500
Marshall	Loamy Upland	4,800	4,400	4,000
Ad:				
Aksarben	Loamy Upland	4,500	4,000	3,500
Morrill	Loamy Upland	6,000	5,000	4,000
Ae:				
Aksarben	Loamy Upland	4,500	4,000	3,500
Morrill	Loamy Upland	6,000	5,000	4,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Bs:				
Burchard	Loamy Upland	4,400	3,900	3,500
Steinauer	Limy Upland	3,200	2,700	2,500
Pawnee	Clay Upland	3,700	3,200	2,700
Bx:				
Burchard	Loamy Upland	4,400	3,900	3,500
Steinauer	Limy Upland	3,200	2,700	2,500
Padonia	Clay Upland	4,500	3,500	2,500
Ch:				
Chase	Loamy Lowland	10,000	8,500	6,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Muscotah	Loamy Lowland	7,000	6,000	5,000
Co:				
Contrary	Loamy Upland	4,000	3,600	3,200
Kennebec	Loamy Lowland	5,300	4,900	4,500
Morrill	Loamy Upland	6,000	5,000	4,000
Ga:				
Grundy	Loamy Upland	4,600	4,200	3,800
Haig	Clay Upland	4,100	3,600	3,200
Ju:				
Judson	Loamy Lowland	4,800	4,400	4,000
Kennebec	Loamy Lowland	5,300	4,900	4,500

Rangeland Productivity Table--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Kd:				
Kennebec	Loamy Lowland	5,300	4,900	4,500
Chase	Loamy Lowland	10,000	8,500	6,000
Muscotah	Loamy Lowland	7,000	6,000	5,000
Ke:				
Kennebec	Loamy Lowland	5,300	4,900	4,500
Chase	Loamy Lowland	10,000	8,500	6,000
Nodaway	Loamy Lowland	4,000	3,800	3,500
Kp:				
Kipson	Limy Upland	4,500	3,500	2,000
Sogn	Shallow Limy	3,500	2,500	1,500
Kennebec	Loamy Lowland	5,300	4,900	4,500
Ma:				
Marshall	Loamy Upland	4,800	4,400	4,000
Wymore	Clay Upland	4,100	3,600	3,200
Mb:				
Marshall	Loamy Upland	4,800	4,400	4,000
Contrary	Limy Upland	4,100	3,600	3,200
Morrill	Loamy Upland	6,000	5,000	4,000
Md:				
Martin	Loamy Upland	7,000	5,500	4,000
Chase	Loamy Lowland	10,000	8,500	6,000
Pawnee	Clay Upland	3,700	3,200	2,700
Mf:				
Martin	Loamy Upland	7,000	5,500	4,000
Padonia	Clay Upland	4,500	3,500	2,500
Vinland	Loamy Upland	5,500	4,500	3,500
Mh:				
Mayberry	Clay Upland	3,700	3,200	2,700
Morrill	Loamy Upland	6,000	5,000	4,000
Wymore	Clay Upland	4,100	3,600	3,200
Mk:				
Monona	Loamy Upland	4,000	3,600	3,200
Pohocco	Loamy Upland	4,200	3,600	3,000

Rangeland Productivity Table--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Mn:				
Monona	Loamy Upland	4,000	3,600	3,200
Netawaka	Loamy Upland	3,500	2,500	2,000
Pohocco	Loamy Upland	4,200	3,600	3,000
Mt:				
Morrill	Loamy Upland	6,000	5,000	4,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Pawnee	Clay Upland	3,700	3,200	2,700
Mw:				
Muscotah	Loamy Lowland	7,000	6,000	5,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Zook	Clay Lowland	9,000	9,000	7,000
My:				
Muscotah	Loamy Lowland	7,000	6,000	5,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Wabash	Clay Lowland	10,000	9,000	7,000
No:				
Nodaway	Loamy Lowland	4,000	3,800	3,500
Chase	Loamy Lowland	10,000	8,500	6,000
Zook	Clay Lowland	9,000	9,000	7,000
Om:				
Olmitz	Loamy Upland	4,100	3,500	3,000
Chase	Loamy Lowland	10,000	8,500	6,000
Pawnee	Clay Upland	3,700	3,200	2,700
Pd, Pe:				
Padonia	Clay Upland	4,500	3,500	2,500
Martin	Loamy Upland	7,000	5,500	4,000
Kipson	Limy Upland	4,500	3,500	2,000
Pf:				
Padonia	Clay Upland	4,500	3,500	2,500
Oska	Clay Upland	6,000	5,000	3,500
Kipson	Limy Upland	4,500	3,500	2,000
Pm:				
Pawnee	Clay Upland	3,700	3,200	2,700
Morrill	Loamy Upland	6,000	5,000	4,000
Shelby	Loamy Upland	4,400	3,900	3,500

Rangeland Productivity Table--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Pn:				
Pawnee	Clay Upland	3,700	3,200	2,700
Morrill	Loamy Upland	6,000	5,000	4,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Po:				
Pawnee	Clay Upland	2,500	2,000	1,500
Mayberry	Clay Upland	3,700	3,200	2,700
Kennebec	Loamy Lowland	5,300	4,900	4,500
Pw, Px:				
Pohocco	Loamy Upland	4,200	3,600	3,000
Netawaka	Loamy Upland	3,500	2,500	2,000
Judson	Loamy Lowland	4,800	4,400	4,000
Re:				
Reading	Loamy Upland	10,000	8,000	6,000
Zook	Clay Lowland	9,000	8,000	7,000
Chase	Loamy Lowland	10,000	8,500	6,000
Sg:				
Shelby	Loamy Upland	7,000	5,500	4,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Pawnee	Clay Lowland	3,700	3,200	2,700
Sm:				
Shelby	Loamy Upland	4,100	3,500	3,000
Padonia	Loamy Upland	4,500	3,500	2,500
Pawnee	Clay Upland	3,700	3,200	2,700
Wa:				
Wabash	Subirrigated	10,000	9,000	7,000
Kennebec	Loamy Lowland	5,300	4,900	4,500
Muscotah	Loamy Lowland	7,000	6,000	5,000
We:				
Wamego	Loamy Upland	6,000	4,500	3,500
Olmitz	Loamy Upland	4,100	3,500	3,000
Pawnee	Clay Upland	3,700	3,200	2,700
Wg:				
Wamego	Loamy Upland	6,000	4,500	3,500
Vinland	Loamy Upland	5,500	4,500	3,500
Pawnee	Clay Upland	3,700	3,200	2,700

Rangeland Productivity Table--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Wm:				
Wymore	Clay Upland	4,100	3,600	3,200
Pawnee	Clay Upland	3,700	3,200	2,700
Wn:				
Wymore	Clay Upland	4,100	3,600	3,200
Pawnee	Clay Upland	3,700	3,200	2,700
Mayberry	Clay Upland	3,700	3,200	2,700

Woodland Management and Productivity Table

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

Soil name and map symbol	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
Ad:										
Aksarben.										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Ae:										
Aksarben.										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Ch:										
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Muscotah	3W	Slight	Moderate	Slight	Moderate	Severe	Bur oak	60	3	Bur oak, hackberry, green ash, eastern cottonwood, black walnut.
							Eastern cottonwood	80	6	
							Green ash	---	---	
							Hackberry	---	---	
							Black walnut	60	3	
Co:										
Contrary.										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	

See footnote at end of table.

Woodland Management and Productivity Table--Continued

Soil name and map symbol	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
Ju:										
Judson.										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Kd:										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	
Muscotah	3W	Slight	Moderate	Slight	Moderate	Severe	Bur oak	60	3	Bur oak, hackberry, green ash, eastern cottonwood, black walnut.
							Eastern cottonwood	80	6	
							Green ash	---	---	
							Hackberry	---	---	
							Black walnut	60	3	
Ke:										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Kp:										
Kipson.										
Sogn.										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	

See footnote at end of table.

Woodland Management and Productivity Table--Continued

Soil name and map symbol	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
Mb:										
Marshall.										
Contrary.										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Md:										
Martin	3C	Slight	Slight	Moderate	Slight	Severe	White oak	60	3	Black walnut, white oak, black oak, hackberry, green ash, shagbark hickory.
							Black walnut	68	---	
Md:										
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	
Pawnee.										
Mf:										
Martin	3C	Slight	Slight	Moderate	Slight	Severe	White oak	60	3	Black walnut, white oak, black oak, hackberry, green ash, shagbark hickory.
							Black walnut	68	---	
Padonia.										
Vinland.										
Mh:										
Mayberry.										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Wymore.										
Mt:										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Pawnee.										

See footnote at end of table.

Woodland Management and Productivity Table--Continued

Soil name and map symbol	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
Mw:										
Muscotah	3W	Slight	Moderate	Slight	Moderate	Severe	Bur oak	60	3	Bur oak, hackberry, green ash, eastern cottonwood, black walnut.
							Eastern cottonwood	80	6	
							Green ash	---	---	
							Hackberry	---	---	
							Black walnut	60	3	
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Zook.										
My:										
Muscotah	3W	Slight	Moderate	Slight	Moderate	Severe	Bur oak	60	3	Bur oak, hackberry, green ash, eastern cottonwood, black walnut.
							Eastern cottonwood	80	6	
							Green ash	---	---	
							Hackberry	---	---	
							Black walnut	60	3	
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Wabash	4W	Slight	Severe	Moderate	Moderate	Severe	Pin oak	75	4	Pin oak, pecan, eastern cottonwood.
No:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	
Zook.										
Om:										
Olmitz.										
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	
Pawnee.										

See footnote at end of table.

Woodland Management and Productivity Table--Continued

Soil name and map symbol	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
Pd, Pe:										
Padonia.										
Martin	3C	Slight	Slight	Moderate	Slight	Severe	White oak	60	3	Black walnut, white oak, black oak, hackberry, green ash, shagbark hickory.
							Black walnut	68	---	
Kipson.										
Pm:										
Pawnee.										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Kipson.										
Pn:										
Pawnee.										
Morrill	3A	Moderate	Moderate	Moderate	Moderate	Moderate	White oak	55	3	Black walnut, white oak, black oak, hackberry, green ash.
							Black walnut	---	---	
							Black oak	55	3	
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Po:										
Pawnee.										
Po:										
Mayberry.										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Re:										
Reading	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	60	3	Black walnut, green ash, hackberry, bur oak, eastern cottonwood, northern red oak.
							Black walnut	73	---	
							Hackberry	69	---	
							Shagbark hickory	62	---	
							Northern red oak	---	---	
Zook.										
Chase	3C	Slight	Slight	Moderate	Slight	Severe	Bur oak	62	4	Bur oak, green ash, eastern cottonwood, hackberry.
							Hackberry	60	---	
							Green ash	60	4	
							Eastern cottonwood	66	4	
							Black walnut	55	---	

See footnote at end of table.

Woodland Management and Productivity Table--Continued

Soil name and map symbol	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
Sg:										
Shelby.										
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Pawnee.										
Wa:										
Wabash	4W	Slight	Severe	Severe	Moderate	Severe	Pin oak	75	4	Pin oak, pecan, eastern cottonwood.
Kennebec	3A	Slight	Slight	Slight	Slight	Moderate	Bur oak	63	3	Bur oak, black walnut, hackberry, green ash, eastern cottonwood, American sycamore.
							Black walnut	79	---	
							Hackberry	---	---	
							Green ash	---	---	
							Eastern cottonwood	---	---	
Wa:										
Muscotah	3W	Slight	Moderate	Slight	Moderate	Severe	Bur oak	60	3	Bur oak, hackberry, green ash, eastern cottonwood, black walnut.
							Eastern cottonwood	80	6	
							Green ash	---	---	
							Hackberry	---	---	
							Black walnut	60	3	

* 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.

Windbreaks and Environmental Plantings Table

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ac:					
Aksarben	---	American plum, autumn-olive, common chokecherry, lilac.	Eastern redcedar, blue spruce, black walnut, bur oak.	Scotch pine, honeylocust, pin oak, Austrian pine, green ash, silver maple.	Siberian elm.
Marshall	---	Autumn-olive, lilac, Amur maple, Amur honeysuckle.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Ad:					
Aksarben	---	American plum, autumn-olive, common chokecherry, lilac.	Eastern redcedar, blue spruce, black walnut, bur oak.	Scotch pine, honeylocust, pin oak, Austrian pine, green ash, silver maple.	Siberian elm.
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Ae:					
Aksarben	---	American plum, autumn-olive, common chokecherry, lilac.	Eastern redcedar, blue spruce, black walnut, bur oak.	Scotch pine, honeylocust, pin oak, Austrian pine, green ash, silver maple.	Siberian elm.
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Bs:					
Burchard	Peking cotoneaster	American plum, lilac.	Eastern redcedar, Russian mulberry, green ash, hackberry, bur oak.	Austrian pine, Scotch pine, honeylocust.	---
Steinauer	Fragrant sumac	Russian-olive	Eastern redcedar, green ash, bur oak.	---	---
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Bx:					
Burchard	Peking cotoneaster	American plum, lilac.	Eastern redcedar, Russian mulberry, green ash, hackberry, bur oak.	Austrian pine, Scotch pine, honeylocust.	---
Steinauer	Fragrant sumac	Russian-olive	Eastern redcedar, green ash, bur oak.	---	---
Padonia	Peking cotoneaster	Lilac, Manchurian crabapple, Amur honeysuckle, Siberian peashrub.	Eastern redcedar, hackberry, Austrian pine, Russian-olive, green ash.	Honeylocust, Siberian elm.	---
Ch:					
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Muscotah	---	Amur honeysuckle, lilac, American plum, Peking cotoneaster.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, bur oak.	Eastern cottonwood.
Co:					
Contrary	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Eastern redcedar, bur oak, hackberry, green ash, Russian-olive.	Austrian pine, eastern white pine, honeylocust.	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Ga:					
Grundy	Lilac	Siberian peashrub, Manchurian crabapple, Amur honeysuckle, autumn-olive.	Eastern redcedar, hackberry, Russian-olive, Austrian pine, green ash, jack pine.	Honeylocust	---

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ga:					
Haig	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, hackberry.	Austrian pine, honeylocust, green ash, golden willow, silver maple, northern red oak.	Eastern cottonwood.
Ju:					
Judson	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Hackberry, bur oak, green ash, Russian-olive, eastern redcedar.	Honeylocust, Austrian pine, eastern white pine.	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Kd:					
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.
Muscotah	---	Amur honeysuckle, lilac, American plum, Peking cotoneaster.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, bur oak.	Eastern cottonwood.
Ke:					
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.
Nodaway	---	Amur honeysuckle, autumn-olive, Amur maple, lilac.	Eastern redcedar	Austrian pine, hackberry, honeylocust, green ash, eastern white pine.	Eastern cottonwood.
Kp:					
Kipson.					

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Kp:					
Sogn.					
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
M-W.					
Miscellaneous water					
Ma:					
Marshall	---	Autumn-olive, lilac, Amur maple, Amur honeysuckle.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Wymore	Peking cotoneaster, skunkbush sumac, lilac.	Manchurian crabapple, Amur honeysuckle.	Eastern redcedar, Austrian pine, ponderosa pine, Russian-olive, hackberry, green ash.	Honeylocust	---
Mb:					
Marshall	---	Autumn-olive, lilac, Amur maple, Amur honeysuckle.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Contrary	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Eastern redcedar, bur oak, hackberry, green ash, Russian-olive.	Austrian pine, eastern white pine, honeylocust.	---
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Md:					
Martin	Lilac	Autumn-olive, Amur honeysuckle, Siberian peashrub, Manchurian crabapple.	Green ash, hackberry, Austrian pine, eastern redcedar, jack pine, Russian-olive.	Honeylocust	---
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Mf:					
Martin	Lilac	Autumn-olive, Amur honeysuckle, Siberian peashrub, Manchurian crabapple.	Green ash, hackberry, Austrian pine, eastern redcedar, jack pine, Russian-olive.	Honeylocust	---
Padonia	Peking cotoneaster	Lilac, Manchurian crabapple, Amur honeysuckle, Siberian peashrub.	Eastern redcedar, hackberry, Austrian pine, Russian-olive, green ash.	Honeylocust, Siberian elm.	---
Vinland.					
Mh:					
Mayberry	Siberian peashrub, Amur honeysuckle, lilac.	Eastern redcedar, Manchurian crabapple, autumn-olive.	Russian-olive, Austrian pine, jack pine, green ash, hackberry, honeylocust.	---	---
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Wymore	Peking cotoneaster, skunkbush sumac, lilac.	Manchurian crabapple, Amur honeysuckle.	Eastern redcedar, Austrian pine, ponderosa pine, Russian-olive, hackberry, green ash.	Honeylocust	---
Mk:					
Monona	---	Autumn-olive, lilac, Amur maple, Amur honeysuckle.	Bur oak, hackberry, green ash, Russian-olive, eastern redcedar.	Honeylocust, eastern white pine, Austrian pine.	---
Pohocco	Lilac, American plum.	Common chokecherry, autumn-olive.	Ponderosa pine, green ash, Austrian pine, bur oak, blue spruce, black walnut, pin oak, eastern redcedar.	Honeylocust, silver maple, Scotch pine, Siberian elm.	---
Mn:					
Monona	---	Autumn-olive, lilac, Amur maple, Amur honeysuckle.	Bur oak, hackberry, green ash, Russian-olive, eastern redcedar.	Honeylocust, eastern white pine, Austrian pine.	---
Netawaka	Lilac, American plum.	Autumn-olive, lilac, Amur maple, Amur honeysuckle.	Bur oak, hackberry, green ash, Russian-olive.	Honeylocust, eastern white pine, Austrian pine.	---

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Mn:					
Pohocco	Lilac, American plum.	Autumn-olive, Common chokecherry, autumn-olive.	Bur oak, Ponderosa pine, green ash, Austrian pine, bur oak, blue spruce, black walnut, pin oak, eastern redcedar.	Honeylocust, Honeylocust, silver maple, Scotch pine, Siberian elm.	---
Mt:					
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Mw:					
Muscotah	---	Amur honeysuckle, lilac, American plum, Peking cotoneaster.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, bur oak.	Eastern cottonwood.
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Zook	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, hackberry.	Honeylocust, golden willow, green ash, northern red oak, silver maple, Austrian pine.	Eastern cottonwood.
My:					
Muscotah	---	Amur honeysuckle, lilac, American plum, Peking cotoneaster.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, bur oak.	Eastern cottonwood.
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
My:					
Wabash	Buttonbush	Possumhaw	Hackberry, eastern redcedar, northern whitecedar, nannyberry viburnum.	Pin oak, baldcypress.	Eastern cottonwood.
No:					
Nodaway	---	Amur honeysuckle, autumn-olive, Amur maple, lilac.	Eastern redcedar	Austrian pine, hackberry, honeylocust, green ash, eastern white pine.	Eastern cottonwood.
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.
Zook	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, hackberry.	Honeylocust, golden willow, green ash, northern red oak, silver maple, Austrian pine.	Eastern cottonwood.
Om:					
Olmitz	---	Amur maple, lilac, autumn-olive, Amur honeysuckle.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Or.					
Orthents					
Pd, Pe:					
Padonia	Peking cotoneaster	Lilac, Manchurian crabapple, Amur honeysuckle, Siberian peashrub.	Eastern redcedar, hackberry, Austrian pine, Russian-olive, green ash.	Honeylocust, Siberian elm.	---
Martin.					
Kipson.					

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pf:					
Padonia	Peking cotoneaster	Lilac, Manchurian crabapple, Amur honeysuckle, Siberian peashrub.	Eastern redcedar, hackberry, Austrian pine, Russian-olive, green ash.	Honeylocust, Siberian elm.	---
Oska	Lilac	Siberian peashrub, autumn-olive, Manchurian crabapple, Amur honeysuckle.	Green ash, hackberry, Austrian pine, eastern redcedar, jack pine, Russian-olive.	Honeylocust	---
Kipson.					
Pm:					
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Shelby	---	Autumn-olive, lilac, Amur honeysuckle, Amur maple.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Pn:					
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Morrill	Peking cotoneaster	Amur honeysuckle, lilac, fragrant sumac.	Green ash, hackberry, Russian-olive, eastern redcedar, bur oak.	Austrian pine, honeylocust, Scotch pine.	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Po:					
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Po:					
Mayberry	Siberian peashrub, Amur honeysuckle, lilac.	Eastern redcedar, Manchurian crabapple, autumn-olive.	Russian-olive, Austrian pine, jack pine, green ash, hackberry, honeylocust.	---	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Pt.					
Pits					
Pw:					
Pohocco.					
Netawaka.					
Judson	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Hackberry, bur oak, green ash, Russian-olive, eastern redcedar.	Honeylocust, Austrian pine, eastern white pine.	---
Px:					
Pohocco	Lilac, American plum.	Common chokecherry, autumn-olive.	Ponderosa pine, green ash, Austrian pine, bur oak, blue spruce, black walnut, pin oak, eastern redcedar.	Honeylocust, silver maple, Scotch pine, Siberian elm.	---
Netawaka.					
Judson	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Hackberry, bur oak, green ash, Russian-olive, eastern redcedar.	Honeylocust, Austrian pine, eastern white pine.	---
Re:					
Reading	---	American plum, lilac, Peking cotoneaster, Amur honeysuckle.	Eastern redcedar	Austrian pine, green ash, bur oak, honeylocust, hackberry, eastern white pine.	Eastern cottonwood.
Zook	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, hackberry.	Honeylocust, golden willow, green ash, northern red oak, silver maple, Austrian pine.	Eastern cottonwood.
Chase	---	American plum, Amur honeysuckle, Peking cotoneaster, lilac.	Eastern redcedar	Austrian pine, eastern white pine, bur oak, green ash, hackberry, honeylocust.	Eastern cottonwood.

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Sg:					
Shelby	---	Autumn-olive, lilac, Amur honeysuckle, Amur maple.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar--	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm------	---
Sm:					
Shelby	---	Autumn-olive, lilac, Amur honeysuckle, Amur maple.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Padonia	Peking cotoneaster	Lilac, Manchurian crabapple, Amur honeysuckle, Siberian peashrub.	Eastern redcedar, hackberry, Austrian pine, Russian-olive, green ash.	Honeylocust, Siberian elm.	---
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm------	---
Wa:					
Wabash	Buttonbush--------	Possumhaw---------	Hackberry, eastern redcedar, northern whitecedar, nannyberry viburnum.	Pin oak, baldcypress.	Eastern cottonwood.
Kennebec	---	Amur maple, Amur honeysuckle, lilac, autumn-olive.	Eastern redcedar--	Austrian pine, hackberry, pin oak, green ash, honeylocust.	Eastern white pine, eastern cottonwood.
Muscotah	---	Amur honeysuckle, lilac, American plum, Peking cotoneaster.	Eastern redcedar--	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, bur oak.	Eastern cottonwood.
We:					
Wamego	Amur honeysuckle, lilac, Peking cotoneaster, fragrant sumac.	---	Eastern redcedar, Austrian pine, hackberry, green ash, bur oak, Russian-olive.	Honeylocust, Siberian elm.	---

Windbreaks and Environmental Plantings Table--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
We:					
Olmitz	---	Amur maple, lilac, autumn-olive, Amur honeysuckle.	Eastern redcedar, Russian-olive, hackberry, bur oak, green ash.	Austrian pine, eastern white pine, honeylocust.	---
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Wg:					
Wamego	Amur honeysuckle, lilac, Peking cotoneaster, fragrant sumac.	---	Eastern redcedar, Austrian pine, hackberry, green ash, bur oak, Russian-olive.	Honeylocust, Siberian elm.	---
Vinland.					
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Wm:					
Wymore	Peking cotoneaster, skunkbush sumac, lilac.	Manchurian crabapple, Amur honeysuckle.	Eastern redcedar, Austrian pine, ponderosa pine, Russian-olive, hackberry, green ash.	Honeylocust	---
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Wn:					
Wymore	Peking cotoneaster, skunkbush sumac, lilac.	Manchurian crabapple, Amur honeysuckle.	Eastern redcedar, Austrian pine, ponderosa pine, Russian-olive, hackberry, green ash.	Honeylocust	---
Pawnee	Amur honeysuckle, lilac, Siberian peashrub, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple.	Austrian pine, Russian-olive, green ash, hackberry, honeylocust.	Siberian elm	---
Mayberry	Siberian peashrub, Amur honeysuckle, lilac.	Eastern redcedar, Manchurian crabapple, autumn-olive.	Russian-olive, Austrian pine, jack pine, green ash, hackberry, honeylocust.	---	---

Recreational Development Table

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ac:				
Aksarben	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Marshall	Slight	Slight	Slight	Slight.
Ad:				
Aksarben	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
Morrill	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
Ae:				
Aksarben	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Morrill	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Bs:				
Burchard	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Steinauer	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Severe: erodes easily.
Bx:				
Burchard	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Padonia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Ch:				
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ch:				
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Muscotah	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Co:				
Contrary	Slight	Slight	Severe: slope.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Morrill	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.
Ga:				
Grundy	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Haig	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.
Ju:				
Judson	Slight	Slight	Moderate: slope.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight.
Kd:				
Kennebec	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Muscotah	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Ke:				
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Kp:				
Kipson	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Moderate: slope.
Sogn	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
M-W. Miscellaneous water				
Ma:				
Marshall	Slight	Slight	Moderate: slope.	Slight.
Wymore	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Moderate: wetness.
Mb:				
Marshall	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Contrary	Slight	Slight	Severe: slope.	Slight.
Morrill	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Md:				
Martin	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: erodes easily.
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Mf:				
Martin	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.
Padonia	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.
Vinland	Severe: thin layer, area reclaim.	Severe: thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Slight.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Mh:				
Mayberry	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Morrill	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
Wymore	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Moderate: wetness.
Mk:				
Monona	Slight	Slight	Moderate: slope.	Slight.
Pohocco	Slight	Slight	Moderate: slope.	Severe: erodes easily.
Mn:				
Monona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Netawaka	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Pohocco	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Mt:				
Morrill	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Severe: erodes easily.
Mw:				
Muscotah	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
My:				
Muscotah	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Moderate: wetness.
Kennebec	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
My:				
Wabash	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
No:				
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Om:				
Olmitz	Slight	Slight	Moderate: slope.	Slight.
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Or.				
Orthents				
Pd:				
Padonia	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.
Martin	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.
Kipson	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Slight.
Pe:				
Padonia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Martin	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.
Kipson	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Moderate: slope.
Pf:				
Padonia	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Pf:				
Oska	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.
Kipson	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Slight.
Pm:				
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Morrill	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
Shelby	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight.
Pn:				
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Severe: erodes easily.
Morrill	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Po:				
Pawnee	Severe: wetness, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: slope, too clayey, wetness.	Severe: too clayey, erodes easily.
Mayberry	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Pt. Pits				
Pw:				
Pohocco	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Netawaka	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Judson	Slight	Slight	Moderate: slope.	Slight.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Px:				
Pohocco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Netawaka	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Judson	Slight	Slight	Moderate: slope.	Slight.
Re:				
Reading	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Chase	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Slight.
Sg:				
Shelby	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Severe: erodes easily.
Sm:				
Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Padonia	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Severe: erodes easily.
Wa:				
Wabash	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
Kennebec	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Muscotah	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Moderate: wetness.

Recreational Development Table--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
We:				
Wamego	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, thin layer, area reclaim.	Slight.
Olmitz	Slight	Slight	Moderate: slope.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Wg:				
Wamego	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Vinland	Severe: thin layer, area reclaim.	Severe: thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Slight.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Severe: erodes easily.
Wm:				
Wymore	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Moderate: wetness.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Wn:				
Wymore	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Moderate: wetness.
Pawnee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.
Mayberry	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.

Wildlife Habitat Table

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ac:												
Aksarben	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Good.
Marshall	Good	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Ad:												
Aksarben	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Good.
Morrill	Good	Good	Good	Fair	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
Ae:												
Aksarben	Fair	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Good.
Morrill	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Bs:												
Burchard	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Steinauer	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Bx:												
Burchard	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Steinauer	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Padonia	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Ch:												
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Kennebec	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Fair.
Muscotah	Fair	Good	Good	Poor	Poor	Good	Fair	Fair	Good	Good	Fair	Fair.
Co:												
Contrary	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Morrill	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Ga:												
Grundy	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Good.

Wildlife Habitat Table--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ga:												
Haig	Good	Fair	Fair	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Poor.
Ju:												
Judson	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Kd:												
Kennebec	Poor	Poor	Good	Good	Good	Fair	Poor	Poor	Poor	Good	Poor	Fair.
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Muscotah	Fair	Good	Good	Poor	Poor	Good	Fair	Fair	Good	Good	Fair	Fair.
Ke:												
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Nodaway	Good	Good	Good	Good	Fair	Good	Fair	Poor	Fair	Good	Fair	Fair.
Kp:												
Kipson	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor.
Sogn	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
M-W.												
Miscellaneous water												
Ma:												
Marshall	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Wymore	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Mb:												
Marshall	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Contrary	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.
Morrill	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Md:												
Martin	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.

Wildlife Habitat Table--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Mf:												
Martin	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Padonia	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Vinland	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Mh:												
Mayberry	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Morrill	Good	Good	Good	Fair	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
Wymore	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Mk:												
Monona	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Pohocco	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Mn:												
Monona	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Netawaka	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Pohocco	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Mt:												
Morrill	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Mw:												
Muscotah	Fair	Good	Good	Poor	Poor	Good	Fair	Fair	Good	Good	Fair	Fair.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Zook	Good	Fair	Good	Fair	Poor	Poor	Good	Good	Fair	Fair	Good	Good.
My:												
Muscotah	Fair	Good	Good	Poor	Good	Good	Fair	Fair	Good	Good	Fair	Fair.
Kennebec	Poor	Poor	Good	Good	Good	Good	Poor	Poor	Poor	Good	Poor	Good.
Wabash	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	Good.

Wildlife Habitat Table--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
No:												
Nodaway	Good	Good	Good	Good	Fair	Good	Fair	Poor	Fair	Good	Fair	Good.
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Zook	Good	Fair	Good	Fair	Poor	Poor	Good	Good	Fair	Fair	Good	Poor.
Om:												
Olmitz	Good	Good	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Or.												
Orthents												
Pd:												
Padonia	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Martin	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Kipson	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor.
Pe:												
Padonia	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Martin	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Kipson	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor.
Pf:												
Padonia	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Oska	Fair	Good	Good	Fair	Fair	Good	Poor	Poor	Fair	Fair	Poor	Good.
Kipson	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor.
Pm:												
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Morrill	Good	Good	Good	Fair	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
Shelby	Good	Good	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Pn:												
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Morrill	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.

Wildlife Habitat Table--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Pn:												
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Po:												
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Mayberry	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Pt. Pits												
Pw:												
Pohocco	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Netawaka	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Judson	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Fair.
Px:												
Pohocco	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Netawaka	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	Good.
Judson	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Re:												
Reading	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Zook	Good	Fair	Good	Fair	Poor	Poor	Good	Good	Fair	Fair	Good	Poor.
Chase	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Sg:												
Shelby	Fair	Good	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Kennebec	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Wa:												
Wabash	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair	Poor.
Kennebec	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Fair.
Muscotah	Fair	Good	Good	Poor	Good	Good	Fair	Fair	Good	Good	Fair	Fair.
We:												
Wamego	Fair	Good	Fair	Fair	Fair	Good	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
Olmitz	Good	Good	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.

Wildlife Habitat Table--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
We:												
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Wg:												
Wamego	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Vinland	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Wm:												
Wymore	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Wn:												
Wymore	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Pawnee	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Poor	Good	Good	Poor	Fair.
Mayberry	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.

Building Site Development Table

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ac:					
Aksarben	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Marshall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Ad:					
Aksarben	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
Ae:					
Aksarben	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Bs:					
Burchard	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Steinauer	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Bx:					
Burchard	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Bx:					
Padonia	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.
Ch:					
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Muscotah	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.
Co:					
Contrary	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Ga:					
Grundy	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Ju:					
Judson	Slight	Slight	Moderate: shrink-swell.	Slight	Severe: low strength, frost action.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Kd:					
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Kd:					
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Muscotah	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.
Ke:					
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Kp:					
Kipson	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
Sogn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
M-W.					
Miscellaneous water					
Ma:					
Marshall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Wymore	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
Mb:					
Marshall	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.
Contrary	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Mb:					
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Md:					
Martin	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Mf:					
Martin	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.
Padonia	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Vinland	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Mh:					
Mayberry	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Wymore	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
Mk:					
Monona	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.
Pohocco	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Mn:					
Monona	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Mn:					
Netawaka	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.
Pohocco	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.
Mt:					
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Mw:					
Muscotah	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
My:					
Muscotah	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Wabash	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
No:					
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
No:					
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Om:					
Olmitz	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Or.					
Orthents					
Pd:					
Padonia	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Martin	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Kipson	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.
Pe:					
Padonia	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.
Martin	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, frost action, shrink-swell.
Kipson	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
Pf:					
Padonia	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Pf:					
Oska	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Kipson	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.
Pm:					
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Shelby	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Pn:					
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Morrill	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Po:					
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Mayberry	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Pt.					
Pits					
Pw:					
Pohocco	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Pw:					
Netawaka	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.
Judson	Slight	Slight	Moderate: shrink-swell.	Slight	Severe: low strength, frost action.
Px:					
Pohocco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.
Netawaka	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.
Judson	Slight	Slight	Moderate: shrink-swell.	Slight	Severe: low strength, frost action.
Re:					
Reading	Moderate: too clayey, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.
Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Chase	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Sg:					
Shelby	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.
Sm:					
Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Padonia	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Sm:					
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Wa:					
Wabash	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Kennebec	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Muscotah	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.
We:					
Wamego	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Olmitz	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Wg:					
Wamego	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Vinland	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.
Wm:					
Wymore	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.

Building Site Development Table--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Wn:					
Wymore	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
Pawnee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
Mayberry	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.

Sanitary Facilities Table

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ac:					
Aksarben	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Marshall	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Ad:					
Aksarben	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Morrill	Severe: percs slowly.	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, small stones.
Ae:					
Aksarben	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Morrill	Severe: percs slowly.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, small stones, slope.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Bs:					
Burchard	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Steinauer	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: hard to pack.
Pawnee	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Bx:					
Burchard	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Steinauer	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
Padonia	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ch:					
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Muscotah	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding, wetness.	Poor: thin layer.
Co:					
Contrary	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Morrill	Severe: percs slowly.	Severe: slope.	Severe: seepage.	Slight	Fair: too clayey, small stones.
Ga:					
Grundy	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, hard to pack, wetness.
Haig	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Ju:					
Judson	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Kd:					
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Muscotah	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: thin layer.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ke:					
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Kp:					
Kipson	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.
Sogn	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
M-W.					
Miscellaneous water					
Ma:					
Marshall	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Wymore	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Mb:					
Marshall	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Contrary	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Morrill	Severe: percs slowly.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, small stones, slope.
Md:					
Martin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Md:					
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mf:					
Martin	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
Padonia	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Vinland	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
Mh:					
Mayberry	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Morrill	Severe: percs slowly.	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, small stones,
Wymore	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Mk:					
Monona	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Pohocco	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Mn:					
Monona	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Netawaka	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Pohocco	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Mt:					
Morrill	Severe: percs slowly.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, small stones, slope.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Mt:					
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Pawnee	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mw:					
Muscotah	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: thin layer.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
My:					
Muscotah	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Wabash	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
No:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Om:					
Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Om:					
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Or.					
Orthents					
Pd:					
Padonia	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Martin	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
Kipson	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Pe:					
Padonia	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Martin	Severe: wetness, percs slowly.	Severe: slope.	Severe: seepage, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
Kipson	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.
Pf:					
Padonia	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Oska	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, too clayey.	Moderate: seepage.	Poor: area reclaim, too clayey, hard to pack.
Kipson	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Pm:					
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pm:					
Morrill	Severe: percs slowly.	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, small stones.
Shelby	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Pn:					
Pawnee	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Morrill	Severe: percs slowly.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, small stones, slope.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Po:					
Pawnee	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mayberry	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Pt.					
Pits					
Pw:					
Pohocco	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Netawaka	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Judson	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Px:					
Pohocco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Netawaka	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Px:					
Judson	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Re:					
Reading	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Moderate: flooding, wetness, too clayey.	Moderate: flooding.	Fair: too clayey, thin layer.
Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Chase	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Sg:					
Shelby	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Pawnee	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Sm:					
Shelby	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Padonia	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Wa:					
Wabash	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Kennebec	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

Sanitary Facilities Table--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wa:					
Muscotah	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
We:					
Wamego	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Moderate: seepage.	Poor: area reclaim, too clayey.
Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Wg:					
Wamego	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Moderate: seepage, slope.	Poor: area reclaim, too clayey.
Vinland	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Wm:					
Wymore	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Wn:					
Wymore	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Pawnee	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mayberry	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Construction Materials Table

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ac:				
Aksarben	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Marshall	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ad:				
Aksarben	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.
Ae:				
Aksarben	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bs:				
Burchard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bx:				
Burchard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Padonia	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Ch:				
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ch:				
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Muscotah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
Co:				
Contrary	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.
Ga:				
Grundy	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Haig	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ju:				
Judson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kd:				
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Muscotah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
Ke:				
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Kp:				
Kipson	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones, slope.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Kp:				
Sogn	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
M-W.				
Miscellaneous water				
Ma:				
Marshall	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wymore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mb:				
Marshall	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Contrary	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.
Md:				
Martin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mf:				
Martin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Padonia	Poor: depth to rock, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Vinland	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
Mh:				
Mayberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mh:				
Wymore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mn:				
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Netawaka	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Pohocco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Mt:				
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mw:				
Muscotah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
My:				
Muscotah	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wabash	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
No:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
No:				
Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Om:				
Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Or.				
Orthents				
Pd:				
Padonia	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Martin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kipson	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones.
Pe:				
Padonia	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Martin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kipson	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones, slope.
Pf:				
Padonia	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Oska	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pf:				
Kipson	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones.
Pn:				
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Morrill	Good	Probable	Improbable: too sandy.	Poor: small stones.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Po:				
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mayberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pt.				
Pits				
Pw:				
Pohocco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Netawaka	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Judson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Px:				
Pohocco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Netawaka	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Judson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Re:				
Reading	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Chase	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sg:				
Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Sm:				
Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Padonia	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wa:				
Wabash	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Muscotah	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
We:				
Wamego	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wg:				
Wamego	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Vinland	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.

Construction Materials Table--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wg:				
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wm:				
Wymore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wn:				
Wymore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Pawnee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mayberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Water Management Table

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ac:							
Aksarben	Moderate: seepage.	Moderate: hard to pack.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
Marshall	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
Ad:							
Aksarben	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Morrill	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Ae:							
Aksarben	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Morrill	Severe: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Bs:							
Burchard	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Pawnee	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Bx:							
Burchard	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Bx:							
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Padonia	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ch:							
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Muscotah	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly, flooding.	Erodes easily, wetness.	Erodes easily, percs slowly.
Co:							
Contrary	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Morrill	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Ga:							
Grundy	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
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.
Ju:							
Judson	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Ju:							
Kennebec	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Slope, flooding.	Favorable	Favorable.
Kd:							
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Muscotah	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly, flooding.	Erodes easily, wetness.	Erodes easily, percs slowly.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ke:							
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
Kp:							
Kipson	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Sogn	Severe: depth to rock, slope.	Slight	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
M-W.							
Miscellaneous water							
Ma:							
Marshall	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Wymore	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Mb:							
Marshall	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Contrary	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Morrill	Severe: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Md:							
Martin	Slight	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness	Erodes easily, wetness.	Erodes easily, percs slowly.
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Pawnee	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Mf:							
Martin	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
Padonia	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Vinland	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, thin layer.	Area reclaim	Area reclaim.
Mh:							
Mayberry	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Morrill	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Wymore	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Mk:							
Monona	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Pohocco	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Mn:							
Monona	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Netawaka	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Pohocco	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Slope, erodes easily.
Mt:							
Morrill	Severe: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Pawnee	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Mw:							
Muscotah	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly, flooding.	Erodes easily, wetness.	Erodes easily, percs slowly.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
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.
My:							
Muscotah	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Wabash	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness	Wetness, percs slowly.	Wetness, percs slowly.
No:							
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Erodes easily	Erodes easily.
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
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.
Om:							
Olmitz	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Om:							
Pawnee	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Or.							
Orthents							

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Pd:							
Padonia	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Martin	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
Kipson	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Large stones, depth to rock.	Large stones, depth to rock.
Pe:							
Padonia	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Martin	Severe: slope.	Moderate: thin layer, 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.
Kipson	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Pf:							
Padonia	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Oska	Moderate: depth to rock, seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, thin layer.	Depth to rock, area reclaim, erodes easily.	Erodes easily, depth to rock, area reclaim.
Kipson	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Large stones, depth to rock.	Large stones, depth to rock.
Pm:							
Pawnee	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Morrill	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Shelby	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Pn:							
Pawnee	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Morrill	Severe: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Po:							
Pawnee	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Mayberry	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Pt.							
Pits							
Pw, Px:							
Pohocco	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Pw, Px:							
Netawaka	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Judson	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Re:							
Reading	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
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.
Chase	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Sg:							
Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Pawnee	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Sm:							
Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope	Slope.
Padonia	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Pawnee	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Wa:							
Wabash	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness	Wetness, percs slowly.	Wetness, droughty, percs slowly.
Wa:							
Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Flooding	Favorable	Favorable.
Muscotah	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
We:							
Wamego	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, thin layer.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
Olmitz	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Pawnee	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Wg:							
Wamego	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, thin layer.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Vinland	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Pawnee	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Wm:							
Wymore	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Pawnee	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Wn:							
Wymore	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.

Water Management Table--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Wn:							
Pawnee	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Mayberry	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.

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.

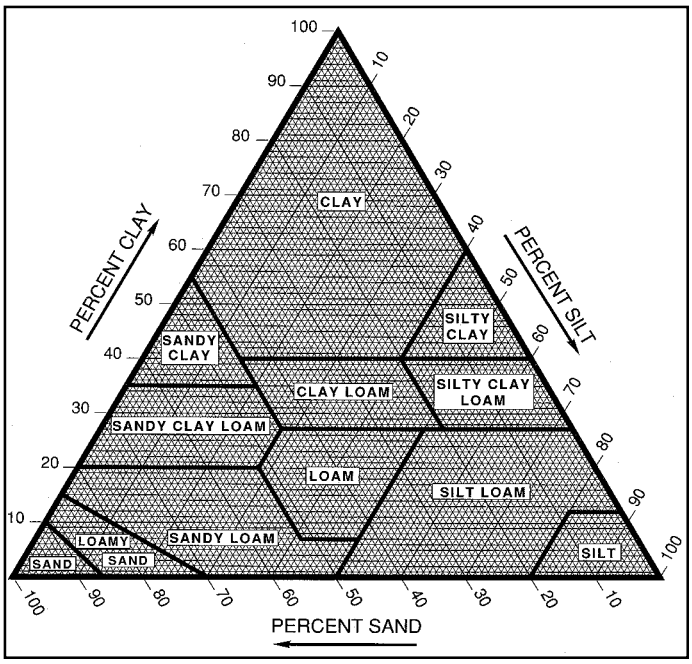

Figure II-2.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

The table "Engineering Index Properties" at the back of this section 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 for each soil series under the heading "Soil Series Descriptions" in Part I of this survey.

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

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 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 table “Physical and Chemical Properties of the Soils” shows 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.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, 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 earthmoving 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 this table, 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.

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.

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

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; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual 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. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, 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.

Soil and Water Features

The table “Soil and Water Features” gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist

mainly of 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 moderately fine texture 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 of moderately fine texture 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 clays that have a high shrink-swell potential, soils that have a 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 inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information 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 levels 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 the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is 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.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage

class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

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

Engineering Index Properties Table

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ac:											
Aksarben	0-13	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-50	15-25
	13-19	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	47-55	22-27
	19-47	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-47	15-22
	47-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-47	14-22
Marshall	0-10	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-40	5-15
	10-43	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	43-80	Silt loam, silty clay loam.	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
Ad:											
Aksarben	0-13	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-50	15-25
	13-19	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	47-55	22-27
	19-47	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-47	15-22
	47-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-47	14-22
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10
Ae:											
Aksarben	0-11	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-50	15-25
	11-21	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	47-55	22-27
	21-42	Silty clay loam	CL	A-7	0	100	100	95-100	90-100	40-47	15-22
	42-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-47	14-22
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Bs:											
Burchard--------	0-9	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-95	60-80	35-50	14-24
	9-33	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-95	65-80	35-50	20-40
	33-80	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-95	60-80	35-50	15-30
Steinauer-------	0-6	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	6-14	Clay loam--------	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	14-80	Loam, clay loam	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	60-75	25-55	10-30
Pawnee----------	0-12	Clay loam--------	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	12-38	Clay------------	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	38-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Bx:											
Burchard--------	0-8	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-95	60-80	35-50	14-24
	8-28	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-95	65-80	35-50	20-40
	28-80	Clay loam--------	CL	A-6, A-7	0-5	95-100	85-100	75-95	60-80	35-50	15-30
Steinauer-------	0-6	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	6-14	Clay loam--------	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	14-80	Loam, clay loam	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	60-75	25-55	10-30
Padonia---------	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-20
	11-22	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	22-32	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	32-37	Silty clay loam	CL	A-7-6	0	100	100	90-100	80-95	45-50	20-25
	37-41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ch:											
Chase-----------	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Kennebec--------	0-44	Silt loam--------	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Muscotah--------	0-16	Silt loam--------	CL	A-6, A-7-6	0	100	100	100	90-100	35-45	15-25
	16-39	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	45-50	25-30
	39-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
	60-80	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
Co:											
Contrary--------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-90	30-45	10-20
	6-32	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
	32-80	Silt loam--------	CL, ML	A-6, A-4	0	100	100	90-100	85-90	30-40	5-15
Kennebec--------	0-44	Silt loam--------	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Co:											
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10
Ga:											
Grundy	0-7	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	10-20
	7-14	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-55	25-35
	14-41	Silty clay	CH	A-7	0	100	100	95-100	90-100	50-70	30-45
	41-80	Silty clay loam	CH, CL	A-7	0	100	100	90-100	90-100	40-55	25-35
Haig	0-7	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	7-19	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	40-55	20-30
	19-41	Silty clay	CH	A-7	0	100	100	100	95-100	50-65	30-40
	41-60	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-30
Ju:											
Judson	0-25	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	25-40	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-50	15-25
	40-80	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	100	95-100	25-50	5-25
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Kd:											
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Chase	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Muscotah	0-16	Silt loam	CL	A-6, A-7-6	0	100	100	100	90-100	35-45	15-25
	16-39	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	45-50	25-30
	39-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
	60-80	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
Ke:											
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Ke:											
Chase	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Nodaway	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	6-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
Kp:											
Kipson	0-8	Silty clay loam	CL	A-6, A-7	0-25	80-100	70-100	65-100	60-95	35-45	15-20
	8-19	Loam, silt loam, silty clay loam.	CL	A-6, A-7-6	0-25	80-100	75-100	70-100	50-95	30-45	10-20
	19-22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sogn	0-12	Silty clay loam	CL	A-6, A-7	0-10	85-100	85-100	85-100	70-100	35-45	15-20
	12-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
M-W.											
Miscellaneous water											
Ma:											
Marshall	0-10	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-40	5-15
	10-32	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	32-80	Silt loam, silty clay loam.	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
Wymore	0-12	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	95-100	35-55	11-25
	12-39	Silty clay	CH	A-7	0	100	100	95-100	95-100	55-70	30-42
	39-80	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-55	20-35
Mb:											
Marshall	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
	6-44	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	44-80	Silt loam, silty clay loam.	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
Contrary	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-90	30-45	10-20
	6-32	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
	32-80	Silt loam	CL, ML	A-6, A-4	0	100	100	90-100	85-90	30-40	5-15
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Md:											
Martin	0-6	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	6-12	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	12-53	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	55-70	35-45
	53-80	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	55-70	35-45
Chase	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Mf:											
Martin	0-6	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	6-12	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	12-53	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	55-70	35-45
	53-80	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	55-70	35-45
Padonia	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-20
	11-22	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	22-32	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	32-37	Silty clay loam	CL	A-7-6	0	100	100	90-100	80-95	45-50	20-25
	37-41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Vinland	0-12	Silty clay loam	CL	A-6, A-7	0-5	80-100	75-100	70-100	65-95	35-45	15-20
	12-19	Silty clay loam, silt loam, fine sandy loam.	CL, SC	A-6, A-7	0	90-100	75-100	50-100	35-95	25-45	10-20
	19-20	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mh:											
Mayberry	0-10	Clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-100	35-50	15-25
	10-42	Clay, sandy clay	CL, CH	A-7	0	100	90-100	80-100	60-100	45-65	25-40
	42-80	Stratified sandy loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	70-95	35-60	15-35
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10
Wymore	0-12	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	95-100	35-55	11-25
	12-39	Silty clay	CH	A-7	0	100	100	95-100	95-100	55-70	30-42
	39-80	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-55	20-35

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mk:											
Monona	0-11	Silt loam	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	11-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	30-80	Silt loam	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
Pohocco	0-5	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
	5-20	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	100	95-100	35-50	10-25
	20-39	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
	39-80	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
Mn:											
Monona	0-6	Silt loam	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	6-30	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	30-80	Silt loam	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
Netawaka	0-6	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	30-35	10-15
	6-9	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	10-15
	9-80	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	10-15
Pohocco	0-5	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
	5-20	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	100	95-100	35-50	10-25
	20-39	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
	39-80	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
Mt:											
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mw:											
Muscotah	0-16	Silt loam	CL	A-6, A-7-6	0	100	100	100	90-100	35-45	15-25
	16-39	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	45-50	25-30
	39-61	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
	61-80	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Zook	0-20	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	20-52	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	52-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50
My:											
Muscotah	0-23	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	23-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
	60-80	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
Kennebec	0-44	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	44-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Wabash	0-19	Silty clay loam	CL, CH	A-6, A-7	0	100	100	100	95-100	35-55	15-35
	19-60	Silty clay, clay	CH	A-7	0	100	100	100	95-100	52-78	30-55
No:											
Nodaway	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	6-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
Chase	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Zook	0-20	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	20-52	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	52-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50
Om:											
Olmitz	0-7	Loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	7-27	Loam, clay loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	27-80	Clay loam	CL	A-6, A-7	0	100	90-100	85-95	60-80	35-45	15-25

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Om:											
Chase	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Or.											
Orthents											
Pd:											
Padonia	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-20
	11-22	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	22-32	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	32-37	Silty clay loam	CL	A-7-6	0	100	100	90-100	80-95	45-50	20-25
	37-41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Martin	0-6	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	6-12	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	12-53	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	55-70	35-45
	53-80	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	55-70	35-45
Kipson	0-8	Silty clay loam	CL	A-6, A-7	0-25	80-100	70-100	65-100	60-95	35-45	15-20
	8-19	Loam, silt loam, silty clay loam.	CL	A-6, A-7-6	0-25	80-100	75-100	70-100	50-95	30-45	10-20
	19-22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pe:											
Padonia	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-20
	11-22	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	22-32	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	32-37	Silty clay loam	CL	A-7-6	0	100	100	90-100	80-95	45-50	20-25
	37-41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Martin	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	10-15	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	15-45	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	55-70	35-45
	45-49	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kipson	0-8	Silty clay loam	CL	A-6, A-7	0-25	80-100	70-100	65-100	60-95	35-45	15-20
	8-19	Loam, silt loam, silty clay loam.	CL	A-6, A-7-6	0-25	80-100	75-100	70-100	50-95	30-45	10-20
	19-22	Weathered bedrock	---	---	---	---	---	---	---	---	---

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pf:											
Padonia	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-20
	11-22	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	22-32	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	32-37	Silty clay loam	CL	A-7-6	0	100	100	90-100	80-95	45-50	20-25
	37-41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Oska	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	11-19	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	95-100	45-60	20-35
	19-35	Silty clay, cherty silty clay, cherty silty clay loam.	CH, CL	A-7	0	85-100	65-100	60-100	55-100	45-60	20-35
	35-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kipson	0-8	Silty clay loam	CL	A-6, A-7	0-25	80-100	70-100	65-100	60-95	35-45	15-20
	8-19	Loam, silt loam, silty clay loam.	CL	A-6, A-7-6	0-25	80-100	75-100	70-100	50-95	30-45	10-20
	19-22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pm:											
Pawnee	0-12	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	12-38	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	38-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10
Shelby	0-13	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	13-36	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	36-80	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
Pn:											
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Morrill	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	75-100	65-100	50-80	25-35	7-15
	9-14	Clay loam, sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7-6	0	85-100	70-100	55-100	25-80	30-45	11-25
	14-40	Loam, clay loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	90-100	70-100	45-100	20-80	20-35	2-15
	40-80	Sand, loamy fine sand, fine sandy loam.	SC, SM, SC-SM, SP-SM	A-4, A-2-4	0	90-100	70-100	45-95	10-40	0-30	NP-10

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pn:											
Kennebec	0-25	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	25-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Po:											
Pawnee	0-5	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	5-38	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	38-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Mayberry	0-10	Clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-100	35-50	15-25
	10-42	Clay, sandy clay	CL, CH	A-7	0	100	90-100	80-100	60-100	45-65	25-40
	42-80	Stratified sandy loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	70-95	35-60	15-35
Kennebec	0-25	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	25-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Pt.											
Pits											
Pw, Px:											
Pohocco	0-5	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
	5-20	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	100	95-100	35-50	10-25
	20-39	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
	39-80	Silt loam	ML	A-6, A-4, A-7	0	100	100	100	95-100	30-45	5-15
Netawaka	0-6	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	30-35	10-15
	6-9	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	10-15
	9-80	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	10-15
Judson	0-25	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	25-40	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-50	15-25
	40-80	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	100	95-100	25-50	5-25
Re:											
Reading	0-18	Silt loam	CL	A-6	0	100	100	90-100	80-90	30-35	10-15
	18-54	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-20
	54-80	Silty clay loam, clay loam, silty clay.	CL	A-7	0	100	100	95-100	80-95	40-50	20-30
Zook	0-20	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	20-52	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	52-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Re:											
Chase	0-9	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	20-30
	9-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	19-41	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	90-100	75-95	50-70	30-45
	41-80	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
Sg:											
Shelby	0-13	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	13-36	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	36-80	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
Kennebec	0-25	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	25-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Sm:											
Shelby	0-4	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	4-8	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-45	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	45-80	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
Padonia	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-20
	11-22	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	22-32	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	20-30
	32-37	Silty clay loam	CL	A-7-6	0	100	100	90-100	80-95	45-50	20-25
	37-41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Wa:											
Wabash	0-15	Silty clay	CH	A-7	0	100	100	100	95-100	50-75	30-50
	15-80	Silty clay, clay	CH	A-7	0	100	100	100	95-100	52-78	30-55
Kennebec	0-25	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	25-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
Muscotah	0-23	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-55	25-35
	23-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40
	60-80	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-65	30-40

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
We:											
Wamego	0-9	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	35-40	15-20
	9-25	Silty clay loam, silty clay, clay loam.	CL	A-7	0	100	85-100	80-100	75-95	45-50	20-25
	25-36	Weathered bedrock	---	---	---	---	---	---	---	---	---
Olmitz	0-7	Loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	7-20	Loam, clay loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	20-80	Clay loam	CL	A-6, A-7	0	100	90-100	85-95	60-80	35-45	15-25
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Wg:											
Wamego	0-9	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	35-40	15-20
	9-25	Silty clay loam, silty clay, clay loam.	CL	A-7	0	100	85-100	80-100	75-95	45-50	20-25
	25-36	Weathered bedrock	---	---	---	---	---	---	---	---	---
Vinland	0-12	Silty clay loam	CL	A-6, A-7	0-5	80-100	75-100	70-100	65-95	35-45	15-20
	12-19	Silty clay loam, silt loam, fine sandy loam.	CL, SC	A-6, A-7	0	90-100	75-100	50-100	35-95	25-45	10-20
	19-23	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Wm:											
Wymore	0-12	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	95-100	35-55	11-25
	12-39	Silty clay	CH	A-7	0	100	100	95-100	95-100	55-70	30-42
	39-80	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-55	20-35
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Wn:											
Wymore	0-10	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	95-100	35-55	11-25
	10-32	Silty clay	CH	A-7	0	100	100	95-100	95-100	55-70	30-42
	32-80	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-55	20-35
Pawnee	0-10	Clay loam	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	10-36	Clay	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	36-80	Clay loam, sandy clay loam.	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40

Engineering Index Properties Table--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Wn:											
Mayberry	0-10	Clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-100	35-50	15-25
	10-42	Clay, sandy clay	CL, CH	A-7	0	100	90-100	80-100	60-100	45-65	25-40
	42-80	Stratified sandy loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	70-95	35-60	15-35

Physical and Chemical Properties of the Soils Table

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Ac:												
Aksarben	0-13	27-35	1.35-1.55	0.6-2.0	0.17-0.23	5.1-6.5	0-0	Moderate	0.32	5	7	2-4
	13-19	35-42	1.35-1.55	0.2-0.6	0.16-0.18	5.1-6.5	0-0	Moderate	0.43			
	19-47	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.6-6.5	0-0	Moderate	0.43			
	47-80	24-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	0-0	Moderate	0.43			
Marshall	0-10	25-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	<2	Low	0.28	5	6	3-4
	10-43	27-34	1.30-1.35	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.43			
	43-80	22-30	1.30-1.40	0.6-2.0	0.20-0.22	6.6-7.3	<2	Moderate	0.43			
Ad:												
Aksarben	0-13	27-35	1.35-1.55	0.6-2.0	0.17-0.23	5.1-6.5	0-0	Moderate	0.32	5	7	2-4
	13-19	35-42	1.35-1.55	0.2-0.6	0.16-0.18	5.1-6.5	0-0	Moderate	0.43			
	19-47	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.6-6.5	0-0	Moderate	0.43			
	47-80	24-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	0-0	Moderate	0.43			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Ae:												
Aksarben	0-11	27-35	1.35-1.55	0.6-2.0	0.17-0.23	5.1-6.5	0-0	Moderate	0.32	5	7	2-4
	11-21	35-42	1.35-1.55	0.2-0.6	0.16-0.18	5.1-6.5	0-0	Moderate	0.43			
	21-42	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.6-6.5	0-0	Moderate	0.43			
	42-80	24-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	0-0	Moderate	0.43			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Bs:												
Burchard	0-9	27-30	1.40-1.60	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.28	5	6	2-4
	9-33	27-35	1.40-1.60	0.2-0.6	0.15-0.17	6.1-8.4	0-0	Moderate	0.37			
	33-80	18-35	1.40-1.60	0.2-0.6	0.14-0.16	7.4-8.4	0-0	Moderate	0.37			
Steinauer	0-6	27-32	1.20-1.35	0.2-0.6	0.19-0.22	7.4-8.4	0-0	Moderate	0.32	5	4L	.5-2
	6-14	27-32	1.30-1.50	0.2-0.6	0.17-0.19	7.9-8.4	0-0	Moderate	0.37			
	14-80	24-35	1.30-1.65	0.2-0.6	0.16-0.19	7.9-8.4	0-0	Moderate	0.37			
Pawnee	0-12	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	12-38	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	38-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Bx:												
Burchard	0-8	27-30	1.40-1.60	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.28	5	6	2-4
	8-28	27-35	1.40-1.60	0.2-0.6	0.15-0.17	6.1-8.4	0-0	Moderate	0.37			
	28-80	18-35	1.40-1.60	0.2-0.6	0.14-0.16	7.4-8.4	0-0	Moderate	0.37			
Steinauer	0-6	27-32	1.20-1.35	0.2-0.6	0.19-0.22	7.4-8.4	0-0	Moderate	0.32	5	4L	.5-2
	6-14	27-32	1.30-1.50	0.2-0.6	0.17-0.19	7.9-8.4	0-0	Moderate	0.37			
	14-80	24-35	1.30-1.65	0.2-0.6	0.16-0.19	7.9-8.4	0-0	Moderate	0.37			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm		K	T		Pct
Bx:												
Padonia	0-11	27-35	1.30-1.40	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	3	7	2-4
	11-22	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.6-7.8	<2	High	0.32			
	22-32	35-50	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	<2	High	0.32			
	32-37	35-40	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
	37-41	---	---	0.01-0.2	---	---	---					
Ch:												
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			
Kennebec	0-44	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Muscotah	0-16	18-27	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-3
	16-39	27-35	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	<2	Moderate	0.37			
	39-60	35-50	1.20-1.30	0.06-0.2	0.10-0.20	5.6-7.3	<2	High	0.28			
	60-80	35-50	1.20-1.30	0.06-0.2	0.10-0.20	5.6-7.3	<2	High	0.28			
Co:												
Contrary	0-6	27-35	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.32	5	7	.5-2
	6-32	18-30	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low	0.43			
	32-80	16-25	1.20-1.40	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low	0.43			
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Ga:												
Grundy	0-7	12-27	1.35-1.50	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.37	3	6	2-4
	7-14	32-45	1.35-1.45	0.2-0.6	0.18-0.20	5.6-6.5	<2	High	0.37			
	14-41	40-50	1.30-1.40	0.06-0.2	0.11-0.13	5.1-7.3	<2	High	0.37			
	41-80	28-35	1.35-1.40	0.06-0.2	0.18-0.20	5.6-7.3	<2	High	0.37			
Haig	0-7	22-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.37	3	6	3-4
	7-19	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.0	<2	High	0.37			
	19-41	40-50	1.30-1.45	<0.2	0.12-0.14	5.1-6.0	<2	High	0.32			
	41-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	<2	High	0.43			
Ju:												
Judson	0-25	24-27	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	<2	Low	0.28	5	6	4-5
	25-40	30-35	1.35-1.45	0.6-2.0	0.21-0.23	5.6-7.3	<2	Moderate	0.43			
	40-80	25-32	1.35-1.45	0.6-2.0	0.21-0.23	6.1-7.8	<2	Moderate	0.43			
Kennebec	0-44	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Kd:												
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Kd:												
Muscotah	0-16	18-27	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-3
	16-39	27-35	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	<2	Moderate	0.37			
	39-60	35-50	1.20-1.30	0.06-0.2	0.10-0.20	5.6-7.3	<2	High	0.28			
	60-80	35-50	1.20-1.30	0.06-0.2	0.10-0.20	5.6-7.3	<2	High	0.28			
Ke:												
Kennebec	0-44	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			
Nodaway	0-6	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	0-2	Low	0.32	5	6	2-3
	6-80	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	0-2	Moderate	0.43			
Kp:												
Kipson	0-8	27-35	1.30-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32	2	4L	1-3
	8-19	18-35	1.35-1.50	0.6-2.0	0.15-0.20	7.9-9.0	0-0	Moderate	0.32			
	19-22	---	---	---	---	---	---	---	---			
Sogn	0-12	27-35	1.35-1.45	0.6-2.0	0.21-0.23	7.4-8.4	0-0	Moderate	0.32	1	4L	1-3
	12-16	---	---	---	---	---	---	---	---			
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
M-W.												
Miscellaneous water												
Ma:												
Marshall	0-10	25-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	<2	Low	0.28	5	6	3-4
	10-32	27-34	1.30-1.35	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.43			
	32-80	22-30	1.30-1.40	0.6-2.0	0.20-0.22	6.6-7.3	<2	Moderate	0.43			
Wymore	0-12	30-40	1.40-1.50	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	3	7	2-4
	12-39	42-55	1.50-1.65	0.01-0.06	0.11-0.14	5.6-7.3	0-0	High	0.32			
	39-80	27-40	1.50-1.70	0.2-0.6	0.18-0.20	6.6-7.3	0-0	High	0.43			
Mb:												
Marshall	0-6	27-35	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	<2	Moderate	0.28	5	7	3-4
	6-44	27-34	1.30-1.35	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.43			
	44-80	22-30	1.30-1.40	0.6-2.0	0.20-0.22	6.6-7.3	<2	Moderate	0.43			
Contrary	0-6	27-35	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.32	5	7	.5-2
	6-32	18-30	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low	0.43			
	32-80	16-25	1.20-1.40	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low	0.43			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Md:												
Martin	0-6	27-40	1.35-1.45	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	5	7	2-4
	6-12	27-40	1.35-1.45	0.2-0.6	0.18-0.20	5.6-7.3	0-0	High	0.28			
	12-53	40-55	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.3	0-0	High	0.28			
	53-80	27-40	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.8	0-0	High	0.28			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Md:												
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Mf:												
Martin	0-6	27-40	1.35-1.45	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	5	7	2-4
	6-12	27-40	1.35-1.45	0.2-0.6	0.18-0.20	5.6-7.3	0-0	High	0.28			
	12-53	40-55	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.3	0-0	High	0.28			
	53-80	27-40	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.8	0-0	High	0.28			
Padonia	0-11	27-35	1.30-1.40	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	3	7	2-4
	11-22	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.6-7.8	<2	High	0.32			
	22-32	35-50	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	<2	High	0.32			
	32-37	35-40	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
	37-41	---	---	0.01-0.2	---	---	---	---	---			
Vinland	0-12	27-35	1.20-1.40	0.6-2.0	0.21-0.24	5.6-7.8	0-0	Moderate	0.32	2	7	2-4
	12-19	15-35	1.30-1.60	0.6-2.0	0.15-0.22	5.6-7.8	0-0	Moderate	0.43			
	19-20	---	---	---	---	---	---	---	---			
Mh:												
Mayberry	0-10	27-40	1.40-1.50	0.2-0.6	0.17-0.23	5.6-6.5	0-0	Moderate	0.37	3	6	1-3
	10-42	40-50	1.50-1.65	0.01-0.06	0.10-0.11	5.6-7.8	0-0	High	0.37			
	42-80	18-45	1.40-1.50	0.06-0.2	0.09-0.16	6.1-8.4	0-0	Moderate	0.37			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Wymore	0-12	30-40	1.40-1.50	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	3	7	2-4
	12-39	42-55	1.50-1.65	0.01-0.06	0.11-0.14	5.6-7.3	0-0	High	0.32			
	39-80	27-40	1.50-1.70	0.2-0.6	0.18-0.20	6.6-7.3	0-0	High	0.43			
Mk:												
Monona	0-11	20-27	1.25-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.28	5	6	3-4
	11-30	24-28	1.30-1.35	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	0.43			
	30-80	18-24	1.35-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low	0.43			
Pohocco	0-5	20-27	1.25-1.30	0.6-2.0	0.22-0.24	6.6-7.8	0-0	Moderate	0.37	5	6	.5-2
	5-20	20-35	1.35-1.45	0.6-2.0	0.18-0.22	6.6-7.8	0-0	Moderate	0.43			
	20-39	20-27	1.35-1.40	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Moderate	0.43			
	39-80	20-27	1.35-1.40	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Moderate	0.43			
Mn:												
Monona	0-6	20-27	1.25-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	2-3
	6-30	24-28	1.30-1.35	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	0.43			
	30-80	18-24	1.35-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low	0.43			
Netawaka	0-6	15-18	1.30-1.35	0.6-2.0	0.22-0.24	7.4-8.4	0-0	Low	0.43	5	4L	1-2
	6-9	12-18	1.30-1.35	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Low	0.43			
	9-80	12-18	1.30-1.35	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Low	0.43			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Mn:												
Pohocco	0-5	20-27	1.25-1.30	0.6-2.0	0.22-0.24	6.6-7.8	0-0	Moderate	0.37	5	6	.5-2
	5-20	20-35	1.35-1.45	0.6-2.0	0.18-0.22	6.6-7.8	0-0	Moderate	0.43			
	20-39	20-27	1.35-1.40	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Moderate	0.43			
	39-80	20-27	1.35-1.40	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Moderate	0.43			
Mt:												
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Mw:												
Muscotah	0-16	18-27	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-3
	16-39	27-35	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	<2	Moderate	0.37			
	39-61	35-50	1.20-1.30	0.06-0.2	0.10-0.20	5.6-7.3	<2	High	0.28			
	61-80	35-50	1.20-1.30	0.06-0.2	0.10-0.20	5.6-7.3	<2	High	0.28			
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Zook	0-20	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	0-0	High	0.37	5	7	5-7
	20-52	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	0-0	High	0.28			
	52-60	20-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	0-0	High	0.28			
My:												
Muscotah	0-23	27-40	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	---	Moderate	0.37	5	7	2-4
	23-60	35-50	1.20-1.30	0.06-0.2	0.11-0.20	5.6-7.3	---	High	0.28			
	60-80	35-50	1.20-1.30	0.00-0.06	0.10-0.20	6.6-7.8	---	High	0.28			
Kennebec	0-44	22-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	44-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Wabash	0-19	27-35	1.35-1.50	0.06-0.2	0.21-0.24	5.1-7.3	0-0	High	0.28	5	7	2-4
	19-60	40-60	1.20-1.45	0.00-0.06	0.08-0.12	5.1-7.8	0-0	Very high	0.28			
No:												
Nodaway	0-6	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	0-2	Low	0.32	5	6	2-3
	6-80	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	0-2	Moderate	0.43			
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			
Zook	0-20	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	0-0	High	0.37	5	7	5-7
	20-52	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	0-0	High	0.28			
	52-60	20-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	0-0	High	0.28			
Om:												
Olmitz	0-7	24-27	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	0-0	Moderate	0.24	5	6	3-4
	7-27	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	0-0	Moderate	0.28			
	27-80	27-34	1.45-1.55	0.6-2.0	0.15-0.17	5.1-6.5	0-0	Moderate	0.28			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Om:												
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Or.												
Orthents												
Pd:												
Padonia	0-11	27-35	1.30-1.40	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	3	7	2-4
	11-22	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.6-7.8	<2	High	0.32			
	22-32	35-50	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	<2	High	0.32			
	32-37	35-40	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
	37-41	---	---	0.01-0.2	---	---	---	---	---			
Martin	0-6	27-40	1.35-1.45	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	5	7	2-4
	6-12	27-40	1.35-1.45	0.2-0.6	0.18-0.20	5.6-7.3	0-0	High	0.28			
	12-53	40-55	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.3	0-0	High	0.28			
	53-80	27-40	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.8	0-0	High	0.28			
Kipson	0-8	27-35	1.30-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32	2	4L	1-3
	8-19	18-35	1.35-1.50	0.6-2.0	0.15-0.20	7.9-9.0	0-0	Moderate	0.32			
	19-22	---	---	---	---	---	---	---	---			
Pe:												
Padonia	0-11	27-35	1.30-1.40	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	3	7	2-4
	11-22	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.6-7.8	<2	High	0.32			
	22-32	35-50	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	<2	High	0.32			
	32-37	35-40	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
	37-41	---	---	0.01-0.2	---	---	---	---	---			
Martin	0-10	27-40	1.35-1.45	0.2-0.6	0.21-0.23	5.6-6.5	<2	Moderate	0.37	4	7	2-4
	10-15	27-40	1.35-1.45	0.2-0.6	0.18-0.20	5.6-7.3	<2	Moderate	0.37			
	15-45	40-55	1.20-1.30	0.06-0.2	0.12-0.18	5.6-7.8	<2	High	0.28			
	45-49	---	---	0.06-2.0	---	---	<2	---	---			
Kipson	0-8	27-35	1.30-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32	2	4L	1-3
	8-19	18-35	1.35-1.50	0.6-2.0	0.15-0.20	7.9-9.0	0-0	Moderate	0.32			
	19-22	---	---	---	---	---	---	---	---			
Pf:												
Padonia	0-11	27-35	1.30-1.40	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	3	7	2-4
	11-22	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.6-7.8	<2	High	0.32			
	22-32	35-50	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	<2	High	0.32			
	32-37	35-40	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
	37-41	---	---	0.01-0.2	---	---	---	---	---			
Oska	0-11	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-6.5	0-0	Moderate	0.37	2	7	1-3
	11-19	35-60	1.35-1.45	0.06-0.2	0.14-0.18	5.6-7.8	0-0	High	0.37			
	19-35	35-50	1.35-1.45	0.06-0.2	0.14-0.18	5.6-7.8	0-0	High	0.37			
	35-38	---	---	0.06-0.6	---	---	---	---	---			
Kipson	0-8	27-35	1.30-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32	2	4L	1-3
	8-19	18-35	1.35-1.50	0.6-2.0	0.15-0.20	7.9-9.0	0-0	Moderate	0.32			
	19-22	---	---	---	---	---	---	---	---			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Pm:												
Pawnee	0-12	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	12-38	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	38-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Shelby	0-13	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	0	Moderate	0.28	5	6	3-4
	13-36	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	0	Moderate	0.37			
	36-80	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	0	Moderate	0.37			
Pn:												
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Morrill	0-9	15-27	1.30-1.65	0.6-2.0	0.15-0.22	4.5-7.3	0-0	Low	0.28	5	6	1-3
	9-14	18-35	1.35-1.70	0.2-0.6	0.12-0.19	5.1-7.3	0-0	Moderate	0.28			
	14-40	10-29	1.40-1.55	0.2-2.0	0.15-0.18	5.1-7.3	0-0	Low	0.37			
	40-80	5-18	1.65-1.75	2.0-6.0	0.05-0.16	5.1-7.3	0-0	Low	0.15			
Kennebec	0-25	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	25-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Po:												
Pawnee	0-5	40-46	1.50-1.65	0.06-0.2	0.09-0.11	5.6-7.3	0-0	High	0.37	5	4	2-3
	5-38	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	38-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Mayberry	0-10	27-40	1.40-1.50	0.2-0.6	0.17-0.23	5.6-6.5	0-0	Moderate	0.37	3	6	1-3
	10-42	40-50	1.50-1.65	0.01-0.06	0.10-0.11	5.6-7.8	0-0	High	0.37			
	42-80	18-45	1.40-1.50	0.06-0.2	0.09-0.16	6.1-8.4	0-0	Moderate	0.37			
Kennebec	0-25	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	25-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Pt.												
Pits												
Pw, Px:												
Pohocco	0-5	20-27	1.25-1.30	0.6-2.0	0.22-0.24	6.6-7.8	0-0	Moderate	0.37	5	6	.5-2
	5-20	20-35	1.35-1.45	0.6-2.0	0.18-0.22	6.6-7.8	0-0	Moderate	0.43			
	20-39	20-27	1.35-1.40	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Moderate	0.43			
	39-80	20-27	1.35-1.40	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Moderate	0.43			
Netawaka	0-6	15-18	1.30-1.35	0.6-2.0	0.22-0.24	7.4-8.4	0-0	Low	0.43	5	4L	1-2
	6-9	12-18	1.30-1.35	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Low	0.43			
	9-80	12-18	1.30-1.35	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Low	0.43			
Judson	0-25	24-27	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	<2	Low	0.28	5	6	4-5
	25-40	30-35	1.35-1.45	0.6-2.0	0.21-0.23	5.6-7.3	<2	Moderate	0.43			
	40-80	25-32	1.35-1.45	0.6-2.0	0.21-0.23	6.1-7.8	<2	Moderate	0.43			
Re:												
Reading	0-18	18-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-6.5	<2	Low	0.32	5	6	2-4
	18-54	27-35	1.40-1.50	0.2-2.0	0.18-0.20	5.6-6.5	<2	Moderate	0.43			
	54-80	30-42	1.40-1.50	0.2-2.0	0.13-0.20	6.1-8.4	<2	Moderate	0.43			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Re:												
Zook	0-20	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	0-0	High	0.37	5	7	5-7
	20-52	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	0-0	High	0.28			
	52-60	20-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	0-0	High	0.28			
Chase	0-9	27-35	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	0-0	Moderate	0.37	5	7	2-4
	9-19	27-40	1.30-1.40	0.2-0.6	0.18-0.20	5.6-7.3	0-0	Moderate	0.37			
	19-41	35-55	1.35-1.45	0.06-0.2	0.11-0.19	5.6-7.8	0-0	High	0.28			
	41-80	27-50	1.35-1.45	0.06-0.2	0.11-0.18	6.1-8.4	0-0	High	0.28			
Sg:												
Shelby	0-13	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	0	Moderate	0.28	5	6	3-4
	13-36	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	0	Moderate	0.37			
	36-80	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	0	Moderate	0.37			
Kennebec	0-25	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	25-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Sm:												
Shelby	0-4	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	<2	Moderate	0.32	5	6	2-3
	4-8	30-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	<2	Moderate	0.28			
	8-45	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	<2	Moderate	0.28			
	45-80	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	<2	Moderate	0.37			
Padonia	0-11	27-35	1.30-1.40	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	3	7	2-4
	11-22	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.6-7.8	<2	High	0.32			
	22-32	35-50	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	<2	High	0.32			
	32-37	35-40	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
	37-41	---	---	0.01-0.2	---	---	---	---	---			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Wa:												
Wabash	0-15	40-46	1.25-1.45	0.00-0.06	0.12-0.14	5.1-7.3	0-0	Very high	0.28	5	4	2-4
	15-80	40-60	1.20-1.45	0.00-0.06	0.08-0.12	5.1-7.8	0-0	Very high	0.28			
Kennebec	0-25	18-27	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	0-2	Moderate	0.28	5	6	5-6
	25-80	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	0-2	Moderate	0.43			
Muscotah	0-23	27-40	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	---	Moderate	0.37	5	7	2-4
	23-60	35-50	1.20-1.30	0.06-0.2	0.11-0.20	5.6-7.3	---	High	0.28			
	60-80	35-50	1.20-1.30	0.00-0.06	0.10-0.20	6.6-7.8	---	High	0.28			
We:												
Wamego	0-9	27-32	1.30-1.40	0.6-2.0	0.21-0.23	5.6-6.5	<2	Low	0.32	3	7	2-4
	9-25	35-42	1.50-1.70	0.06-0.2	0.12-0.20	5.6-7.3	<2	Moderate	0.43			
	25-36	---	---	0.01-0.2	---	---	<2	---	---			
Olmitz	0-7	24-27	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	0-0	Moderate	0.24	5	6	3-4
	7-20	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	0-0	Moderate	0.28			
	20-80	27-34	1.45-1.55	0.6-2.0	0.15-0.17	5.1-6.5	0-0	Moderate	0.28			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			

Physical and Chemical Properties of the Soils Table--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Wg:												
Wamego	0-9	27-32	1.30-1.40	0.6-2.0	0.21-0.23	5.6-6.5	<2	Low	0.32	3	7	2-4
	9-25	35-42	1.50-1.70	0.06-0.2	0.12-0.20	5.6-7.3	<2	Moderate	0.43			
	25-39	---	---	0.01-0.2	---	---	<2	---	---			
Vinland	0-12	27-35	1.20-1.40	0.6-2.0	0.21-0.24	5.6-7.8	0-0	Moderate	0.32	2	7	2-4
	12-19	15-35	1.30-1.60	0.6-2.0	0.15-0.22	5.6-7.8	0-0	Moderate	0.43			
	19-23	---	---	0.01--0.2	---	---	---	---	---			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Wm:												
Wymore	0-12	30-40	1.40-1.50	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	3	7	2-4
	12-39	42-55	1.50-1.65	0.01-0.06	0.11-0.14	5.6-7.3	0-0	High	0.32			
	39-80	27-40	1.50-1.70	0.2-0.6	0.18-0.20	6.6-7.3	0-0	High	0.43			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Wn:												
Wymore	0-10	30-40	1.40-1.50	0.2-0.6	0.21-0.23	5.6-6.5	0-0	Moderate	0.37	3	7	2-4
	10-32	42-55	1.50-1.65	0.01-0.06	0.11-0.14	5.6-7.3	0-0	High	0.32			
	32-80	27-40	1.50-1.70	0.2-0.6	0.18-0.20	6.6-7.3	0-0	High	0.43			
Pawnee	0-10	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	0-0	Moderate	0.37	3	6	3-4
	10-36	40-50	1.50-1.70	0.01-0.06	0.09-0.11	6.1-8.4	0-0	High	0.37			
	36-80	25-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	0-0	High	0.37			
Mayberry	0-10	27-40	1.40-1.50	0.2-0.6	0.17-0.23	5.6-6.5	0-0	Moderate	0.37	3	6	1-3
	10-42	40-50	1.50-1.65	0.01-0.06	0.10-0.11	5.6-7.8	0-0	High	0.37			
	42-80	18-45	1.40-1.50	0.06-0.2	0.09-0.16	6.1-8.4	0-0	Moderate	0.37			

Soil and Water Features Table

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Ac:											
Aksarben	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Marshall	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Ad:											
Aksarben	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Ae:											
Aksarben	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Bs:											
Burchard	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low.
Steinauer	B	None	---	---	>6.0	---	---	>80	---	High	Low.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Bx:											
Burchard	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low.
Steinauer	B	None	---	---	>6.0	---	---	>80	---	High	Low.
Padonia	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Ch:											
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Muscotah	D	Occasional	Brief	Mar-Jun	2.0-3.0	Apparent	Mar-Jun	>60	---	High	Low.
Co:											
Contrary	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Ga:											
Grundy	C	None	---	---	1.0-2.5	Perched	Nov-Apr	>60	---	High	Moderate.
Haig	C/D	None	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High	Moderate.
Ju:											
Judson	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.

Soil and Water Features Table--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Kd:											
Kennebec	B	Frequent	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Muscotah	D	Occasional	Brief	Mar-Jun	2.0-3.0	Apparent	Mar-Jun	>60	---	High	Low.
Ke:											
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Nodaway	B	Occasional	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Apr-Jul	>80	---	Moderate	Low.
Kp:											
Kipson	D	None	---	---	>6.0	---	---	7-20	Soft	Low	Low.
Sogn	D	None	---	---	>6.0	---	---	4-20	Hard	Low	Low.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
M-W. Miscellaneous water											
Ma:											
Marshall	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Wymore	D	None	---	---	1.0-3.0	Perched	Mar-Apr	>80	---	High	Moderate.
Mb:											
Marshall	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Contrary	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Md:											
Martin	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	Low.
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Mf:											
Martin	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	Low.
Padonia	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Vinland	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate.
Mh:											
Mayberry	D	None	---	---	1.0-3.0	Perched	Mar-May	>80	---	High	Low.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Wymore	D	None	---	---	1.0-3.0	Perched	Mar-Apr	>80	---	High	Moderate.
Mk:											
Monona	B	None	---	---	>6.0	---	---	>60	---	Low	Low.
Pohocco	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low.

Soil and Water Features Table--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Mn:											
Monona	B	None	---	---	>6.0	---	---	>60	---	Low	Low.
Netawaka	B	None	---	---	>6.0	---	---	>60	---	Low	Low.
Pohocco	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low.
Mt:											
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Mw:											
Muscotah	D	Occasional	Brief	Mar-Jun	2.0-3.0	Apparent	Mar-Jun	>60	---	High	Low.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Zook	C/D	Occasional	Brief or long.	Feb-Nov	0-1.0	Apparent	Nov-Jul	>60	---	High	Moderate.
My:											
Muscotah	D	Occasional	Brief	Mar-Jun	1.5-3.0	Apparent	Mar-Jun	>60	---	High	Low.
Kennebec	B	Frequent	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Wabash	D	Occasional	Brief or long.	Nov-May	0-1.0	Apparent	Nov-Apr	>60	---	High	Moderate.
No:											
Nodaway	B	Occasional	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Apr-Jul	>80	---	Moderate	Low.
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Zook	C/D	Occasional	Brief or long.	Feb-Nov	0-1.0	Apparent	Nov-Jul	>60	---	High	Moderate.
Om:											
Olmitz	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Or.											
Orthents											
Pd:											
Padonia	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Martin	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	Low.
Kipson	D	None	---	---	>6.0	---	---	7-20	Soft	Low	Low.
Pe:											
Padonia	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Martin	C	None	---	---	2.0-3.0	Perched	Dec-Apr	40-60	Soft	High	Low.
Kipson	D	None	---	---	>6.0	---	---	7-20	Soft	Low	Low.

Soil and Water Features Table--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Pf:											
Padonia	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Oska	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Kipson	D	None	---	---	>6.0	---	---	7-20	Soft	Low	Low.
Pm:											
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Pn:											
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Morrill	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Po:											
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Mayberry	D	None	---	---	1.0-3.0	Perched	Mar-May	>80	---	High	Low.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Pt.											
Pits											
Pw, Px:											
Pohocco	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low.
Netawaka	B	None	---	---	>6.0	---	---	>60	---	Low	Low.
Judson	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Re:											
Reading	B	Rare	---	---	3.5-6.0	Perched	Dec-Apr	>60	---	Moderate	Low.
Zook	C/D	Occasional	Brief or long.	Feb-Nov	0-1.0	Apparent	Nov-Jul	>60	---	High	Moderate.
Chase	C	Occasional	Very brief	Mar-Sep	2.0-4.0	Perched	Feb-May	>60	---	High	Low.
Sg:											
Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Sm:											
Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Sm:											
Padonia	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.

Soil and Water Features Table--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Wa:											
Wabash	D	Occasional	Brief or long.	Nov-May	0-1.0	Apparent	Nov-Apr	>60	---	High	Moderate.
Kennebec	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low.
Muscotah	D	Occasional	Brief	Mar-Jun	1.5-3.0	Apparent	Mar-Jun	>60	---	High	Low.
We:											
Wamego	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
Olmitz	B	None	---	---	>6.0	---	---	>80	---	Moderate	Moderate.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Wg:											
Wamego	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
Vinland	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Wm:											
Wymore	D	None	---	---	1.0-3.0	Perched	Mar-Apr	>80	---	High	Moderate.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Wn:											
Wymore	D	None	---	---	1.0-3.0	Perched	Mar-Apr	>80	---	High	Moderate.
Pawnee	D	None	---	---	1.0-3.0	Perched	Mar-May	>60	---	High	Low.
Mayberry	D	None	---	---	1.0-3.0	Perched	Mar-May	>80	---	High	Low.

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Glossary

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.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

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

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

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

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.

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

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

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.

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

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

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

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

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

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

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

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.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

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

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

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

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

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

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.

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.

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.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

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.

Fine textured soil. Sandy clay, silty clay, or clay.

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

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

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

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

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

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

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35

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 the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." 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.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

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.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration 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.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

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.

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-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.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

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.

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).

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 of 6.6 to 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.

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

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

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

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

Percolation. The movement of water through the soil.

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

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 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 flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

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.

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. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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.

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.

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.

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

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

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.

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.

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.

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.

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.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the slope classes are as follows:

Nearly level	0 to 2 percent
Gently sloping	1 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 17 percent
Moderately steep	17 to 30 percent

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

Slow 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 material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

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).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

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

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.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

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 that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related

to tillage, seedbed preparation, seedling emergence, and root penetration.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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.