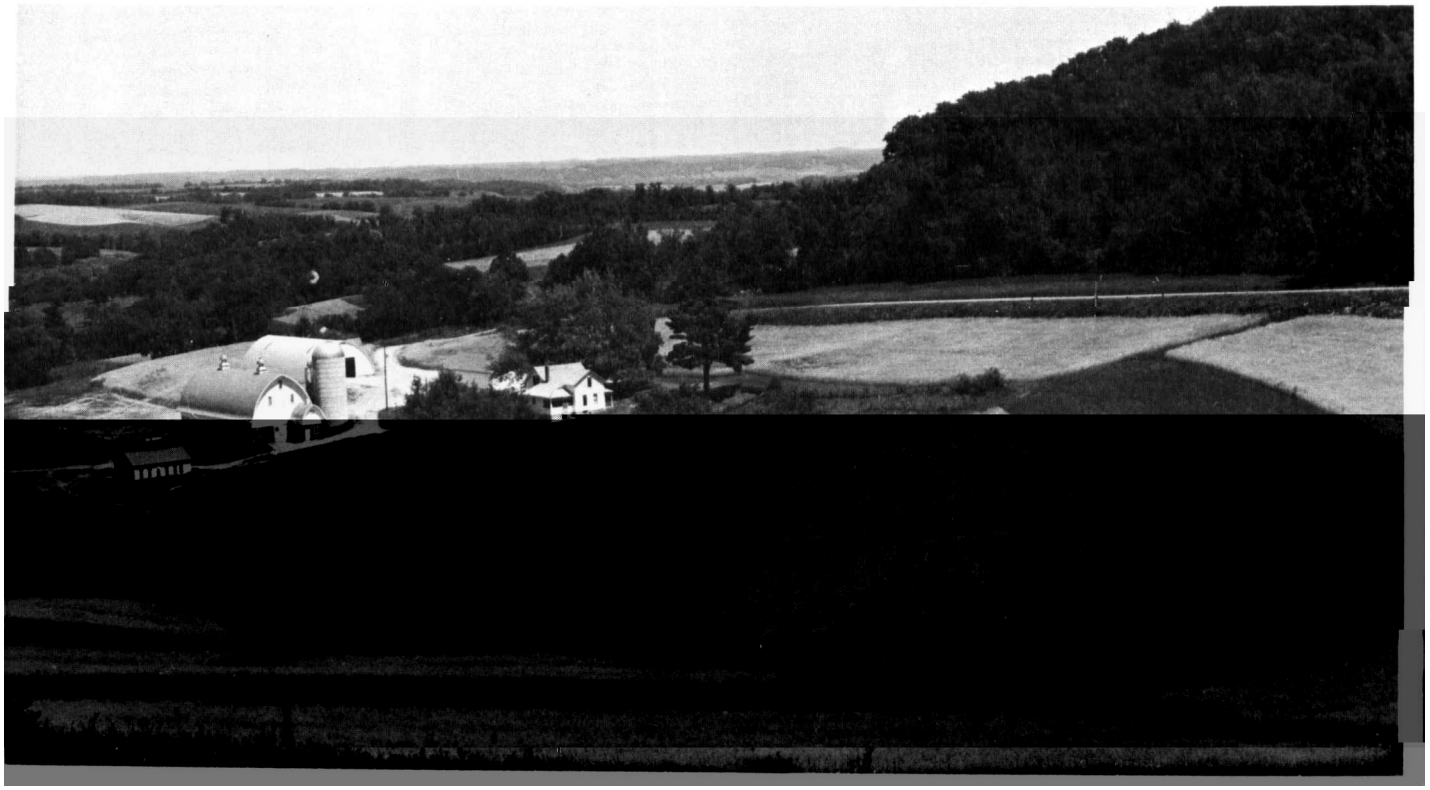
SOIL SURVEY OF

Trempealeau County, Wisconsin



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Wisconsin Research Division of the
College of Agriculture and Life Sciences
University of Wisconsin

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. 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 the period 1958–1967. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1968. This survey was made cooperatively by the Soil Conservation Service and the Wisconsin Research Division of the College of Agriculture and Life Sciences, University of Wisconsin. It is part of the technical assistance furnished to the Trempealeau County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All of the soils of Trempealeau County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the woodland group and wildlife group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and woodland groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Engineering Uses of the Soils."

Engineers and builders can find, also under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Trempealeau County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover: **Contour strips and wooded uplands on a farm in Trempealeau County.**

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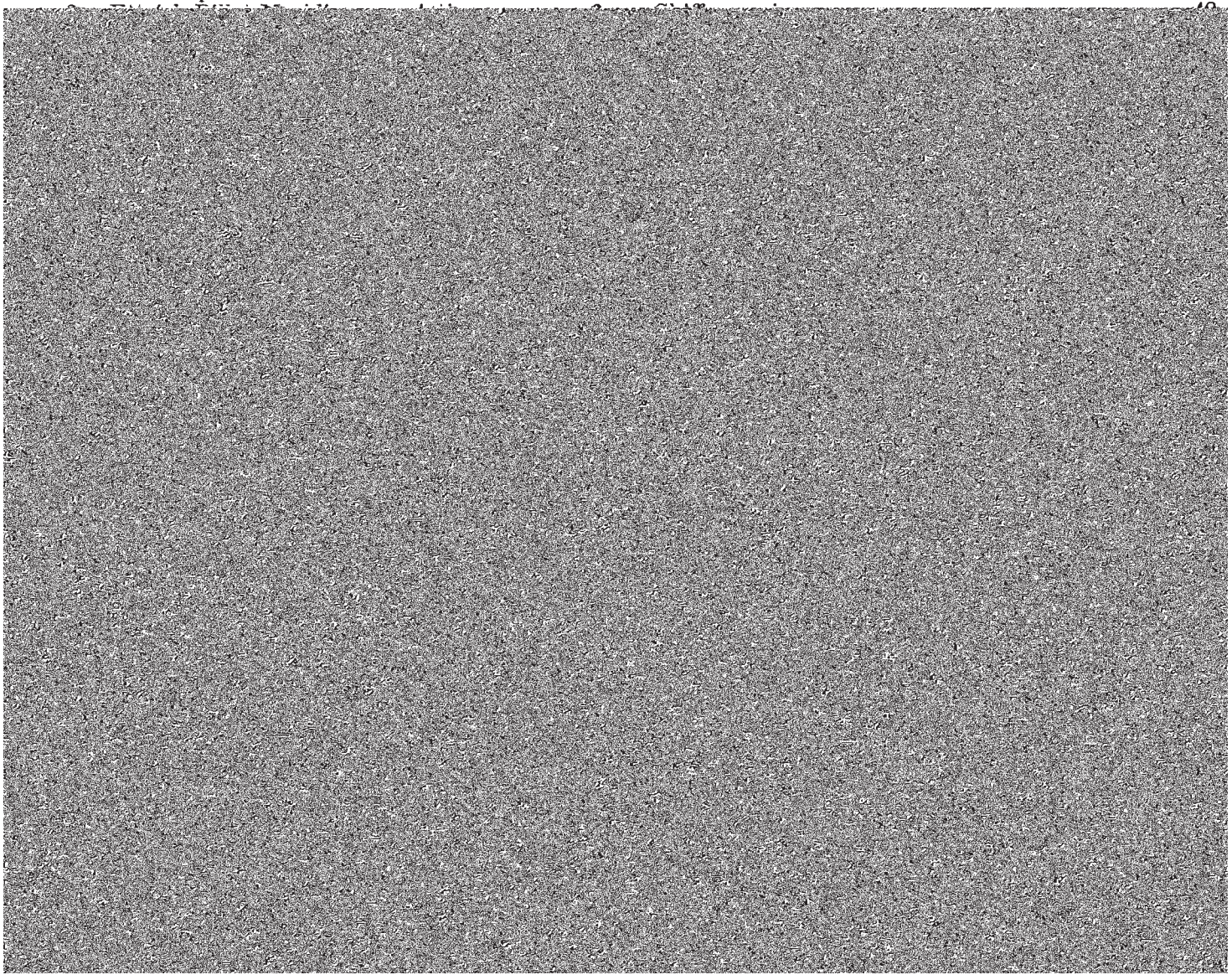


SOIL SURVEY OF TREMPEALEAU COUNTY, WISCONSIN

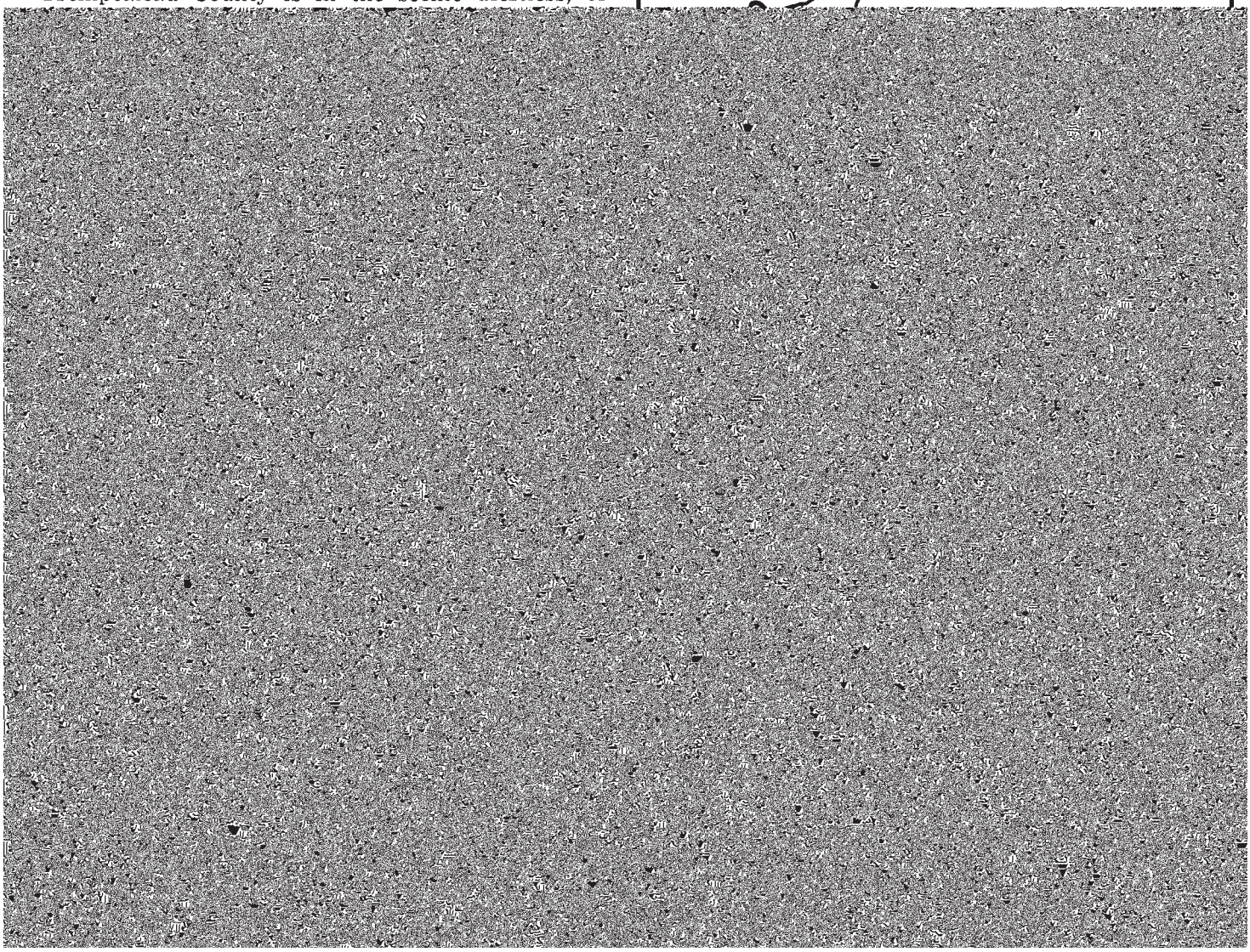
BY JOHN E. LANGTON, SOIL CONSERVATION SERVICE

FIELDWORK BY NORMAN L. JOHNSON, WAYNE D. BARNDT, AND JOHN E. LANGTON, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE WISCONSIN RESEARCH DIVISION OF THE COLLEGE OF AGRICULTURE AND LIFE SCIENCES, UNIVERSITY OF WISCONSIN

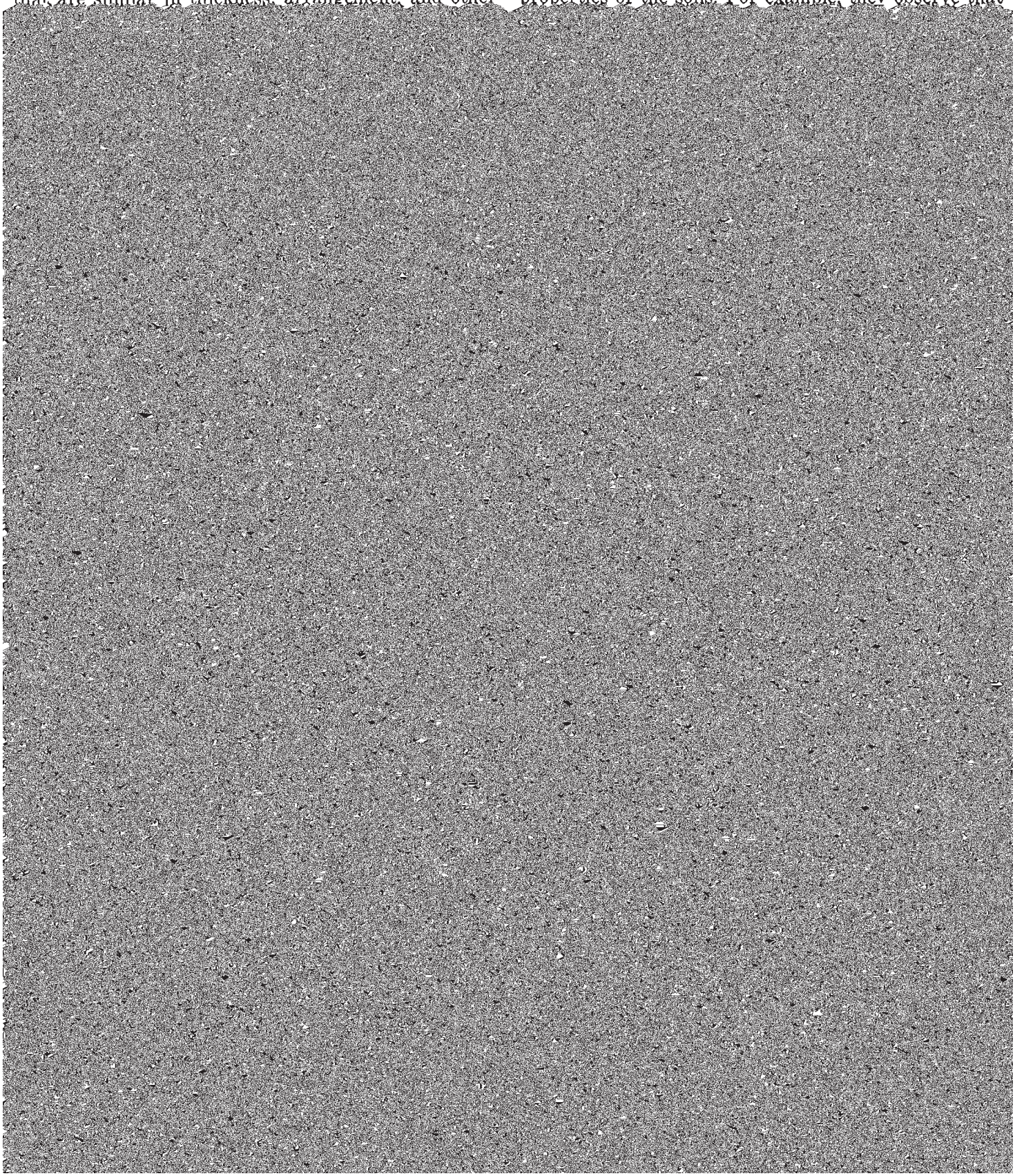
TREMPEALEAU COUNTY is in the west-central part of Wisconsin (fig. 1). Its boundaries are partly formed by three rivers—the Mississippi River on the south, the Trempealeau River on the west, and the Black River on the southeast. The county is about 42 miles long and 18 to 23 miles wide. It has a land area of about 470,340 acres.

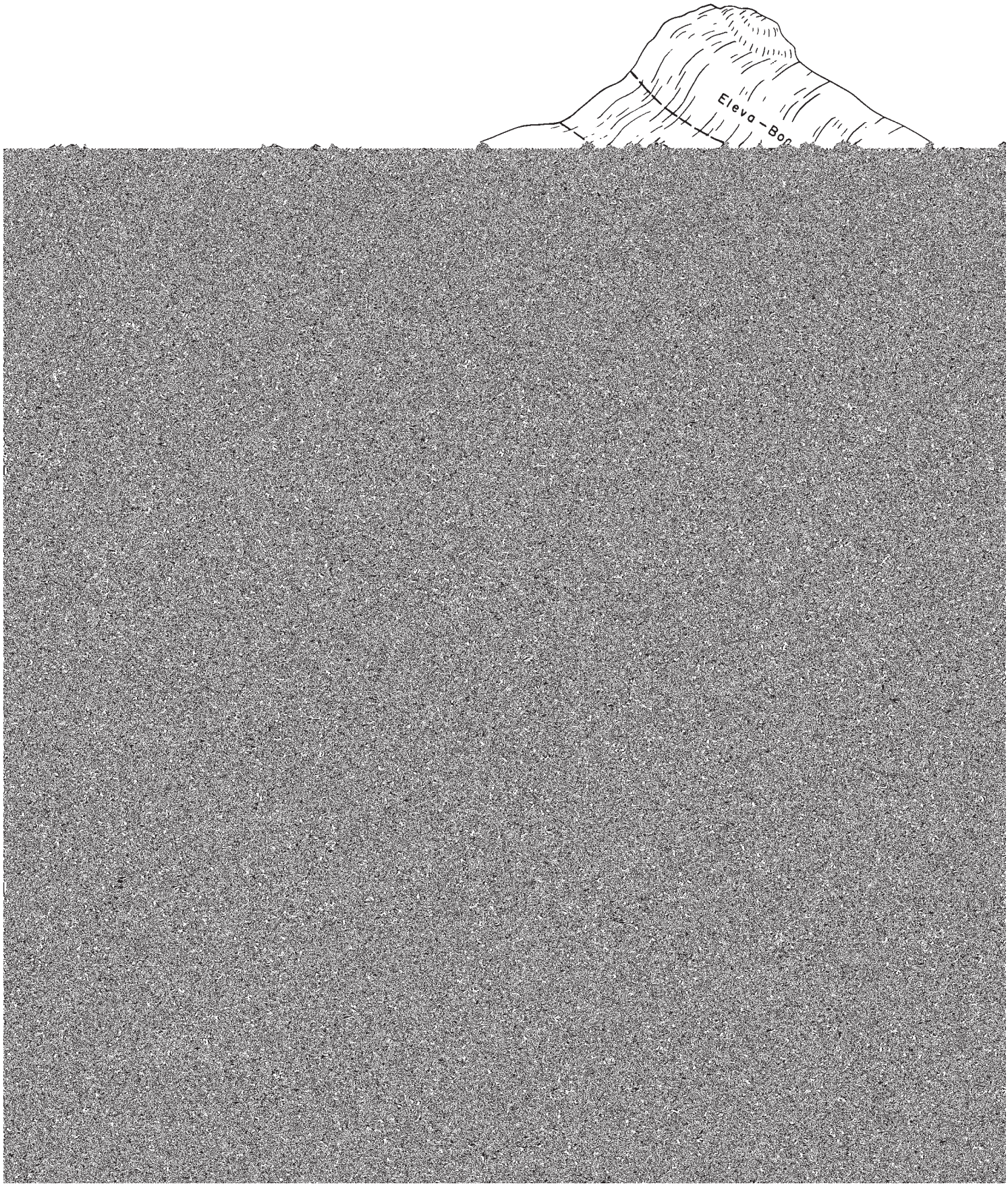
Trempealeau County is in the scenic driftless, or



layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other

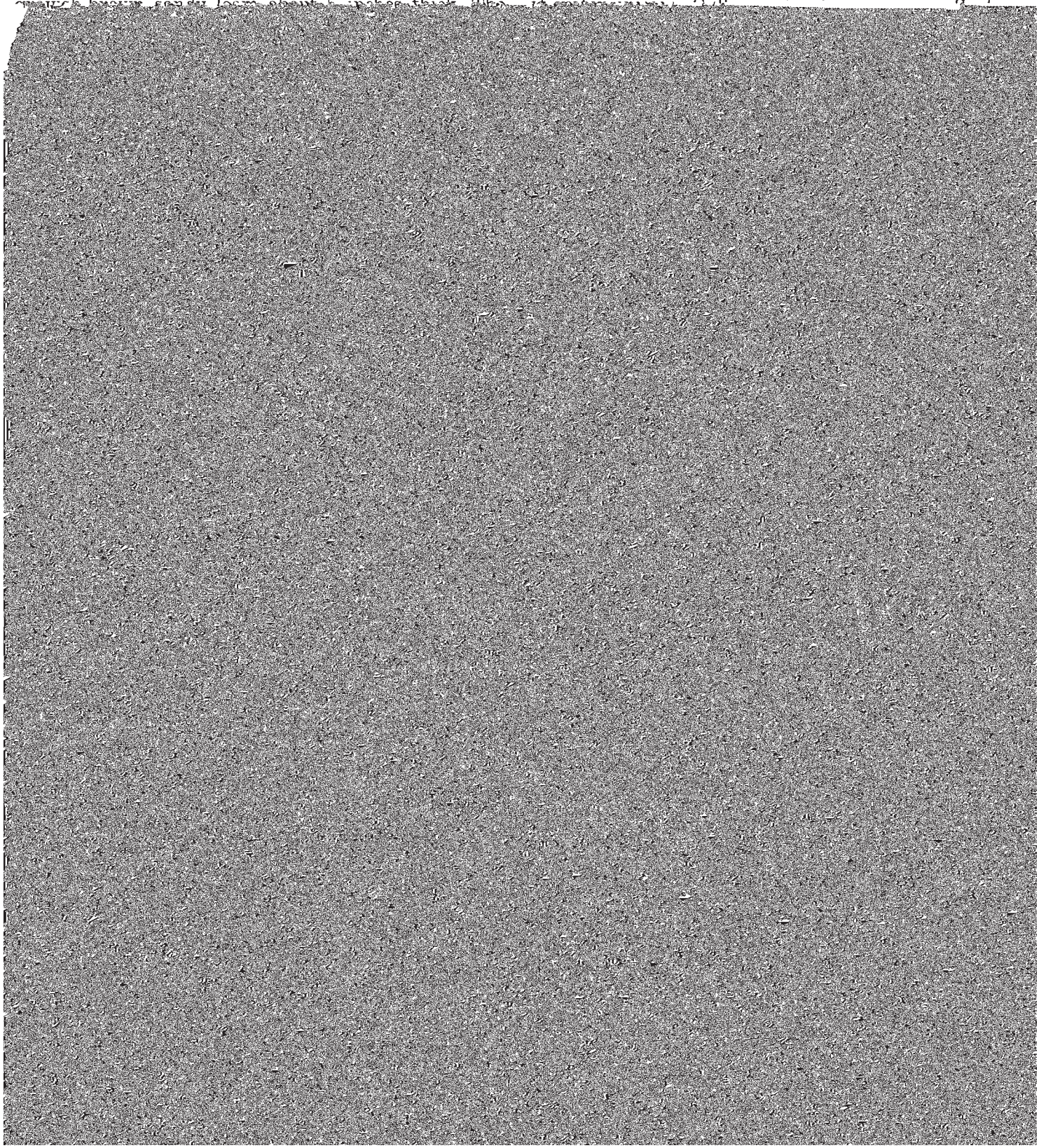
or covering for structures. They relate this behavior to properties of the soils. For example, they observe that




Eleva - Bon

moderately steep. In most areas they are closely intermingled with Gale and Boone soils and are mapped in complexes with these soils. The surface layer is dark

and medium to high in the other soils of this association. Most of the soils in this association are moderately steep or steeper and are subject to a severe hazard



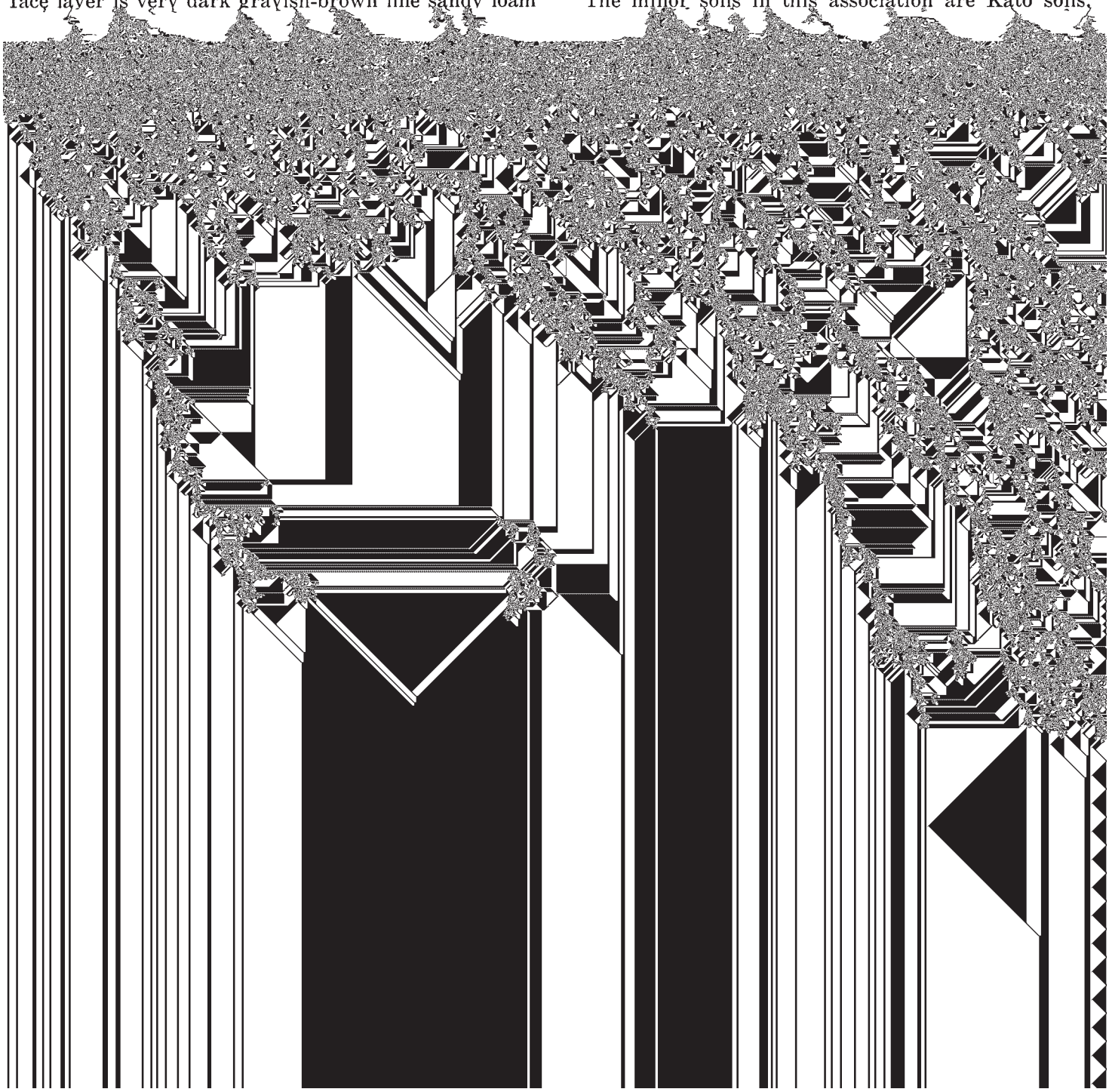
where the terraces are adjacent to the sandstone uplands (fig. 3).

This association occupies about 14 percent of the county. Billett soils make up about 25 percent of the association, Sparta soils 15 percent, Gotham soils 15 percent, and minor soils the remaining 45 percent.

Billett soils are on high terraces. Some areas on terraces adjacent to sandstone uplands are underlain at a depth of slightly more than 60 inches by sandstone bedrock. These soils are well drained and are mainly gently sloping to sloping. In cultivated areas the surface layer is very dark grayish-brown fine sandy loam 30 inches by brownish-yellow coarse and medium sand.

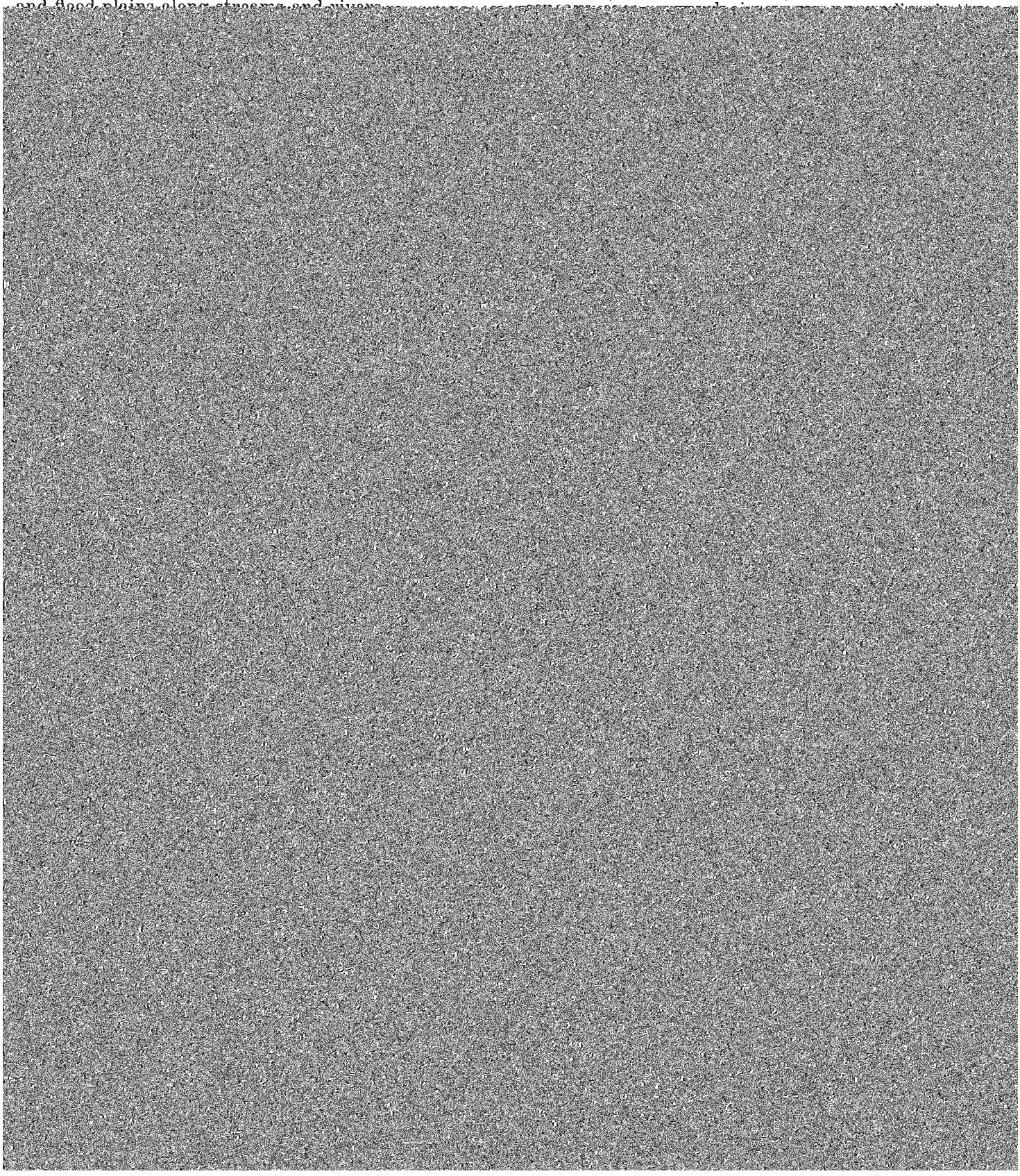
Gotham soils are on stream and river terraces. These soils are somewhat excessively drained and are mainly gently sloping to moderately steep. In cultivated areas the surface layer is very dark grayish-brown loamy fine sand about 9 inches thick. The subsoil is brown to dark-brown loamy sand and heavy loamy sand that is strongly acid. It is underlain at a depth of about 36 inches by light yellowish-brown medium sand that has bands of dark-brown loamy sand and sandy loam.

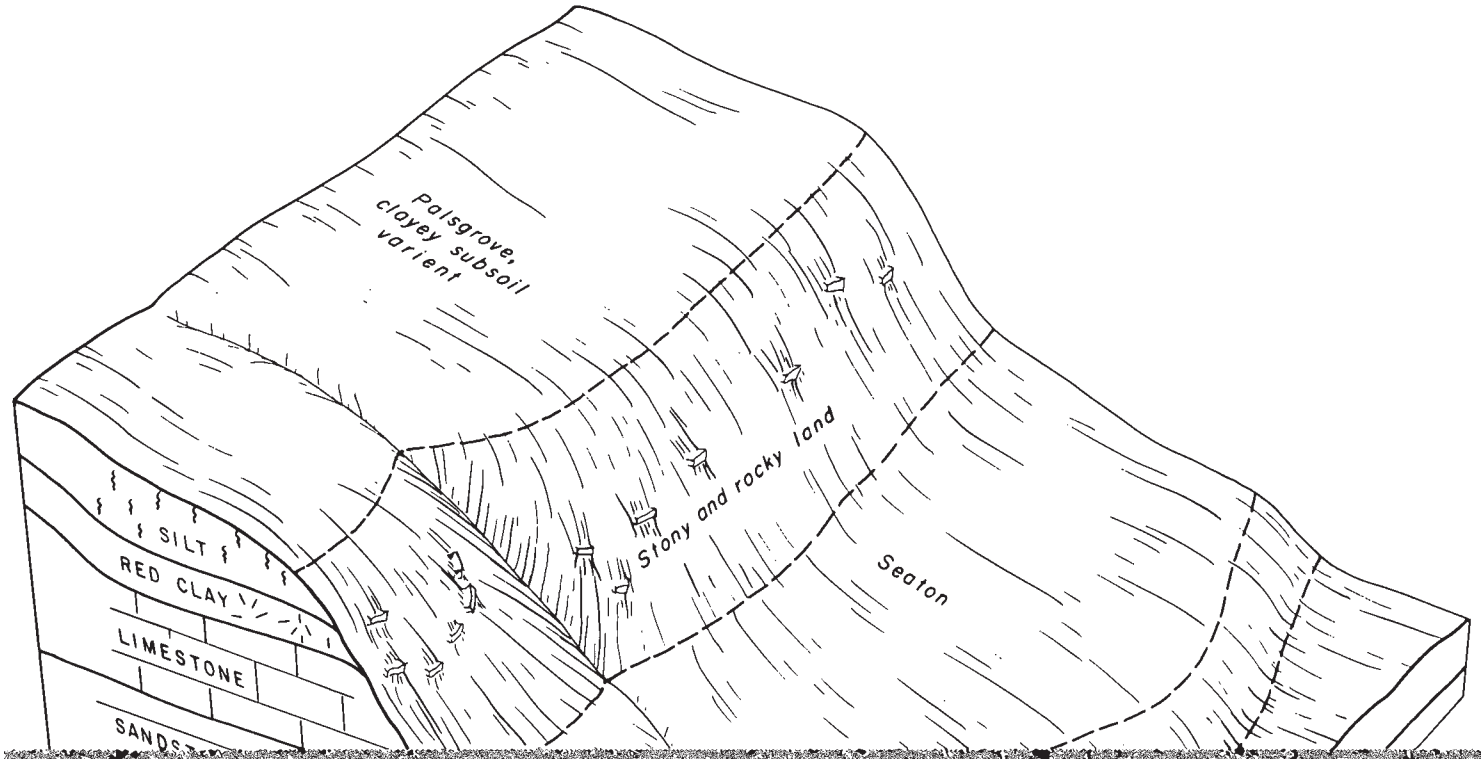
The minor soils in this association are Kato soils,



Well-drained Eleva and Hixton soils are in sloping to steep valley areas. Wet alluvial land is on bottom lands and flood plains along streams and rivers.

concave valley benches. Well drained to poorly drained Huntsville, Worthen, Lawson, and Wallkill soils are in




Palsgrove, clayey subsoil variant
Stony and rocky land
Seaton
SILT
RED CLAY
LIMESTONE

Large gullies are common on Seaton and Port Byron soils.

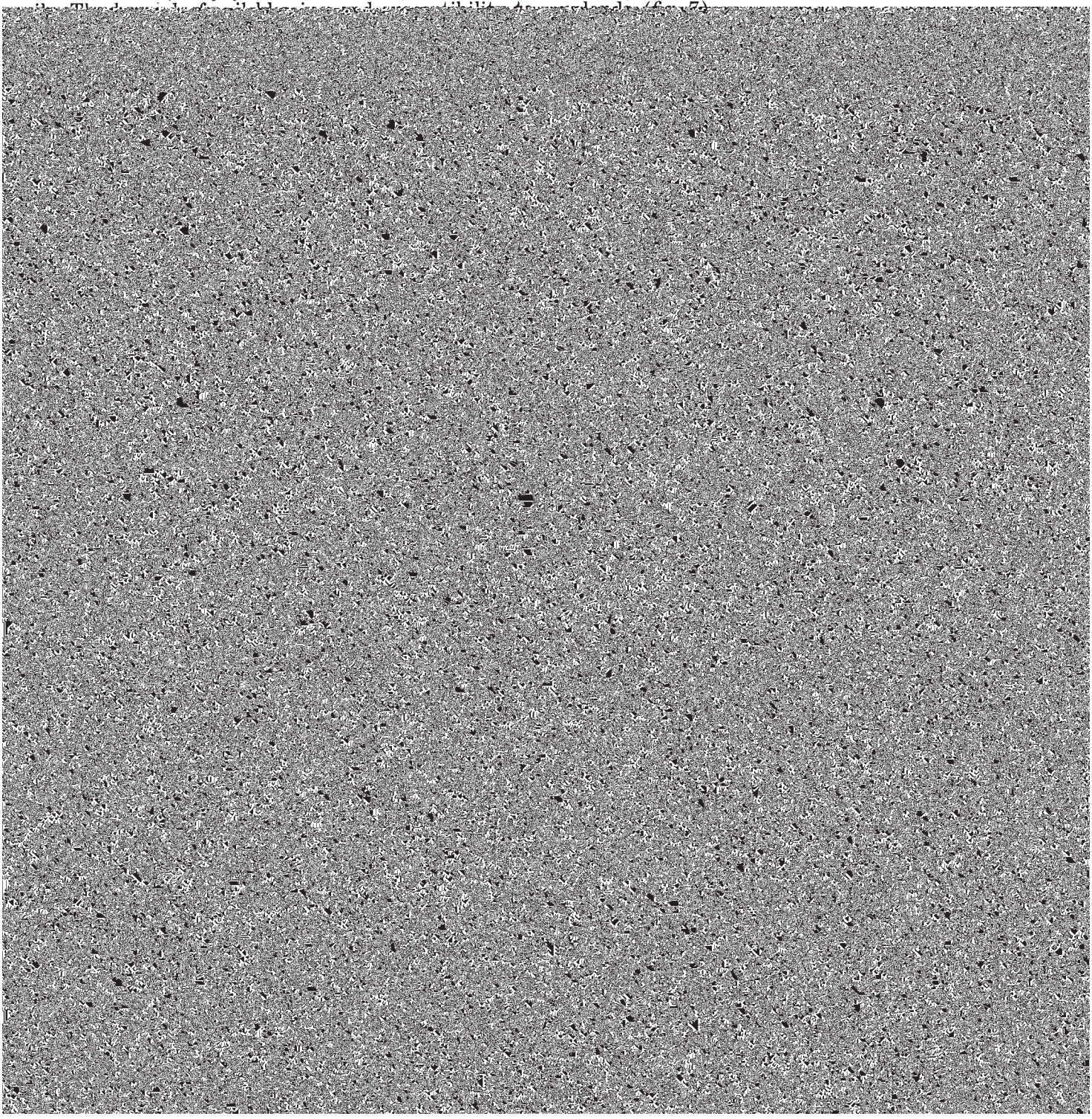
Most areas of the Palsgrove soils, clayey subsoil variant, and Palsgrove soils, and some of the Fayette, Seaton, Port Byron, and Gale soils that are gently sloping to moderately steep, are used for crops and pasture. Corn, oats, and alfalfa hay are the main crops. These crops are used to feed dairy herds or other livestock. Most of the steep and moderately steep areas of Boone, Eleva, Gale, and Hixton soils and Stony and rocky land are used for trees, for wildlife habitat, and

This association occupies about 2 percent of the county. Houghton soils make up about 50 percent of the association, Palms soils 20 percent, and minor soils the remaining 30 percent.

Houghton soils are on valley bottoms along the upper end of streams and small rivers. These soils are very poorly drained and nearly level. The surface layer is very dark brown muck about 8 inches thick. The subsoil is very dark brown muck that is neutral in reaction. It is underlain at a depth of about 28 inches by very dark gray and black muck that has many partly

soils, clayey subsoil variant, and Ettrick, Wallkill, and Huntsville soils are on the lower end of valley bottoms and in areas near valley side slopes. Small areas of moderately steep and steep Eleva and Gale soils are on valley side slopes. Wet alluvial land is on some flood plains along streams and small rivers.

Natural fertility ranges from low to medium in Wet alluvial land and Palms and Houghton soils and high in Ettrick soils, clayey subsoil variant, and Ettrick



6. *Downs-Boaz-Muscatine association*

Well drained to poorly drained soils that have a subsoil of silt loam and silty clay loam over silt loam; on valley benches and valley bottoms

This association consists of nearly level to moderately steep valley benches and valley bottoms. Most of this association is nearly level to gently sloping. It is steeper, however, on valley benches adjacent to the

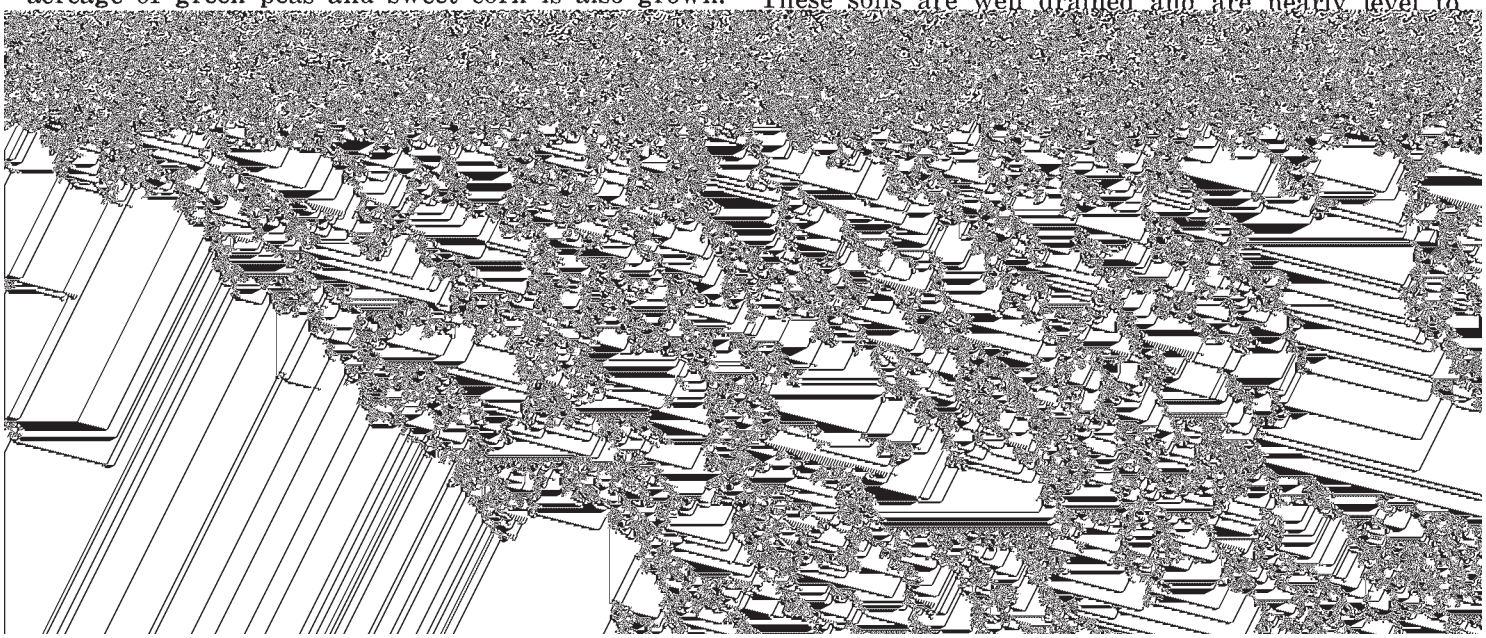
Boaz soils are on high valley bottoms. These soils are somewhat poorly drained to poorly drained and are nearly level. In cultivated areas the surface layer is very dark grayish-brown silt loam about 9 inches thick. The subsoil is brown and grayish-brown, medium acid silt loam that has dark-brown mottles. It is underlain at a depth of about 38 inches by light brownish-gray silt loam.

Muscatine soils are on valley benches. These soils are somewhat poorly drained and nearly level. The surface layer is very dark grayish-brown and very dark brown silt loam about 15 inches thick. The subsoil is brown to grayish-brown, slightly acid to strongly acid silt loam and silty clay loam that has grayish-brown to yellowish-red mottles. It is underlain at a depth of about 45 inches by grayish-brown silt loam.

The minor soils in this association are Seaton, Port Byron, Pillot, Huntsville, and Ettrick soils and Loamy alluvial land and Loamy terrace escarpments. Well-drained Seaton and Port Byron soils are on sloping to steep, concave valley benches. Well-drained Pillot soils are in nearly level to sloping areas along high stream and river terraces. Well-drained to poorly drained Huntsville and Ettrick soils are in nearly level areas along the upper end of valley bottoms. Loamy alluvial land is on bottom lands and flood plains along streams and rivers. Loamy terrace escarpments occur as long, narrow, steep fronts of terraces along streams and rivers.

Natural fertility and the available water capacity are high in most of the soils in this association. The major management concerns are maintenance of structure, fertility, and drainage in wet areas. Growing row crops year after year has deteriorated the structure of many areas of the Downs, Muscatine, and Boaz soils. Rapid runoff from the adjacent uplands creates severe hazards of flooding and erosion on the silty soils, especially those along French and Beaver Creeks.

Most of these soils are in crops, mainly corn. Corn is used to feed dairy herds and other livestock. A large acreage of green peas and sweet corn is also grown.



alluvial or organic sediment. Additional flooding by stream and river overflow occurs in wet seasons.

The minor soils in this association are Sparta soils, mottled subsoil variant; Sparta and Morocco soils; and Sandy alluvial land, Loamy alluvial land, Loamy terrace escarpments, and Sandy terrace escarpments. Well-drained to somewhat poorly drained Sparta soils, mottled subsoil variant, and Sparta and Morocco soils are generally in low, nearly level to gently sloping areas on river and stream terraces. Sandy alluvial land and Loamy alluvial land are on nearly level bottom lands along rivers and streams. Loamy terrace escarpments and Sandy terrace escarpments occur as long, narrow, steep terrace fronts adjacent to the bottom lands of rivers and streams.

Natural fertility and the response of crops are low on these soils.

Most of the soils in this association are in brush, lowland hardwoods, and marsh vegetation. A few small areas, mainly the Sparta soils, mottled subsoil variant, are used for pasture or crops. Most other areas are used as wildlife habitat, mainly for waterfowl and furbearers. These areas are natural resting and feeding places for waterfowl using the Mississippi flyway.

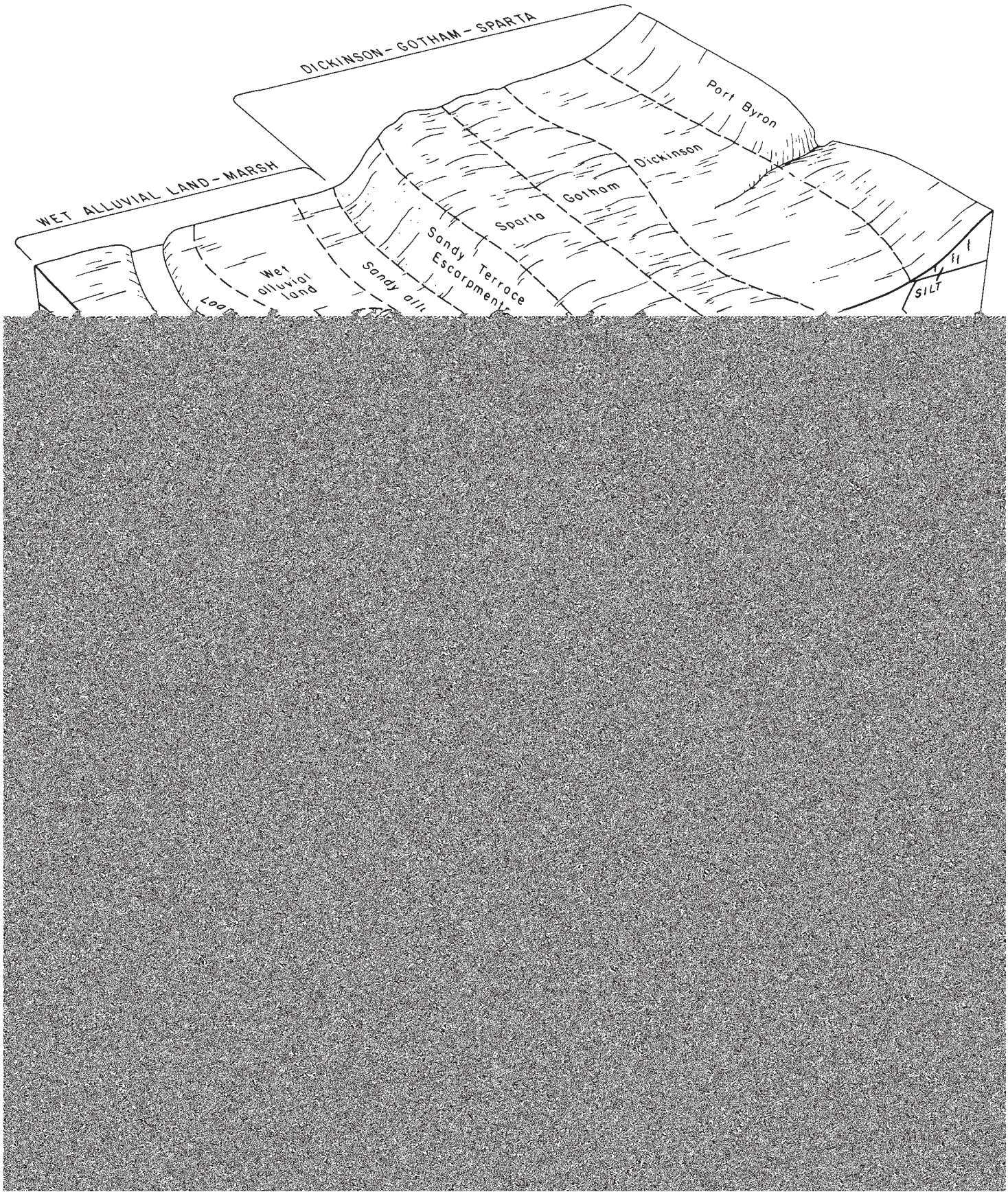
8. Dickinson-Gotham-Sparta association

Excessively drained to well drained soils that have a subsoil of loamy sand to fine sandy loam over fine to coarse sand; on river terraces

This association consists of a nearly level to moderately steep high river terrace along the Mississippi and Black Rivers. Most of this association is nearly level or gently sloping. It is steeper, however, along Sandy terrace escarpments on Trempealeau Mountain in Perrot State Park, and on sand dunes.

This association occupies about 6 percent of the county. Dickinson soils make up about 30 percent of the association, Gotham soils 25 percent, Sparta soils 15 percent, and minor soils the remaining 30 percent.

Dickinson soils in most places occupy that part of the terrace midway between the river and the uplands. These soils are well drained and are nearly level to


DICKINSON – GOTHAM – SPARTA
WET ALLUVIAL LAND – MARSH
Port Byron
Dickinson
Gotham
Sparta
Sandy Terrace Escarpment
Wet alluvial land
Sandy alluvial
SILT

ing material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Loamy alluvial land and Marsh, for example, do not belong to a soil series, but, nevertheless, they are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each

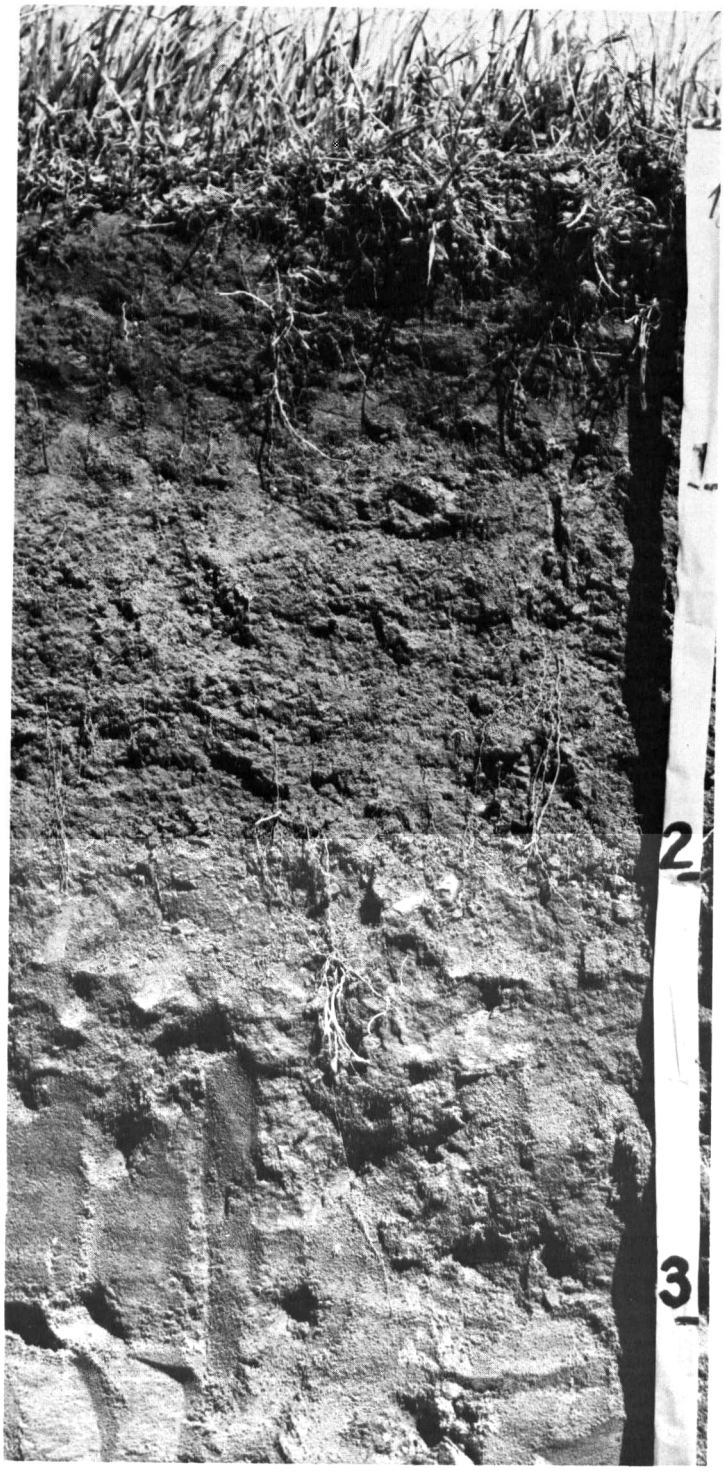


TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Billett fine sandy loam, 0 to 2 percent slopes	1,850	0.4
Billett fine sandy loam, 2 to 6 percent slopes	9,700	2.1
Billett fine sandy loam, 6 to 12 percent slopes, eroded	3,950	.8
Billett fine sandy loam, 12 to 20 percent slopes, eroded	1,250	.4
Boaz silt loam, 0 to 3 percent slopes	3,750	.8
Boone loamy sand, 2 to 6 percent slopes	720	.2
Boone loamy sand, 6 to 12 percent slopes, eroded	1,150	.2
Boone loamy sand, 12 to 30 percent slopes, eroded	3,700	.8
Denrock silt loam	600	.1
Denrock silt loam, wet subsoil variant	650	.1
Dickinson fine sandy loam, 0 to 2 percent slopes	3,150	.7
Dickinson fine sandy loam, 2 to 6 percent slopes	4,650	1.0
Dickinson loam, 0 to 3 percent slopes	1,200	.3
Downs silt loam, 0 to 2 percent slopes	2,950	.6
Downs silt loam, 2 to 6 percent slopes	6,500	1.4
Downs silt loam, 6 to 12 percent slopes, eroded	2,400	.5
Downs silt loam, 12 to 20 percent slopes, eroded	800	.2
Dunnville fine sandy loam, 0 to 2 percent slopes	630	.1
Dunnville fine sandy loam, 2 to 6 percent slopes	3,000	.6
Dunnville fine sandy loam, 6 to 12 percent slopes	410	.1
Eleva sandy loam, 2 to 6 percent slopes, eroded	1,700	.4
Eleva sandy loam, 6 to 12 percent slopes, eroded	8,300	1.8
Eleva sandy loam, 12 to 20 percent slopes, eroded	6,700	1.4
Eleva sandy loam, 20 to 30 percent slopes, eroded	3,300	.7
Eleva-Boone complex, 20 to 45 percent slopes	17,700	3.8
Eleva-Gale complex, 20 to 30 percent slopes	40,700	8.6
Ettrick silt loam	12,900	2.8
Ettrick silt loam, clayey subsoil variant	600	.1
Fayette silt loam, 2 to 6 percent slopes	2,400	.5
Fayette silt loam, 6 to 12 percent slopes	1,400	.3
Fayette silt loam, 6 to 12 percent slopes, eroded	11,100	2.3
Fayette silt loam, 12 to 20 percent slopes	1,450	.3
Fayette silt loam, 12 to 20 percent slopes, eroded	16,600	3.5
Fayette silt loam, 12 to 20 percent slopes, severely eroded	1,900	.4
Fayette silt loam, 20 to 30 percent slopes	3,400	.7
Gale silt loam, 2 to 6 percent slopes	500	.1
Gale silt loam, 6 to 12 percent slopes	900	.2
Gale silt loam, 6 to 12 percent slopes, eroded	2,000	.4
Gale silt loam, 12 to 20 percent slopes	950	.2
Gale silt loam, 12 to 20 percent slopes, eroded	7,500	1.6
Gale silt loam, shallow, 6 to 12 percent slopes, eroded	470	.1
Gale silt loam, shallow, 12 to 20 percent slopes, eroded	810	.2
Gale silt loam, shallow, 20 to 30 percent slopes, eroded	920	.2
Gotham loamy fine sand, 0 to 2 percent slopes	920	.2
Gotham loamy fine sand, 2 to 6 percent slopes	11,000	2.3
Gotham loamy fine sand, 6 to 12 percent slopes	3,150	.7
Gotham loamy fine sand, 12 to 20 percent slopes, eroded	1,350	.3
Gotham-Sparta loamy fine sands, 12 to 20 percent slopes	850	0.2
Gullied land	520	.1
Hixton loam, 2 to 6 percent slopes, eroded	930	.2
Hixton loam, 6 to 12 percent slopes, eroded	2,600	.5
Hixton loam, 12 to 20 percent slopes, eroded	4,150	.9
Hixton loam, 20 to 30 percent slopes, eroded	3,600	.8
Hixton loam, 30 to 45 percent slopes	15,000	3.2
Houghton muck	5,600	1.2
Huntsville silt loam, 0 to 3 percent slopes	6,700	1.4
Kato loam, sandy loam variant	960	.2
Kato silt loam, 0 to 3 percent slopes	1,700	.4
La Farge silt loam, 2 to 6 percent slopes, eroded	2,100	.4
La Farge silt loam, 6 to 12 percent slopes, eroded	9,800	2.1
La Farge silt loam, 12 to 20 percent slopes, eroded	16,400	3.5
La Farge silt loam, 20 to 35 percent slopes	2,200	.5
La Farge silt loam, 20 to 30 percent slopes, eroded	4,000	.9
Lawson silt loam, 0 to 3 percent slopes	3,400	.7
Loamy alluvial land	11,300	2.4
Loamy terrace escarpments	3,250	.7
Marsh	4,000	.9
Meridian loam, 0 to 2 percent slopes	1,150	.2
Meridian loam, 2 to 6 percent slopes	6,300	1.3
Meridian loam, 6 to 12 percent slopes, eroded	900	.2
Morocco loamy sand, 0 to 3 percent slopes	550	.1
Muscatine silt loam, 0 to 3 percent slopes	3,100	.7
Norden loam, 4 to 12 percent slopes, eroded	1,100	.2
Norden loam, 12 to 20 percent slopes, eroded	740	.2
Norden silt loam, 2 to 6 percent slopes, eroded	1,100	.2
Norden silt loam, 6 to 12 percent slopes, eroded	1,600	.3
Norden silt loam, 12 to 20 percent slopes, eroded	4,500	1.0
Norden silt loam, 20 to 30 percent slopes, eroded	2,400	.5
Palms muck	2,000	.4
Palsgrove silt loam, 2 to 6 percent slopes	380	.1
Palsgrove silt loam, 6 to 12 percent slopes, eroded	560	.1
Palsgrove silt loam, 12 to 20 percent slopes, eroded	690	.1
Palsgrove silt loam, clayey subsoil variant, 2 to 6 percent slopes	580	.1
Palsgrove silt loam, clayey subsoil variant, 6 to 12 percent slopes	1,850	.4
Palsgrove silt loam, clayey subsoil variant, 12 to 20 percent slopes	1,650	.4
Palsgrove silt loam, clayey subsoil variant, 12 to 20 percent slopes, eroded	1,200	.3
Palsgrove silt loam, clayey subsoil variant, 20 to 30 percent slopes	1,450	.3
Palsgrove soils, clayey subsoil variant, 12 to 20 percent slopes, severely eroded	550	.1
Pillot silt loam, 0 to 2 percent slopes	660	.1
Pillot silt loam, 2 to 6 percent slopes	5,500	1.2
Pillot silt loam, 6 to 12 percent slopes, eroded	910	.2
Port Byron silt loam, 2 to 6 percent slopes	530	.1
Port Byron silt loam, 6 to 12 percent slopes, eroded	1,050	.2
Port Byron silt loam, 12 to 20 percent slopes, eroded	2,400	.5
Port Byron silt loam, 20 to 30 percent slopes	1,700	.4
Sandy alluvial land	2,500	.5
Sandy terrace escarpments	720	.2
Seaton silt loam, 2 to 6 percent slopes	850	.2
Seaton silt loam, 6 to 12 percent slopes	1,000	.2
Seaton silt loam, 6 to 12 percent slopes, eroded	2,700	.6

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Seaton silt loam, 12 to 20 percent slopes, eroded	13,300	2.8	Urne fine sandy loam, 20 to 30 percent slopes, eroded	1,650	0.3
Seaton silt loam, 20 to 30 percent slopes	2,900	.6	Urne fine sandy loam, 30 to 45 percent slopes	1,250	.3
Seaton silt loam, 20 to 30 percent slopes, eroded	6,200	1.3	Urne silt loam, 6 to 12 percent slopes, eroded	730	.2
Shiffer loam, 0 to 3 percent slopes	1,000	.2	Urne silt loam, 12 to 20 percent slopes		
Sparta loamy sand, 0 to 2 percent slopes	1,800	.4			

amounts of corn and soybeans. Capability unit IIIe–7; woodland group 3; wildlife group 3.

Billett fine sandy loam, 12 to 20 percent slopes, eroded (BlD2).—This soil is in irregularly shaped areas on stream and river terraces. It has a profile similar to the one described as representative of the series, but the surface layer is lighter in color and the subsoil is thinner.

Included with this soil in mapping are small areas of soils that have a thick, dark surface layer and a few small areas of Eleva soils. Also included are a few small areas of somewhat poorly drained loamy soils and loamy sand soils that are underlain by a sandy substratum that has loamy bands.

This soil has low available water capacity. The hazard of water erosion is severe, and the hazard of soil blowing is moderate.

Most areas of this soil are used for pasture and hay. This soil is well suited to grasses, alfalfa, and pine tree plantations. Capability unit IVe–7; woodland group 3; wildlife group 3.

Boaz Series

The Boaz series consists of nearly level to gently sloping, somewhat poorly drained and poorly drained soils on high valley bottoms. The soils formed in silty alluvium. The native vegetation was moist-land grasses, tall shrubs, and a few trees, such as silver maple, elm, and ash.

In a representative profile the plow layer is very dark grayish-brown silt loam about 9 inches thick. The subsurface layer is grayish-brown, platy silt loam 7 inches thick that has reddish-brown mottles. In many cultivated areas, most of the subsurface layer is incorporated into the surface layer. The subsoil is silt loam about 22 inches thick. It is brown silt loam that has dark-brown mottles in the upper 6 inches and grayish-brown heavy silt loam that has dark-brown mottles in the lower 16 inches. It is underlain by light brownish-gray silt loam that has many dark-brown mottles.

Permeability is moderate, but percolation of water is slow in wet seasons. Available water capacity is very high, and natural fertility is high. The subsoil is medium acid. The water table is seasonally high for short periods in areas where water is concentrated by runoff and stream overflow. The water table is deep enough in most areas to permit tillage late in spring. Tile drains, shallow surface drains, and water diversions permit earlier tillage.

Most areas of these soils are used for corn. These soils are well suited to corn if drainage is adequate.

Representative profile of Boaz silt loam, 0 to 3 percent slopes, in a cornfield near a ditchbank, 250 yards east of the road in NW¼NW¼ sec. 36, T. 19 N., R. 8 W.:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, subangular blocky structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A2—9 to 16 inches, dark grayish-brown (10YR 4/2) silt loam that has few, distinct reddish-brown (5YR 4/4) mottles; moderate, thin, platy structure; very friable; medium acid; clear, smooth boundary.

B1—16 to 22 inches, brown (10YR 5/3) silt loam that has common, fine, prominent, dark-brown (7.5YR 5/2) and strong-brown (7.5YR 5/6) mottles; moderate, medium, platy structure that parts to weak, medium and fine, subangular blocky; friable; medium acid; clear, smooth boundary.

B2g—22 to 38 inches, grayish-brown (10YR 5/2) heavy silt loam that has many medium, prominent, strong-brown (7.5YR 4/4) mottles; moderate, thick, platy structure that parts to moderate, coarse and medium, subangular blocky; friable; medium acid; clear, smooth boundary.

C—38 to 60 inches, light brownish-gray (2.5YR 6/2) silt loam that has many, coarse, prominent, dark-brown (7.5YR 4/4) mottles; massive; slightly acid.

The solum ranges from 30 to 40 inches in thickness. The Ap horizon is very dark grayish-brown (10YR 3/2) or very dark gray (10YR 3/1) in color and ranges from 6 to 10 inches in thickness. The Ap horizon commonly is slightly acid, but in limed areas it is neutral in reaction. The Bg horizon is silt loam. It has a hue of 10YR or 2.5Y, a value of 4, 5, or 6, and a chroma of 2 or less.

Boaz soils are adjacent to areas of Loamy alluvial land and to Ettrick soils. They are generally somewhat poorly drained and have a slightly lighter colored surface layer than the poorly drained Ettrick soils, and they do not have the B2t horizon that is characteristic of those soils. They have a B horizon that lacks the stratification of Loamy alluvial land, and the B horizon has a stronger structure than that of Loamy alluvial land.

Boaz silt loam, 0 to 3 percent slopes (BmA).—This soil is in uniformly shaped areas on high valley bottoms. Recent silt washed from areas on uplands or the mixing of the surface layer and subsoil during cultivation causes some areas to be lighter in color.

Included with this soil in mapping are a few small areas of poorly drained Ettrick soils and Loamy alluvial land.

Erosion caused by runoff and stream overflow is a moderate to severe hazard in cultivated areas. Streambank erosion is a severe hazard in cultivated and pastured areas. Most areas are wet for short periods, but they can be cultivated without tile drains because the water table is at a depth of more than 3 feet most of the year.

Most areas of this soil are used for corn. This soil is well suited to corn. Drainage is adequate. Capability unit IIw–13; woodland group 9; wildlife group 5a.

Boone Series

The Boone series consists of gently sloping to steep, excessively drained soils on sandstone uplands. These soils formed in sandy residuum underlain by cemented sandstone bedrock (fig. 10). The native vegetation was mainly black oak savanna.

In a representative profile the surface layer is very dark grayish-brown loamy sand about 4 inches thick. The subsoil is yellowish-brown loamy sand about 11 inches thick. It is underlain by yellowish-brown to pale-brown sand about 10 inches thick. Beneath the loose sand is yellowish-brown cemented sandstone bedrock.

Permeability is rapid. Natural fertility is low, and available water capacity is very low. The subsoil is strongly acid.

Most areas of these soils are used for pasture or as woodland. A few areas, however, are used for corn, oats, and hay. Most areas are too steep and droughty for crops.

Representative profile of Boone loamy sand, 12 to

Figure 10.—Area of a Boone soil underlain by cemented sandstone.

30 percent slopes, in black oak woods, in the NE¼SE¼ sec. 22, T. 24 N., R. 7 W.:

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) loamy sand; weak, fine, crumb structure; very friable; very strongly acid; clear, wavy boundary.

B2—4 to 15 inches, yellowish-brown (10YR 5/4) loamy sand; weak, medium, subangular blocky structure; very friable; strongly acid; clear, irregular boundary.

C1—15 to 20 inches, yellowish-brown (10YR 5/6) fine sand that has yellowish-brown (10YR 5/6) angular pieces of sandstone; loose; single grained; strongly acid; clear, wavy boundary.

C2—20 to 25 inches, very pale brown (10YR 7/4) sand; loose; single grained; strongly acid; clear, wavy boundary.

IIR—25 to 60 inches, yellowish-brown (10YR 5/8) cemented sandstone bedrock.

The solum ranges from 7 to 20 inches in thickness. Depth to bedrock ranges from 20 to 40 inches.

Where present, the Ap horizon is lighter colored than the A horizon and ranges from 6 to 8 inches in thickness. The A horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2) and ranges from 1 to 4 inches in thickness. The A horizon commonly is very strongly acid, but it is slightly acid or neutral in limed fields.

Boone soils are adjacent to Eleva and Hixton soils and Stony and rocky land. They have less clay and more sand than Hixton and Eleva soils, which formed in sandstone residuum. Boone soils have more sand and less silt, clay, and rock than Stony and rocky land.

Boone loamy sand, 2 to 6 percent slopes (BnB).—This soil is in uniformly shaped areas on ridgetops and in valleys. It has a profile similar to the one described as representative of the series, but in cultivated areas the surface layer is thicker and lighter colored. Also, depth to bedrock is slightly greater.

Included with this soil in mapping are a few areas of loamy fine sand and fine sandy loam. Also included are a few areas of soils that have a darker surface layer than this soil, and they are mainly in trees.

This soil has very low available water capacity. The hazard of soil blowing is severe.

This soil is suited to alfalfa and grasses or to pine tree plantations. A few areas are used for corn, oats, and soybeans. Capability unit IVs–3; woodland group 4; wildlife group 3.

Boone loamy sand, 6 to 12 percent slopes, eroded (BnC2).—This soil is in uniformly shaped areas on ridgetops and in valleys. It has a profile similar to the one described as representative of the series, but in cultivated areas the surface layer is thicker and lighter colored.

Included with this soil in mapping are a few areas of loamy fine sand and sandy loam. Also included are small wooded areas of soils that have a thinner, darker surface layer than this soil and some areas of rock outcrop.

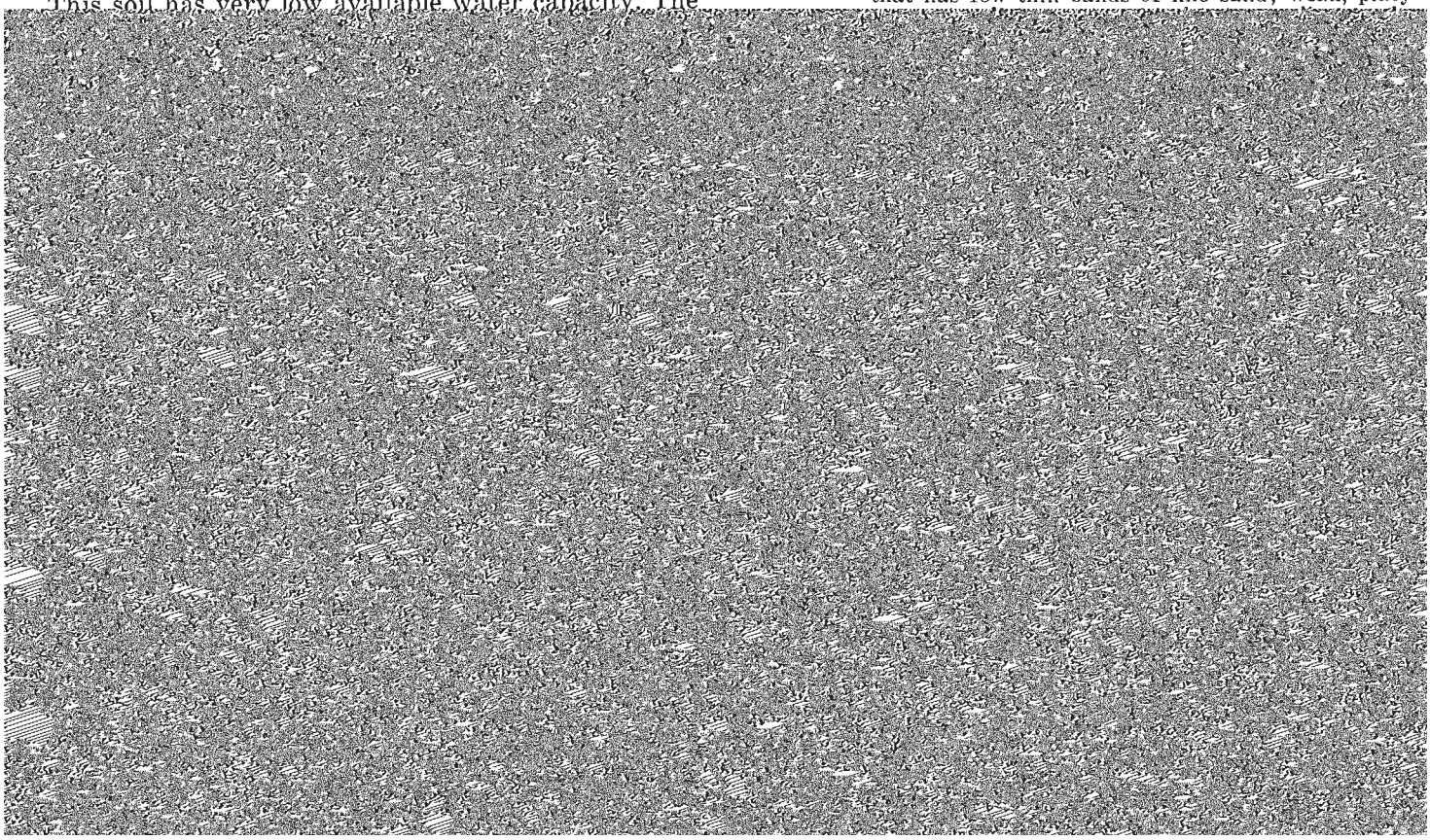
This soil has very low available water capacity. The hazard of water erosion is moderate, and the hazard of soil blowing is severe.

This soil is suited to alfalfa and grasses for pasture or to pine tree plantations. Capability unit VIs–3; woodland group 4; wildlife group 3.

Boone loamy sand, 12 to 30 percent slopes, eroded (BnE2).—This soil is in uniformly shaped areas on ridges and valleys. It has the profile described as representative for the series.

Included with this soil in mapping are some areas of cultivated soils that have a thicker, lighter colored surface layer than this soil and small areas that have rock outcrop. Also included are a few areas of sandy loam and areas of soils that are slightly more sloping than this Boone soil.

This soil has very low available water capacity. The



most areas of these soils can be tilled late in spring. Shallow surface drains and water diversions improve drainage and permit tillage earlier in spring. The subsoil is medium acid to slightly acid.

Most areas of Denrock soils are cultivated. These soils are well suited to corn and to other row crops where drainage is adequate.

Representative profile of Denrock silt loam, in a cornfield on the boundary between the NE¼ and SE¼ in SW¼ sec. 5, T. 18 N., R. 9 W.:

Ap—0 to 8 inches, black (10YR 2/1) silt loam; medium, coarse, granular structure; firm; slightly plastic; common roots; strongly acid; abrupt, smooth boundary.

A12—8 to 11 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, platy structure that parts to strong, fine, granular; firm; slightly plastic; common roots; strongly acid; clear, wavy boundary.

B1t—11 to 18 inches, dark-brown (10YR 4/3) silty clay; strong, medium, angular blocky structure that parts to fine, angular blocky; few continuous clay films on ped faces; very firm; plastic; few roots; strongly acid; clear, wavy boundary.

B2t—18 to 33 inches, reddish-brown (2.5YR 4/4) silty clay that has common, coarse, distinct, gray (10YR 5/1) mottles; moderate, medium, prismatic structure that parts to strong, angular blocky; ped faces coated with many, thick, continuous clay films; very firm; very plastic; slightly acid; gradual, irregular boundary.

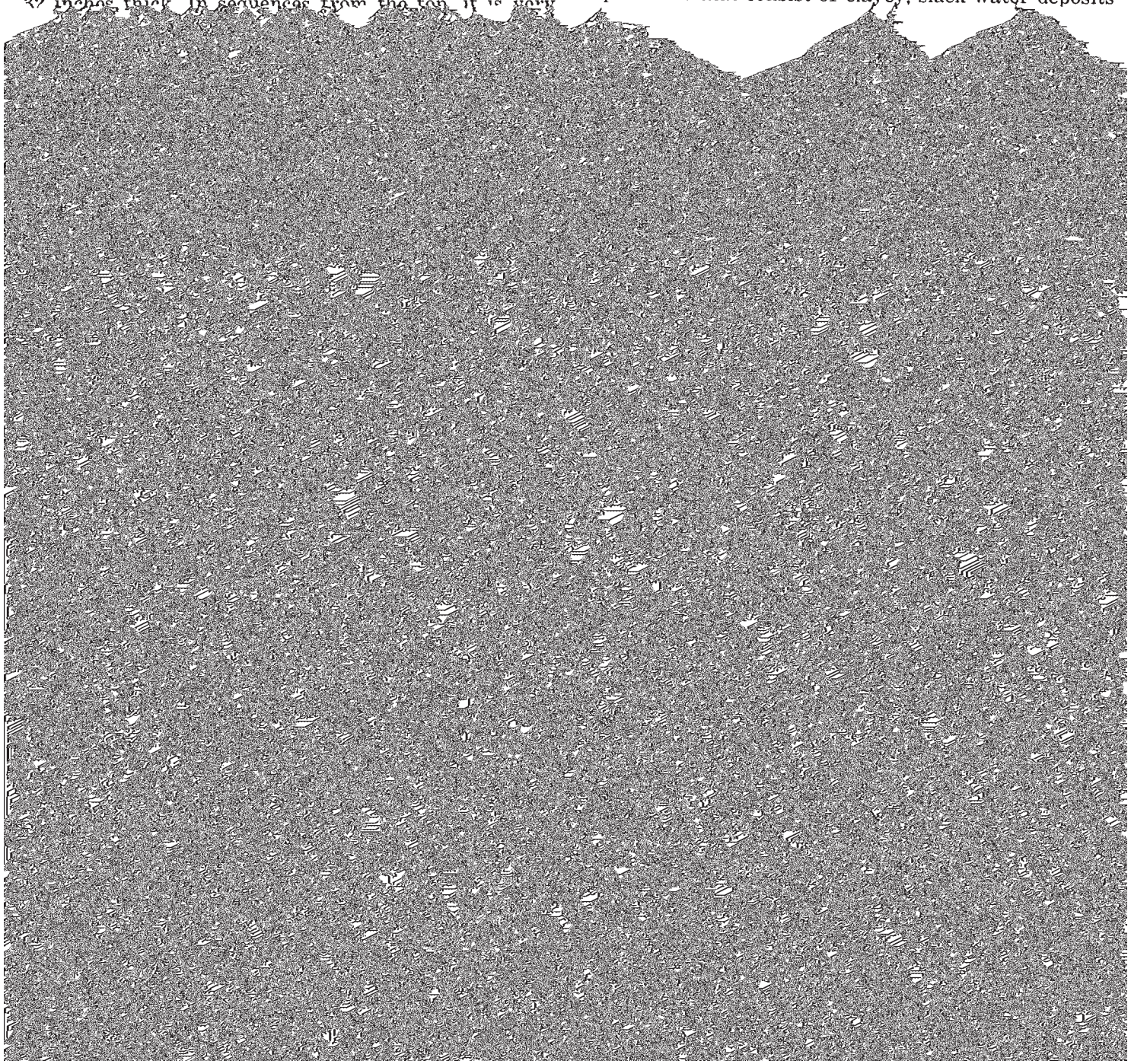
B3—33 to 42 inches, reddish-brown to weak-red (2.5YR 4/4 to 4/2) silty clay that has common, coarse, distinct, gray (10YR 5/1) mottles; weak, medium, prismatic structure that parts to strong, coarse, angular blocky; plastic; neutral; gradual, irregular boundary.

C1—42 to 50 inches, reddish-brown (5YR 4/3) silty clay that has few thin bands of fine sand; weak, platy

Denrock Series, Wet Subsoil Variant

The Denrock series, wet subsoil variant, consists of nearly level, poorly drained soils in an ancient slack-water basin on a large terrace along the Mississippi River. These soils formed mainly in grayish-brown and reddish-brown, clayey, slack-water sediment 4 to 6 feet thick. Beneath the clayey sediment is loose sand. The native vegetation was wetland prairie grasses, tall shrubs, and a few trees, such as silver maple, elm, and ash.

In a representative profile the surface layer is very dark gray silt loam 12 inches thick. The subsoil is about 32 inches thick. In sequences from the top, it is very



inches in thickness. It is neutral to slightly acid. The Btg horizon has hues of 2.5Y and 10YR, values of 4, 5, and 6, and chromas of 2 or less. The clay sediment in the B3 horizon and the upper part of the C horizon has hues of 2.5YR, 5YR, and 7.5YR and values and chromas of 3, 4, and 5.

Denrock soils, wet subsoil variant, are adjacent to Denrock, Dickinson, and Sparta soils. Denrock soils, wet subsoil variant, are more poorly drained and have a thicker A horizon than Denrock soils. They have less sand and more clay and silt than the well-drained Dickinson and Sparta soils.

Denrock silt loam, wet subsoil variant (De).—This soil is nearly level. It is in uniformly shaped areas in depressions that consist of clayey, slack-water deposits

sand; weak, medium, subangular blocky structure; very friable; strongly acid; abrupt, smooth boundary.

C—32 to 60 inches, dark yellowish-brown (10YR 4/4) fine sand; loose; single grained; strongly acid.

The solum ranges from 30 to 36 inches in thickness. In a few areas the substratum is loamy sand or has loamy bands that range from 1 to 6 inches in thickness.

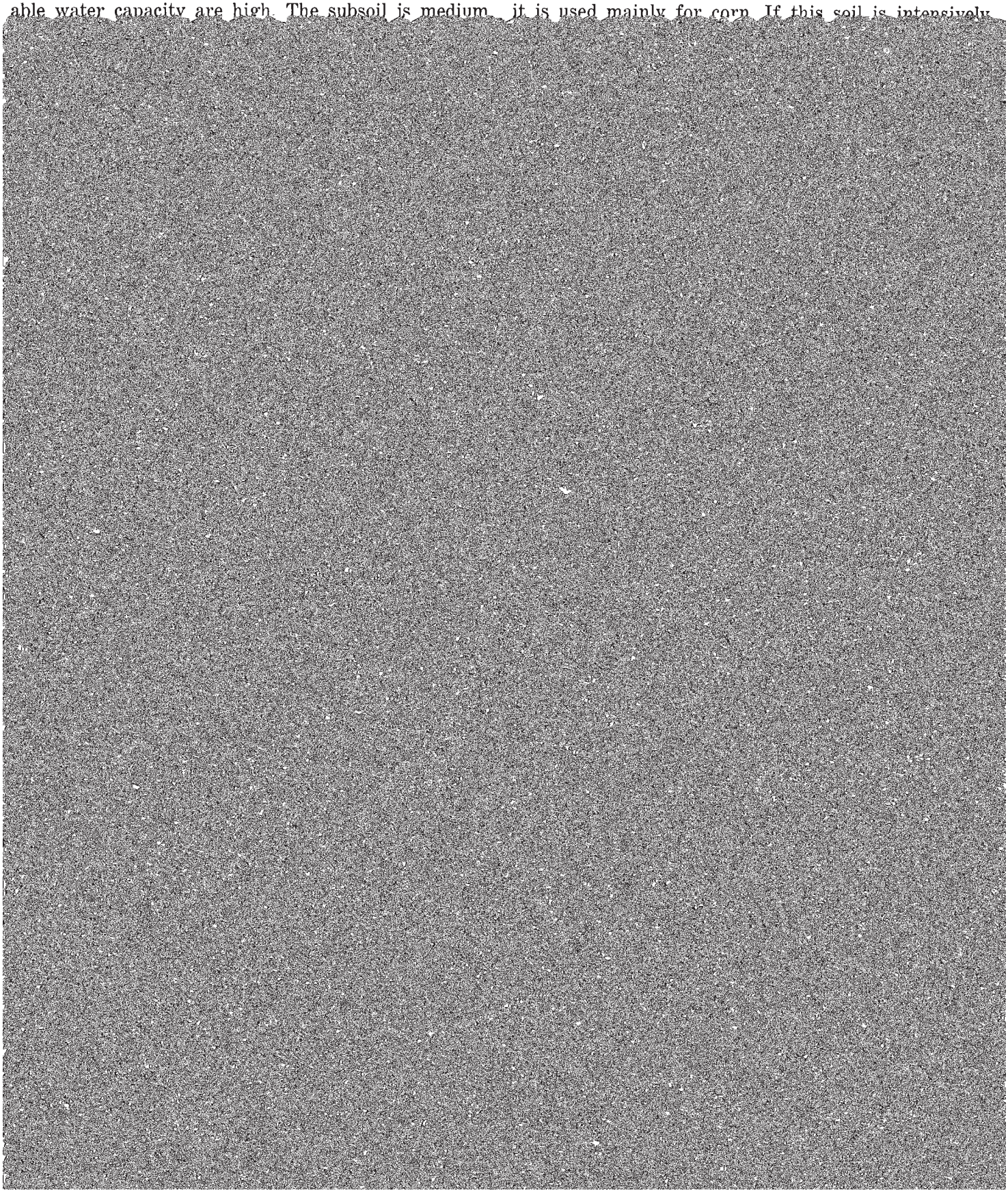
The A horizon is black (10YR 2/1) or dark-brown (10YR 3/3) fine sandy loam or light loam that ranges from 10 to 30 inches in thickness. The organic-matter content in the lower part of the A horizon is less than 1 percent.

Downs Series

The Downs series consists of nearly level to moderately steep, well-drained soils on valley benches. The soils formed in deep silty sediment (fig. 11). The native vegetation was bur and black oak savanna.

In a representative profile the surface layer is very dark grayish-brown silt loam about 9 inches thick. The subsurface layer is brown, platy silt loam about 2 inches thick. The subsoil is about 40 inches thick. It is

able water capacity are high. The subsoil is medium. It is used mainly for corn. If this soil is intensively



Representative profile of Dunnville fine sandy loam, 0 to 2 percent slopes, in a cornfield on a low terrace, 450 yards north of County Highway Q and just west of driveway into farmyard in SE¼NE¼ sec. 30, T. 22 N., R. 8 W.:

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) fine sandy loam; weak, medium, subangular blocky structure that parts to weak, fine, granular; very friable; strongly acid; abrupt, smooth boundary.

A12—8 to 13 inches, dark-brown (7.5YR 3/2) fine sandy loam; weak, coarse, prismatic structure that parts to weak, medium, subangular blocky; very friable; strongly acid; abrupt, smooth boundary.

B1—13 to 17 inches, dark reddish-brown (5YR 3/3) fine sandy loam; weak, coarse, prismatic structure that parts to weak, medium, subangular blocky; very friable; strongly acid; clear, wavy boundary.

B2—17 to 26 inches, reddish-brown (5YR 4/4) fine sandy

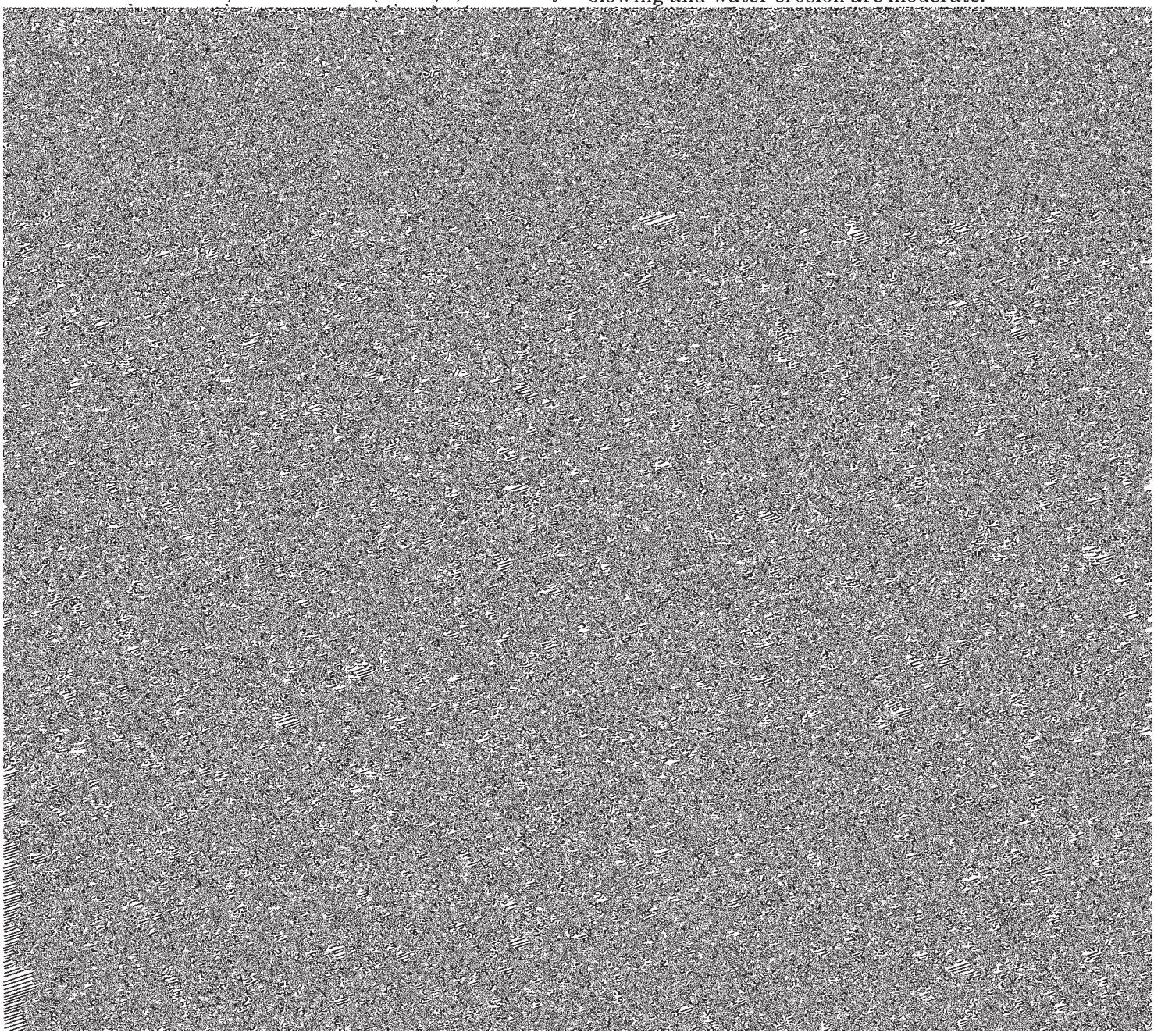
Available water capacity is low. The hazard of soil blowing is moderate. Irrigation is feasible on some large areas of this soil.

This soil is suited to corn, oats, and alfalfa. It is used for soybeans, lima beans, and garden crops. Capability unit IIIs–4; woodland group 3; wildlife group 3.

Dunnville fine sandy loam, 6 to 12 percent slopes (DuC).—This soil is in irregularly shaped areas on knolls on low terraces. It has a profile similar to the one described as representative for the series, but the surface layer and subsoil are thinner.

Included with this soil in mapping are a few small areas of Sparta and Trempealeau soils and Sandy terrace escarpments.

Available water capacity is low. The hazards of soil blowing and water erosion are moderate.



friable; few fine roots; medium acid; gradual, irregular boundary.
C—30 to 36 inches, yellowish-brown (10YR 5/6) medium and fine sand; loose; single grained; strongly acid.
R1—36 to 46 inches, brownish-yellow (10YR 6/6) weakly cemented sandstone; medium acid.
R2—46 to 60 inches, brownish-yellow (10YR 6/6) medium-grained indurated sandstone bedrock.

The solum ranges from 20 to 40 inches in thickness. Depth to strongly cemented sandstone ranges from 36 to 60 inches. The A1 horizon, where present, is very dark gray (10YR 3/1) or very dark grayish-brown (10YR 3/2) sandy loam or fine sandy loam that ranges from 1 to 4 inches in thickness. The Ap horizon is dark grayish brown (10YR 4/2) to dark brown (10YR 4/3). The Bt horizon generally ranges from sandy loam to light loam in texture.

Eleva soils are adjacent to Boone, Hixton, Gale, La Farge, Fayette, and Meridian soils. They are underlain by a more acid, coarser grained sandstone formation than La Farge soils. They have more silt and clay and are deeper than Boone soils. Eleva soils have less silt and clay than Hixton soils. They lack the moderately deep silt mantle of Gale and La Farge soils and the deep silt mantle of Fayette soils. They have slightly less silt and clay than Meridian soils and are underlain by sandstone rather than by loose sand.

Eleva sandy loam, 2 to 6 percent slopes, eroded (ElB2).—This soil is in irregularly shaped areas on valley side slopes. It has a profile similar to the one described as representative of the series, but the surface layer is slightly darker and depth to sandstone bedrock is slightly greater.

Included with this soil in mapping are a few small areas of Billett soils and of moderately well drained sandy soils that are underlain by sandstone.

This soil has low available water capacity and natural fertility. The hazard of soil blowing is moderate. The tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to corn, oats, and alfalfa. Control of erosion and maintenance of organic-matter content are good management practices. Capability unit IIIs–4; woodland group 3; wildlife group 1.

Eleva sandy loam, 6 to 12 percent slopes, eroded (ElC2).—This soil is in irregularly shaped areas on valley side slopes. It has the profile described as representative for the series.

Included with this soil in mapping are a few areas of moderately well drained sandy loams and small areas of Billett soils. Also included are small areas of soils that have a surface layer that is darker colored than the surface layer of this Eleva soil.

This soil has low available water capacity and natural fertility. The hazard of erosion is moderate. The tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to oats, alfalfa, grasses, and a limited amount of corn. Control of erosion and maintenance of organic-matter content are good management practices. Capability unit IIIe–7; woodland group 3; wildlife group 1.

Eleva sandy loam, 12 to 20 percent slopes, eroded (ElD2).—This soil is in irregularly shaped areas on valley side slopes. It has a profile similar to the one described as representative for the series, but depth to bedrock is less.

Included with this soil in mapping are small areas of Boone and Hixton soils. Also included are a few areas of soils that have a dark-colored surface layer and areas of severely eroded soils.

This soil has a low available water capacity. The hazard of erosion is severe. The tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to grasses, alfalfa, and pine tree plantations. Most areas are in pasture. Control of erosion and maintenance of organic-matter content are good management practices. Capability unit IVe–7; woodland group 3; wildlife group 1.

Eleva sandy loam, 20 to 30 percent slopes, eroded (ElE2).—This soil is in irregularly shaped areas on the sides of ridges and valleys. It has a profile similar to the one described as representative for the series, but the surface layer is thinner and generally darker, and depth to bedrock is less.

Included with this soil in mapping are small areas of Boone, Hixton, and Gale soils.

This soil has low available water capacity and natural fertility. The hazard of erosion is severe. The tilth and organic-matter content of the surface layer have been adversely affected by erosion.

Most of this soil is in pasture. This soil is suited to red and white pines. Control of erosion and maintenance of organic-matter content are good management practices. Capability unit VIe–7; woodland group 3; wildlife group 1.

Eleva-Boone complex, 20 to 45 percent slopes (EnF).—The soils in this complex are on sandstone ridges and valley slopes throughout the county. Eleva soils are in concave areas in or near drainageways or on the lower end of valleys, and Boone soils are on convex knobs or on the steeper parts of valleys (fig. 12). These soils are so intermingled and are in areas so small that it is impractical to map them separately. Eleva soils make up about 60 percent of the acreage, and Boone soils make up 40 percent. The native vegetation was hardwoods, mainly black oak.

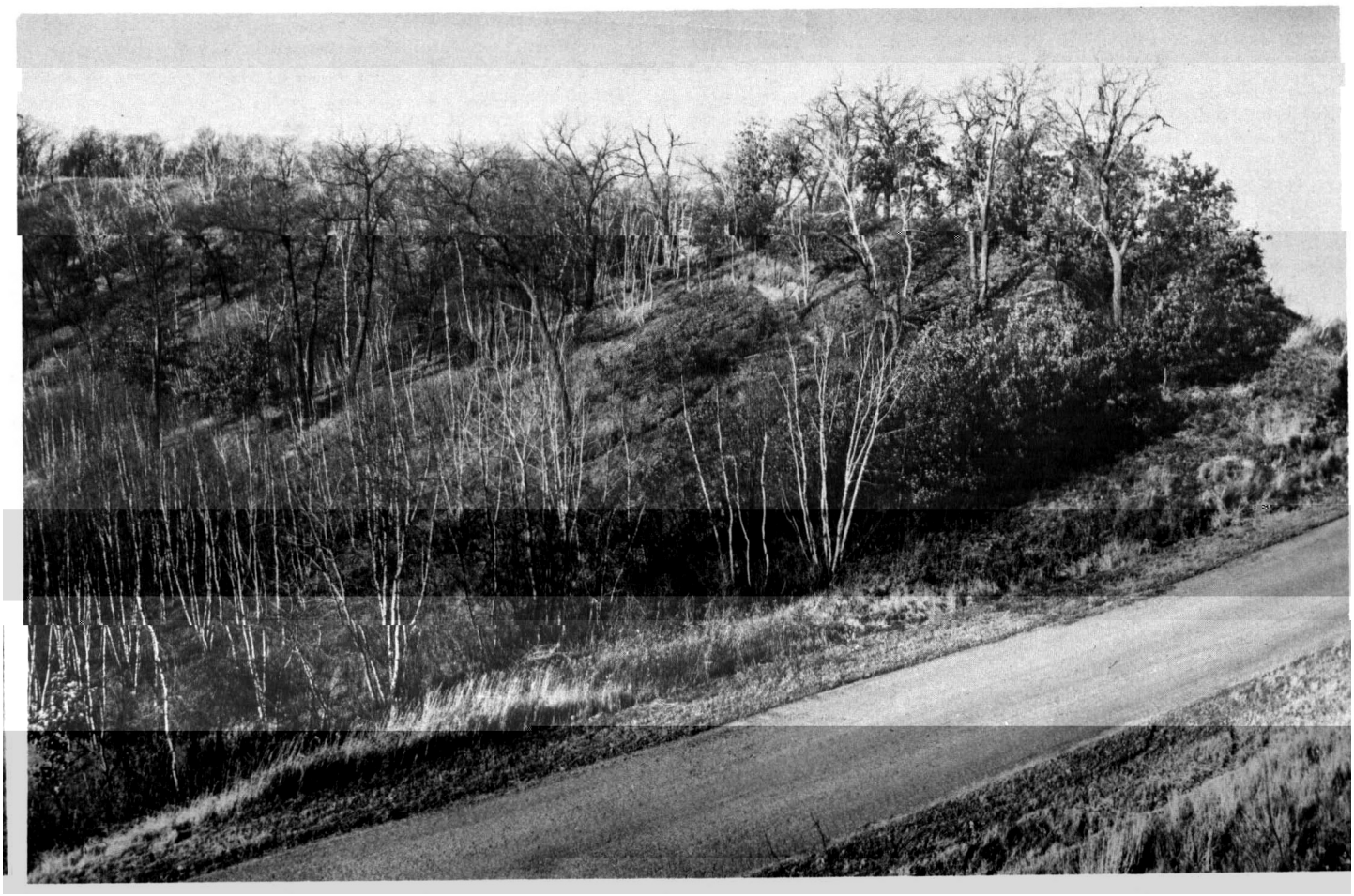
Eleva soils have a profile similar to the one described as representative for the Eleva series, but they are not so deep, the surface layer is very dark grayish-brown sandy loam or loam 1 to 4 inches thick, and the subsoil has less clay and a structure that is not so well defined. Boone soils have a profile similar to the one described as representative for the Boone series.

Included with this complex in mapping are a few small areas of Urne, Hixton, Gale, and Seaton soils. These areas are generally less than 2 acres in size.

The available water capacity is low in Eleva soils and very low in Boone soils. The hazard of erosion is severe.

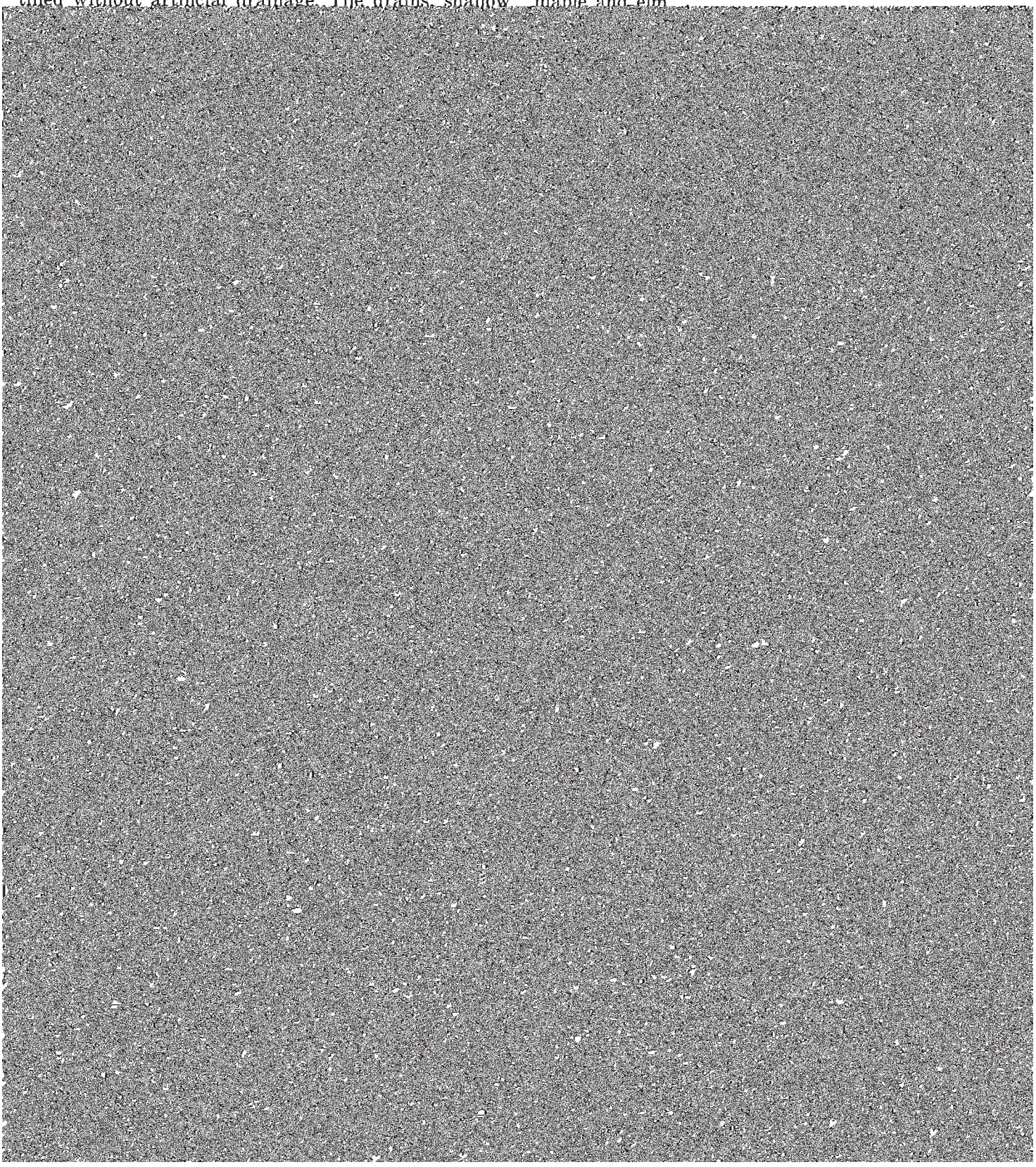
The soils in this complex are too steep to be cultivated. They are well suited to use as wildlife habitat. They are also well suited to red and white pine trees of medium to good quality and to hardwoods of poor quality, such as red and black oaks. Trees do not grow so well in areas where slopes face south and southwest as they do in areas where slopes face in other directions. Capability unit VIIe–7; woodland group 3; wildlife group 3.

Eleva-Gale complex, 20 to 30 percent slopes (EoE).—The soils in this complex are on sandstone ridges and on the sides of valleys throughout the county. Eleva soils have convex slopes, and Gale soils have concave slopes and generally are near drainageways. These soils are so intermingled and the areas are so



when runoff is received during thaws in spring and heavy rains. Where the ground water level has been lowered by stream entrenchment, these soils can be tilled without artificial drainage. Tile drains, shallow

that is underlain by loose sand at a depth of between 3 and 4 feet. The native vegetation was wetland prairie grasses, tall shrubs, and a few trees, such as silver maple and elm.



soil is in a large, ancient drainageway, about 600 acres in size, near the lower end of Tamarack Valley.

Included with this soil in mapping are a few small areas of poorly drained Kato soils and of a soil that has a surface layer of moderately well drained fine sandy loam. Also included are a few small areas of Ettrick soils.

Permeability is moderately slow. This soil has a seasonally perched water table, and it is wet early in spring and during rainy periods. Areas along streams are subject to flooding. The hazard of streambank erosion is severe in cultivated and pastured areas. Good tilth and structure are difficult to maintain, especially where tillage extends into the clayey subsoil. In these areas the soil is sticky when wet and hard when dry. Therefore, tillage must be done when the soil has the proper moisture content.

Most areas of this soil are used for corn. This soil is well suited to row crops where drainage is adequate. Capability unit IIw–1; woodland group 7; wildlife group 5b.

Fayette Series

The Fayette series consists of gently sloping to steep, well-drained soils on uplands. These soils formed in deep silty loess that is underlain at a depth of more than 60 inches by limestone or sandstone bedrock. The native vegetation was mixed hardwoods, mainly red and white oaks.

In a representative profile the plow layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer is brown, platy silt loam about 5 inches thick. The subsoil is a friable layer about 30 inches thick. It is dark yellowish-brown silt loam in the upper part, brown heavy silt loam and silty clay loam in the middle part, and dark yellowish-brown heavy silt loam in the lower part. It is underlain by dark yellowish-brown silt loam.

Permeability is moderate. Available water capacity and natural fertility are high. The subsoil is medium to strongly acid.

Most of the gently sloping to moderately steep areas of these soils are used for corn, oats, and alfalfa.

structure; coatings of light brownish-gray (10YR 6/2) silt particles on ped faces and few, thin, continuous, dark-brown (10YR 4/3) clay films; firm; few roots; strongly acid; clear, smooth boundary.

B3—30 to 43 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; weak, coarse, subangular blocky structure that parts to massive; iron stems 1/8 to 1/2 inch in diameter; friable; medium acid; clear, smooth boundary.

C—43 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; massive; medium acid.

The solum ranges from 36 to 55 inches in thickness. The loess is 5 to 15 feet thick.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) and has a dry value of more than 5 and a chroma of more than 3. In uncultivated areas the A horizon is very dark brown (10YR 2/2) or very dark gray (10YR 3/1) and ranges from 2 to 4 inches in thickness. The A horizon commonly is medium acid or slightly acid, but it is neutral in limed areas. The lower part of the Bt horizon is silty clay loam that has a hue of 10YR, a value of 4, and a chroma of 3 or 4.

Fayette soils are adjacent to La Farge, Gale, and Seaton soils. The lower part of the B horizon of Fayette soils formed in silty loess, and that of the La Farge and Gale soils typically formed in loamy residuum from sandstone. They have more clay in the Bt horizon than Seaton soils.

Fayette silt loam, 2 to 6 percent slopes (FaB).—This soil is in irregularly shaped areas on ridgetops. It has a profile similar to the one described as representative for the series, but the surface layer is slightly darker.

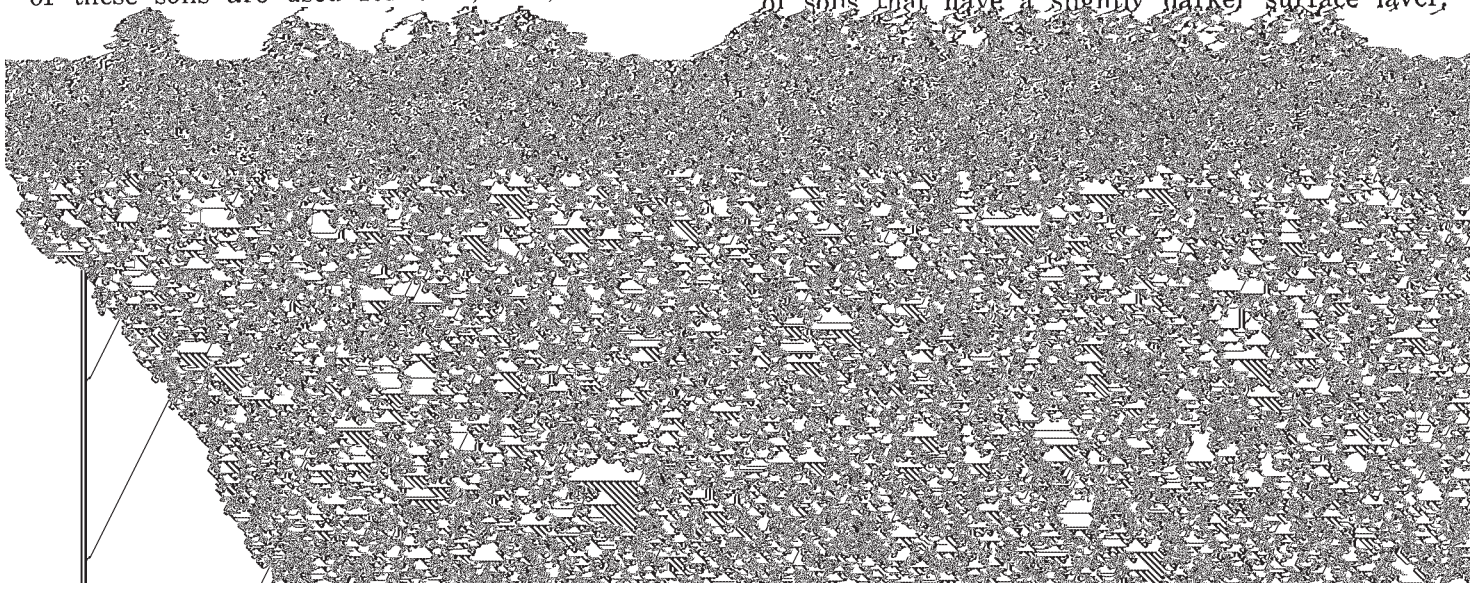
Included with this soil in mapping are a few small areas of well-drained La Farge and Gale soils. Also included are a few areas of soils that have slopes of less than 2 percent.

The hazard of erosion is slight.

This soil is well suited to corn, oats, and alfalfa. It commonly is used for corn. Capability unit IIe–1; woodland group 1; wildlife group 1.

Fayette silt loam, 6 to 12 percent slopes (FaC).—This soil is in irregularly shaped areas on ridgetops. It has the profile described as representative for the series.

Included with this soil in mapping are a few small areas of La Farge, Hixton, and Gale soils. Also included are small areas of soils that are less sloping or more sloping than this Fayette soil and a few areas of soils that have a slightly darker surface layer,



of tilth are good management practices. Capability unit IIIe–1; woodland group 1; wildlife group 1.

Fayette silt loam, 12 to 20 percent slopes (FaD).—This soil is in uniformly shaped areas on side slopes of uplands. It has a profile similar to the one described as representative for the series, but the surface layer is thinner and darker.

Included with this soil in mapping are a few small areas of Gale, La Farge, and Seaton soils. Also included are a few areas of silty soils that are underlain at a depth of about 60 inches by sand.

The hazard of water erosion is severe.

Most of this soil is in woodland and pasture. This soil is well suited to grasses and alfalfa. Control of erosion is a good management practice. Capability unit IVe–1; woodland group 1; wildlife group 1.

Fayette silt loam, 12 to 20 percent slopes, eroded (FaD2).—This soil is in uniformly shaped areas on side slopes on uplands. In areas where this soil is cultivated, some material from the subsoil is mixed with that in the plow layer.

Included with this soil in mapping are small areas of La Farge, Gale, and Seaton soils and a few areas of silty soils that are underlain at a depth of 60 inches by sand. Also included are small areas of soils that have a dark surface layer and small areas of soils that are less sloping or more sloping than this Fayette soil.

The hazard of water erosion is severe. Tilth and organic matter content of the surface layer have been

The hazard of water erosion is severe.

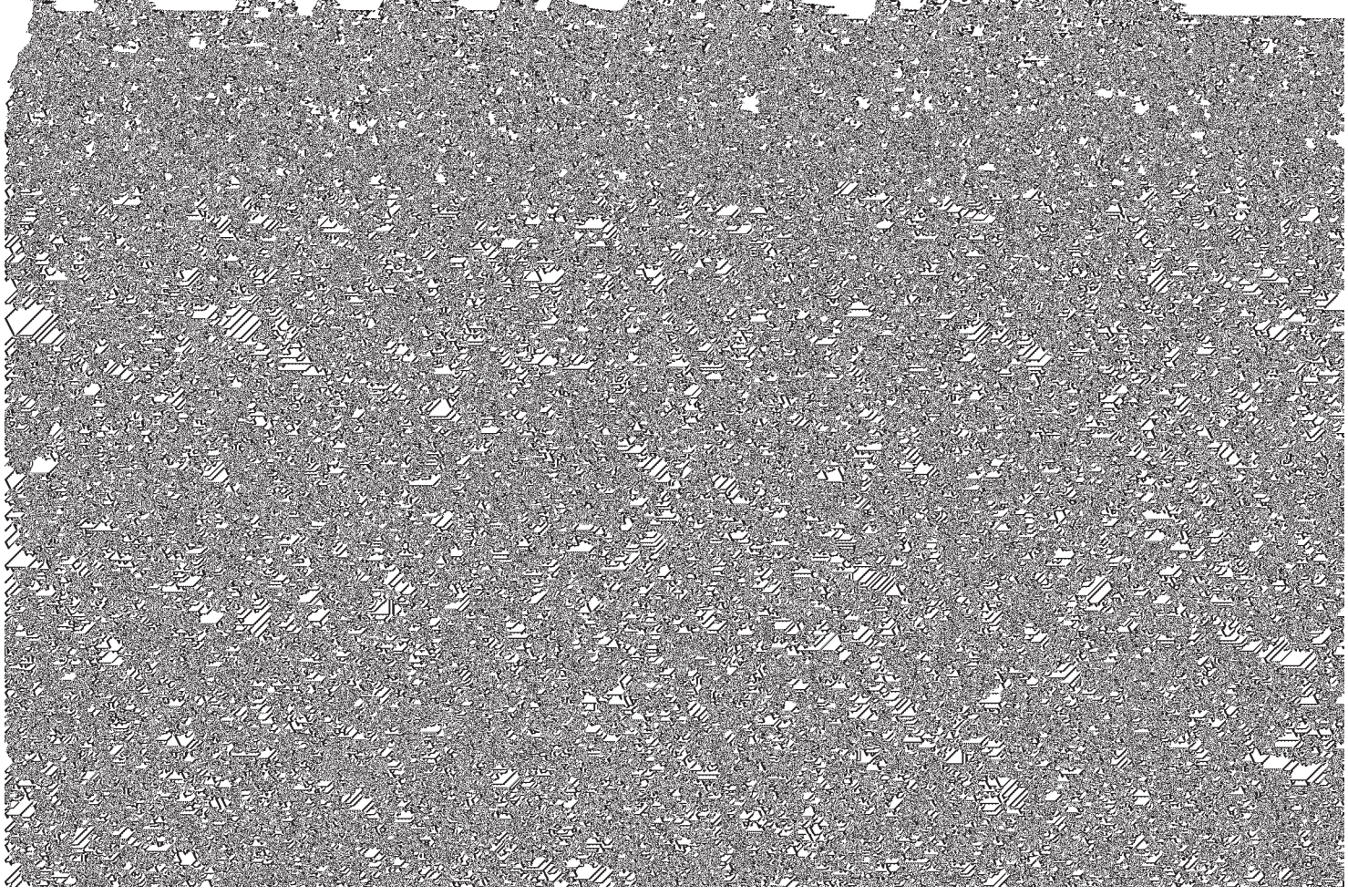
Most of this soil is in woodland and pasture. This soil is well suited to these uses. Trees do not grow so well in areas where slopes face south and southwest as they do in areas where slopes face in other directions. Capability unit VIe–1; woodland group 1; wildlife group 1.

Gale Series

The Gale series consists of gently sloping to steep, well-drained soils on uplands. These soils formed mainly in silty loess underlain by cemented sandstone. In many places this sandstone occurs as massive cliffs along valleys or as high knobs and narrow ridges on uplands. The native vegetation was hardwoods, mainly oaks.

In a representative profile the plow layer is dark grayish-brown silt loam 8 inches thick. The subsurface layer is platy silt loam 4 inches thick. The subsoil is about 22 inches thick. It is brown heavy silt loam in the upper part and brown loam in the lower part. Beneath the subsoil is yellowish-brown loamy sand that is underlain by cemented sandstone.

Available water capacity generally is moderate, but it is low where these soils are shallow phases. Natural fertility is medium. Permeability is moderate. The subsoil is medium to strongly acid



La Farge soils. They have a B horizon in which the lower part formed in loamy sandstone residuum, and the B horizon of Fayette soils does not.

Gale silt loam, 2 to 6 percent slopes (GaB).—This soil is in irregularly shaped areas on ridgetops. It has a profile similar to the one described as representative of the series, but the silt mantle is slightly thicker and the surface layer is darker.

Included with this soil in mapping are small areas

Available water capacity is moderate. The hazard of water erosion is severe.

This soil is well suited to grasses and alfalfa. Control of erosion is a good management practice. Capability unit IVe–2; woodland group 1; wildlife group 1.

Gale silt loam, 12 to 20 percent slopes, eroded (GaD2).—This soil is in uniformly shaped areas on side slopes on uplands. In areas where this soil is cultivated, some material from the subsoil is mixed with that in the

Gale silt loam, shallow, 20 to 30 percent slopes, eroded (GlE2).—This soil is in nearly uniformly shaped areas on a few narrow ridgetops, knolls, and side slopes. It has a profile similar to the one described as representative of the series, but the surface layer is thinner, the subsoil has more sand and less clay, and depth to sandstone is less. Sandstone fragments occur on the surface.

Included with this soil in mapping are a few small areas of Urne and Eleva soils and small areas of soils that are more sloping than this Gale soil. Also included are some areas of uneroded soils.

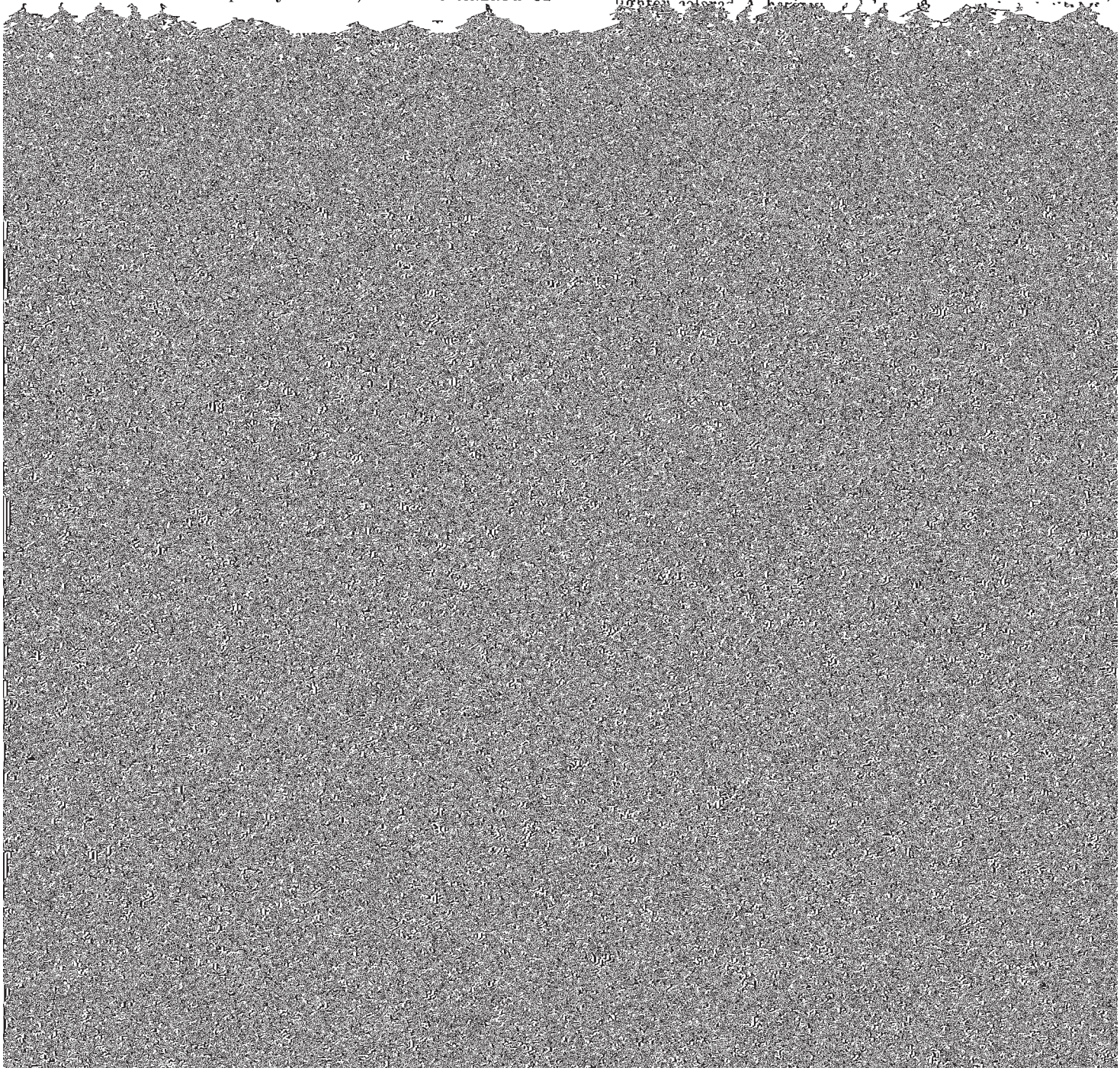
Available water capacity is low, and the hazard of

medium sand that has dark-brown (7.5YR 4/4) bands of sandy loam and loamy sand 1/4 to 1 inch thick; single grained; loose; few roots; strongly acid.

The solum ranges from 20 to 38 inches in thickness. In most areas the loose, sandy substratum has a few bands that range from 1/4 inch to 4 inches in thickness.

The A horizon is dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2) and ranges from 6 to 10 inches in thickness. The Bt horizon ranges from loamy fine sand to light fine sandy loam. In many places the clay bridging in the Bt horizon is so sparse that a hand lens is needed to detect it.

Gotham soils are on stream and river terraces adjacent to Sparta, Dickinson, and Billett soils. They have a thinner,



small areas of soils that are less sloping or more sloping than this Gotham soil.

Available water capacity and natural fertility are low. The hazard of soil blowing is severe. Percolation of effluent from septic tanks is restricted in areas where thick, loamy bands are in the loose sand.

This soil is suited to grasses and to a limited amount of row crops. Control of erosion and maintenance of fertility are good management practices. Capability unit IVs–3; woodland group 3; wildlife group 3.

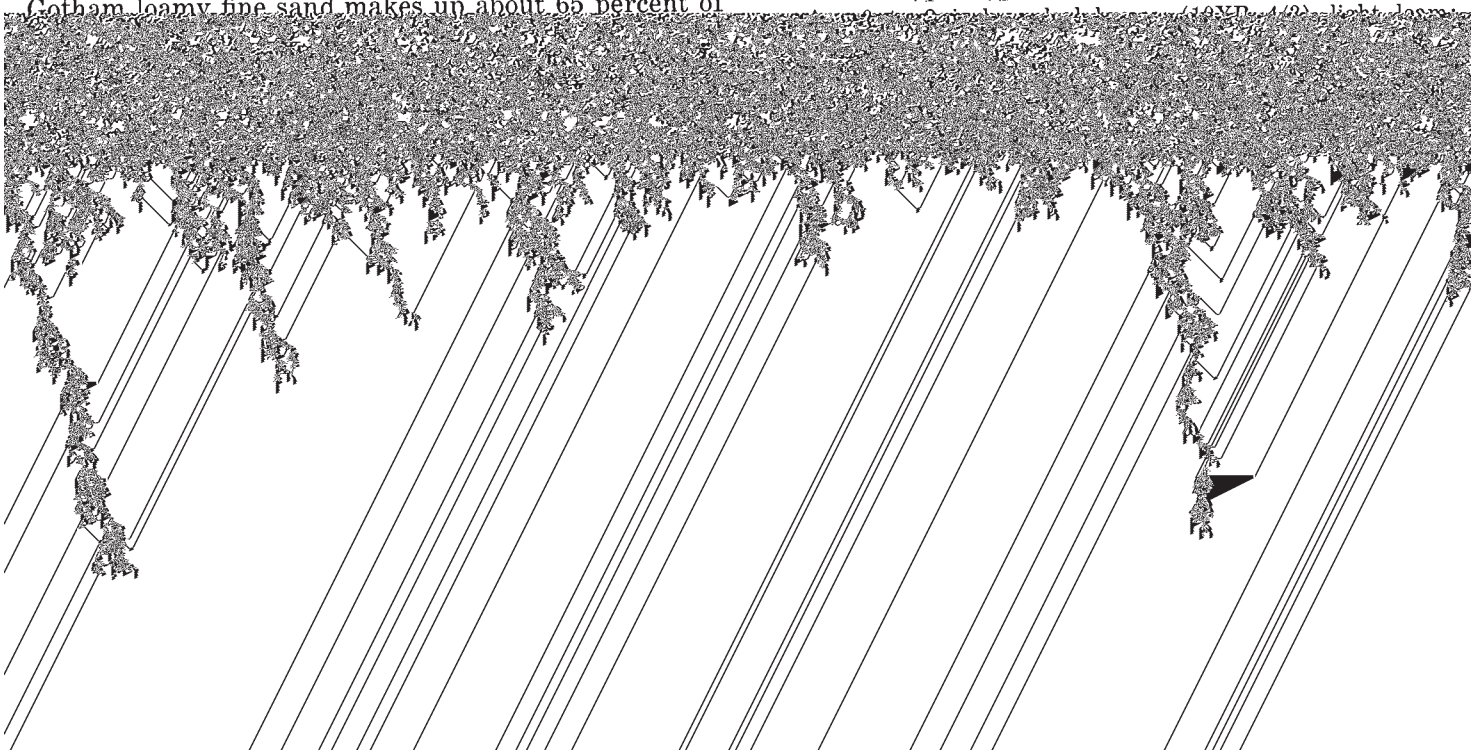
Gotham loamy fine sand, 12 to 20 percent slopes, eroded (GoD2).—This soil is in irregularly shaped areas on stream and river terraces. It has a profile similar to the one described as representative of the series, but the surface layer is thinner and lighter colored.

Included with this soil in mapping are a few areas of sand and dark loamy sand underlain by loose sand that has loamy bands. Also included are a few small areas of soils that are less sloping or more sloping than this Gotham soil.

Available water capacity and natural fertility are low. The hazard of soil blowing is severe. The tilth and organic-matter content of the surface layer have been adversely affected by erosion. Percolation of effluent from septic tanks is restricted where thick, loamy bands are in the loose sand.

This soil is suited to grasses and to pine tree plantations. Control of erosion is a good management practice. Capability unit VIe–9; woodland group 3; wildlife group 3.

Gotham-Sparta loamy fine sands, 12 to 20 percent slopes (GpD).—The soils in this complex are on sand dunes on terraces of the Mississippi River. These dunes range from 4 to 60 acres in size and are generally oriented in a northwesterly-southeasterly direction. These soils are so intermingled and the areas are so small that it is impractical to map them separately. Gotham loamy fine sand makes up about 65 percent of



ranges from black to yellowish brown. Many areas of Gullied land are on valley slopes below areas of Stony and rocky land in Dodge Township.

Erecting gully control structures, fencing out livestock, and establishing a plant cover help to control gully erosion.

If the areas of Gullied land are properly managed, they are well suited to use as wildlife habitat and watershed management areas. Capability unit VIIIs–10; woodland group 13; wildlife group 1.

Hixton Series

The Hixton series consists of gently sloping to very steep, well-drained soils on ridges on uplands and on valley slopes. These soils formed in loamy sandstone residuum underlain by cemented sandstone bedrock. In many places this sandstone occurs as rock outcrop along valleys or on narrow ridges on uplands. The native vegetation was hardwoods, mainly red and black oaks.

In a representative profile the surface layer is dark-brown loam about 8 inches thick. The subsurface layer is brown loam 2 inches thick. The subsoil is about 24 inches thick. It is dark yellowish-brown and brown loam in the upper part and brown sandy loam in the lower part. Beneath the subsoil is brown sand residuum that is underlain at a depth of about 40 inches by brownish-yellow cemented sandstone.

Permeability is moderate. Available water capacity is moderate, and natural fertility is medium. The subsoil is mainly strongly acid to very strongly acid.

Most areas of moderately steep to very steep Hixton soils are used for pasture or as woodland. Most of the gently sloping to sloping areas are in corn, oats, and alfalfa.

Representative profile of Hixton loam, 2 to 6 percent slopes, eroded, in a pasture, 150 yards south of a town road in NW¼SW¼ sec. 30, T. 23 N., R. 7 W.:

Hixton soils are adjacent to Boone, Eleva, Gale, and La Farge soils. Hixton soils have more silt and clay than Boone and Eleva soils. They lack the moderately deep mantle of silt of La Farge and Gale soils. They are underlain by a more acid, coarser grained sandstone bedrock than La

maintenance of tilth are good management practices. Capability unit IVe–2; woodland group 1; wildlife group 1.

Hixton loam, 20 to 30 percent slopes, eroded (HnF2)

water is slow where the water table is high. Available water capacity is very high. Natural fertility is medium to moderately low.

Most areas of these soils are used for wetland pasture, as wildlife habitat, and for water storage basins. Where adequately drained, these soils are suited to corn.

Representative profile of Houghton muck, in a sedge meadow along the Black River, in the NE¼NE¼ sec. 9, T. 18 N., R. 8 W.:

Oa1—0 to 8 inches, very dark brown (10YR 2/2) sapric material that has many, coarse and medium, very dark brown (10YR 2/2) herbaceous fibers; 25 percent fiber content, 10 percent when rubbed; weak, fine, granular structure; neutral; abrupt, smooth boundary.

Oa2—8 to 14 inches, black (10YR 2/1) sapric material that has many, fine and medium, grayish-brown (10YR 5/2) herbaceous fibers; 45 percent fiber content, 10 percent when rubbed; fine, granular structure; neutral; abrupt, smooth boundary.

Oa3—14 to 28 inches, very dark brown (10YR 2/2) sapric material that has many, coarse to fine, dark-brown (7.5YR 3/2) and brown (7.5YR 4/4) herbaceous fibers; 50 percent fiber content, less than 10 per-

is in uniformly shaped areas on bottom lands and flood plains.

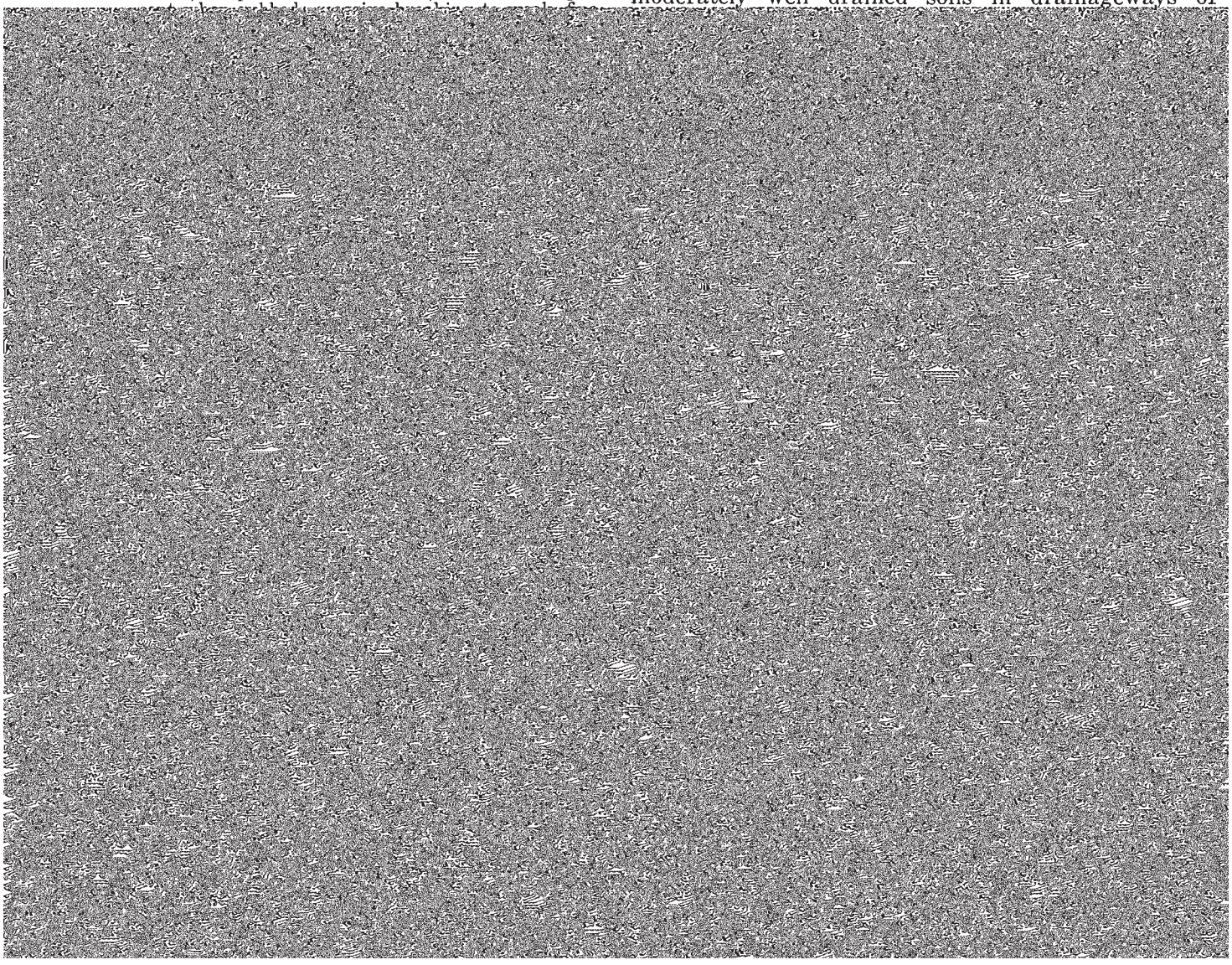
Included with this soil in mapping are a few small areas of a soil that has slopes of more than 2 percent.

The hazard of erosion along streams and the hazard of soil blowing in cultivated areas are moderate to severe. Subsidence of cultivated areas is also a hazard. The hazard of flooding is severe in some areas. The water table is near the surface in most areas, but in a few areas it has been lowered by stream entrenchment or other natural conditions.

Most areas of this soil are used for wetland pasture, as wildlife habitat, and for water storage basins. If this soil is drained, it is suited to corn. Control of erosion along streambanks or in cultivated areas and maintenance of fertility are good management practices. Capability unit IIIw–9; woodland group 10; wildlife group 6.

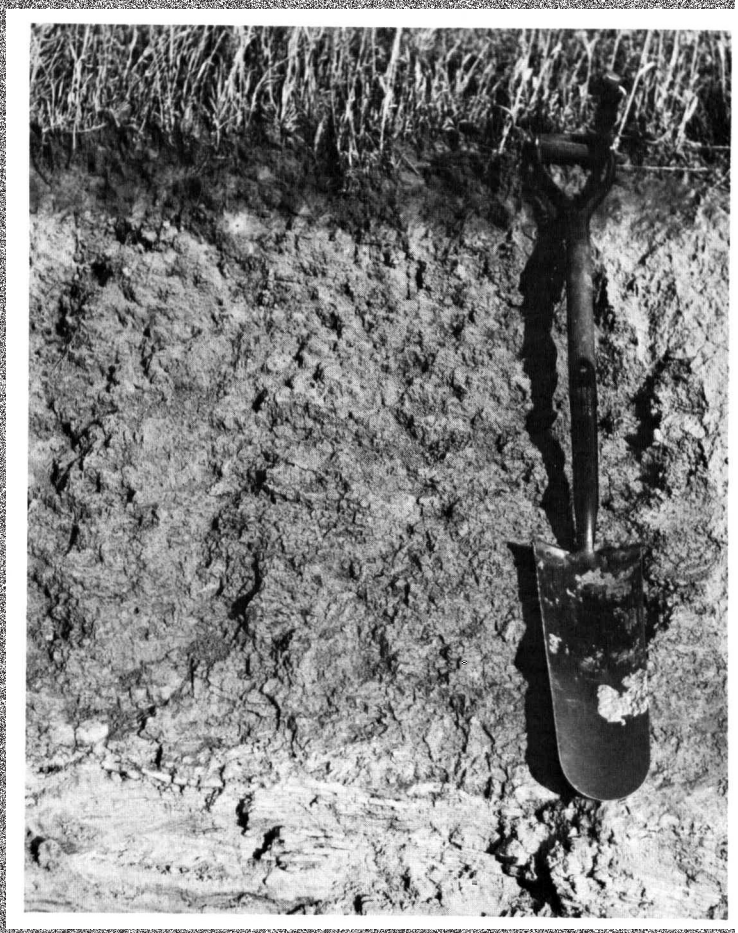
Huntsville Series

The Huntsville series consists of well drained and moderately well drained soils in drainageways of



but in places it is neutral in reaction, especially in limed areas. The A horizon is very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) in the upper part. The

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, subangular blocky structure; very friable; many roots; medium acid;



the subsoil is light olive-brown sandy loam and loamy sand that has bands of dark grayish-brown loam. The underlying material is soft, shaly, olive-brown sandstone.

Permeability is moderate. Available water capacity is moderate, and natural fertility is medium. Potassium is available for plant growth where glauconite decomposes in the subsoil and substratum. Residuum in the subsoil and substratum is unstable when wet.

Most gently sloping to moderately steep areas of these soils are in corn, oats, and alfalfa. Steep and very steep areas are in pasture or woodland.

Representative profile of La Farge silt loam in an area of La Farge silt loam, 6 to 12 percent slopes, eroded, in a wooded area on a narrow ridgetop along County Highway W in the NE¼SW¼ sec. 13, T. 22 N., R. 7 W.:

O1—1/2 inch, hardwood leaf litter.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable; neutral; clear, wavy boundary.
A2—2 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure that parts to very weak, fine, subangular blocky; very friable; slightly acid; clear, wavy boundary.
B1—9 to 15 inches, dark-brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.
B2t—15 to 29 inches, dark-brown (10YR 4/3) silty clay loam; moderate, coarse, subangular blocky structure that parts to fine, subangular blocky; firm; many, continuous to nearly continuous, dark-brown clay films on ped faces; bleached silt coatings on ped faces along dominant cleavage planes; strongly acid; clear, smooth boundary.
IIB3—29 to 34 inches, yellowish-brown (10YR 5/4) loam; moderate, coarse, subangular blocky structure that parts to moderate and weak, fine, subangular blocky; friable; strongly acid; clear, smooth boundary.
IIC—34 to 36 inches, light olive-brown (2.5Y 5/4) sandy loam and loamy sand; thin layers of dark grayish-brown (2.5Y 4/2) loam; massive; residuum has grains of green glauconite; slightly acid; clear, smooth boundary.
IIR—36 to 60 inches, olive-brown (2.5Y 4/4) soft, fine-grained, sandstone bedrock that has many thin layers of olive-gray (5Y 4/2) glauconite; slightly acid.

The silty loess mantle ranges from 18 to 35 inches in thickness. The solum ranges from 20 to 40 inches in thickness. Glauconite content of the residuum varies. In areas that have small amounts of glauconite, the residuum is more sandy and more siliceous than in others.

Where present, the Ap horizon ranges from dark brown (10YR 3/3) to dark grayish brown (10YR 4/2). It has a dry value of more than 5 and a dry chroma of more than 3. The Ap horizon commonly is medium acid or slightly acid, but it is neutral in some limed areas. The A1 horizon is very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2) and ranges from 2 to 6 inches in thickness. It is neutral or slightly acid in reaction.

La Farge soils are adjacent to Hixton, Eleva, Gale, and Fayette soils. They have more glauconite than Hixton soils. They are more siliceous than Eleva soils. They have more glauconite than Gale soils. They have more glauconite and are more siliceous than Fayette soils.

La Farge silt loam, 2 to 6 percent slopes, eroded (LfC2).—This soil is in irregularly shaped areas on ridgetops. It has a profile similar to the one described as representative for the series, but in areas where this soil is cultivated, some material from the subsoil is mixed with that in the plow layer.

Included with this soil in mapping are a few small areas of Norden, Gale, and Fayette soils. Also included are a few areas of soils that have a dark-colored surface layer and small areas of soils that are less sloping or more sloping than this La Farge soil.

Available water capacity is moderate, and natural fertility is medium. The hazard of erosion is slight, but in most areas the tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is well suited to corn, oats, and alfalfa. It commonly is used for corn. Control of erosion and maintenance of tilth are good management practices. Capability unit IIe–2; woodland group 1; wildlife group 1.

La Farge silt loam, 6 to 12 percent slopes, eroded (LfC2).—This soil is in irregularly shaped areas on ridgetops. It has a profile similar to the one described as representative for the series, but in areas where this soil is cultivated, the surface layer is lighter in color.

Included with this soil in mapping are a few areas of severely eroded soils and a few small areas of Norden, Gale, and Fayette soils. Also included are small areas of soils that are less sloping or more sloping than this La Farge soil.

Available water capacity is moderate, and natural fertility is medium. The hazard of erosion is moderate. In most areas of this soil, the tilth and organic-matter content of the surface layer have been adversely affected by erosion.

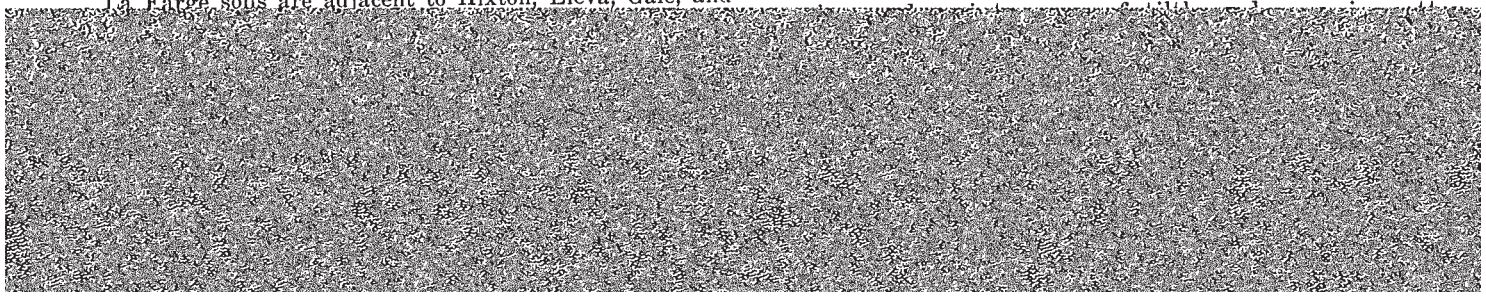
This soil is suited to oats, alfalfa, and limited amounts of corn. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit IIIe–2; woodland group 1; wildlife group 1.

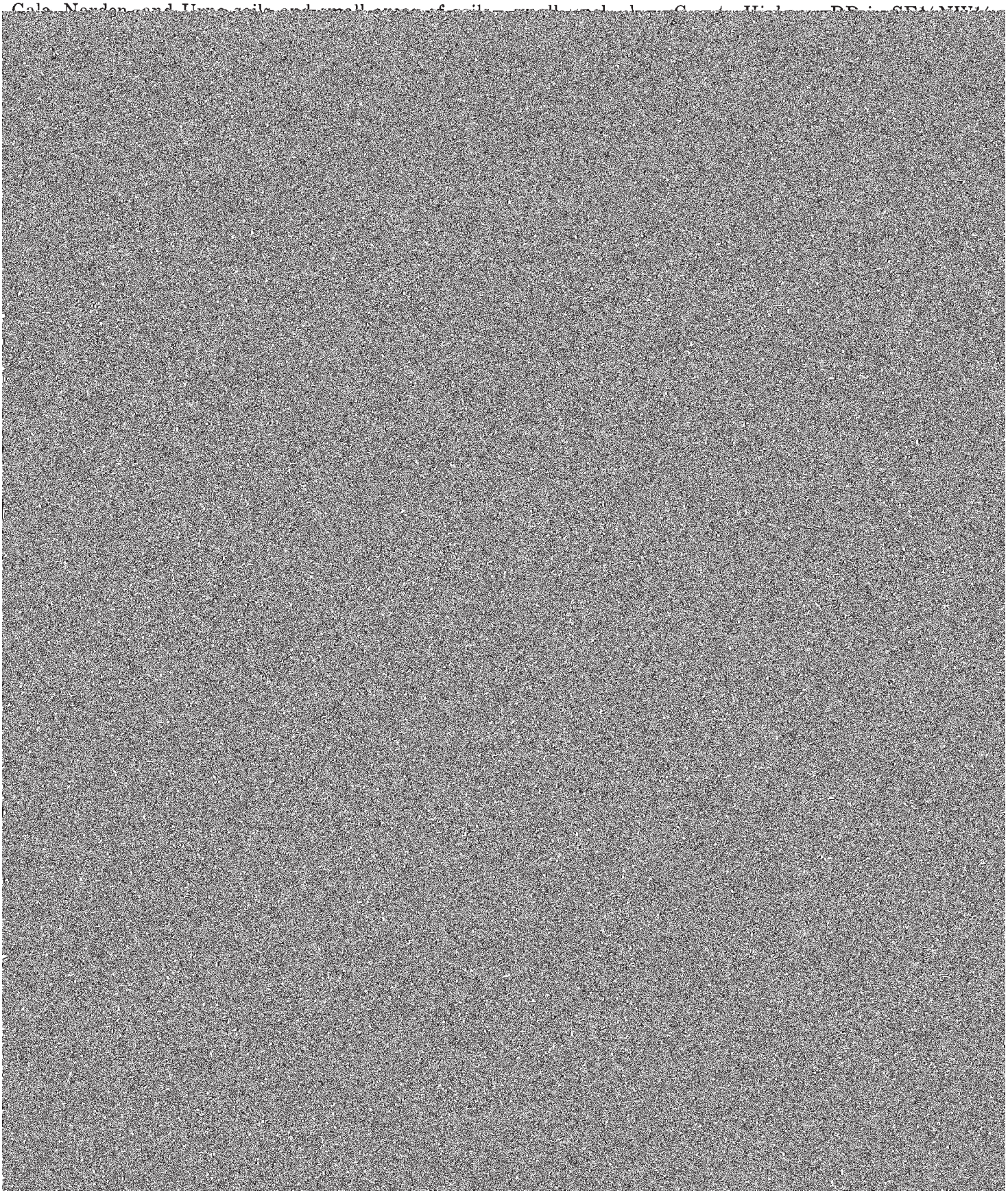
La Farge silt loam, 12 to 20 percent slopes, eroded (LfD2).—This soil is in irregularly shaped areas on the sides of ridges. In areas where this soil is cultivated, some material from the subsoil is mixed with that in the plow layer.

Included with this soil in mapping, in wooded areas, are soils that have a profile similar to the one described as representative for the series. Also included are a few areas of severely eroded soils; a few small areas of Norden, Gale, and Fayette soils; and small areas of soils that are less sloping or more sloping than this La Farge soil.

The hazard of erosion is severe. Available water capacity is moderate, and natural fertility is medium. In most areas the tilth and organic-matter content of the surface layer have been adversely affected by erosion.

Most areas of this soil are in crops or pasture. This soil is well suited to alfalfa and grasses. Control of





Much of this land type is in pasture, trees, or brush. Loamy alluvial land is well suited to pasture, woodland, and wildlife habitat. Flooding is common, but some crops are grown where the danger of flooding is less. Row crops can be grown if fertility and soil structure are maintained and if this soil is protected from flooding. Tillage is delayed during wet seasons. Susceptibility to flooding and erosion of streambanks are major concerns. Capability unit IIw–13; woodland group 1; wildlife group 7.

Loamy Terrace Escarpments

Loamy terrace escarpments (Lx) consists of moderately steep to very steep, long, narrow fronts of terraces near rivers and streams (fig. 14). The native vegetation was white pine and hardwoods in some areas and prairie grasses and a few trees in other areas.

Loamy terrace escarpments formed where rivers and streams cut through loamy and silty soils that have been altered by erosion and decomposition. In most areas Loamy terrace escarpments are underlain at a depth of 20 to 50 inches by loose sand. In a few areas they are underlain by sandstone bedrock or deep silty loess.

Included with this land type in mapping are small areas of Downs, Fayette, Whitehall, Trempealeau, and Meridian soils.

The hazard of erosion, especially gully erosion, is very severe. Gully erosion is more common where areas of Loamy terrace escarpments are heavily pastured or where they have been disturbed.

Most areas are in pasture and trees. This land type is suited to grasses, alfalfa, and trees. Control of erosion is the major need. Capability unit VIIe–1; woodland group 1; wildlife group 1.

Marsh

Marsh (Ma) is nearly level and is on flood plains of rivers and streams, mainly along Beaver Creek and the Trempealeau, Black, and Mississippi Rivers. This land type consists of shallow ponds underlain by loamy and organic sediment.

Included with this land type in mapping are small areas of moderately well drained and somewhat poorly drained Sparta soils that have a mottled subsoil, some-

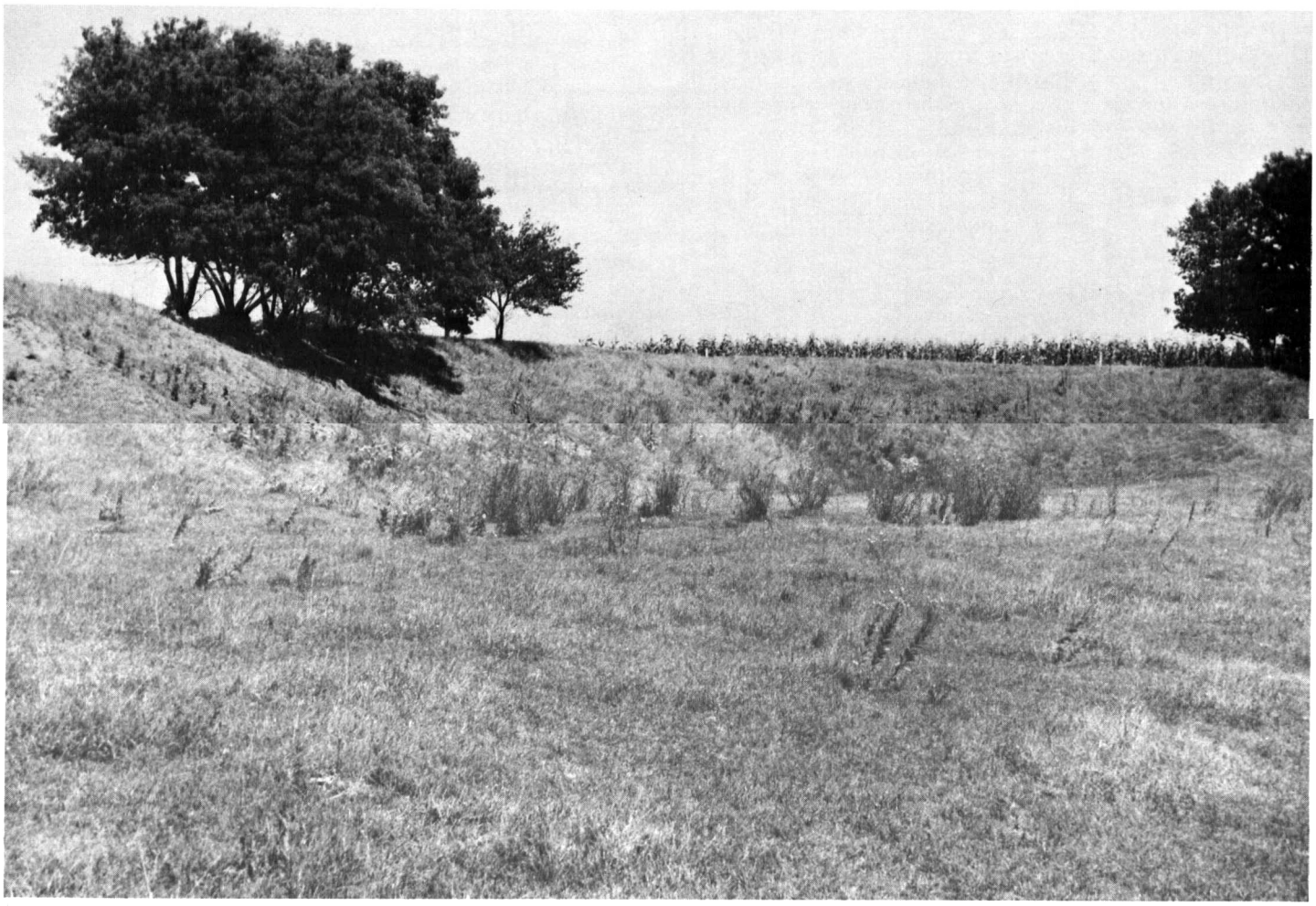


Figure 14.—An area of Loamy terrace escarpments along the Trempealeau River south of Independence.

what poorly drained Morocco soils, poorly drained Houghton and Palms soils, and areas of Loamy alluvial land and Sandy alluvial land.

Most areas of Marsh are subject to stream and river overflow in wet seasons. Runoff is slow.

Most marsh areas are in rushes, sedges, cattails, and other marsh plants. These areas are suited to wildlife habitat and to water storage areas. Capability unit VIIIw–15; woodland group 10; wildlife group 5b.

Meridian Series

The Meridian series consists of nearly level to sloping, well-drained soils on stream and river terraces. The soils formed in loamy sediment underlain by loose sand. The native vegetation was oak savanna.

In a representative profile the plow layer is very dark grayish-brown loam about 9 inches thick. The subsoil is about 21 inches thick. It is dark-brown loam in the upper part, dark yellowish-brown heavy loam in the middle part, and dark yellowish-brown sandy loam in the lower part. It is underlain by dark yellowish-terial from the A2 horizon is mixed with that in the Ap horizon. The Bt horizon ranges from light loam to heavy loam.

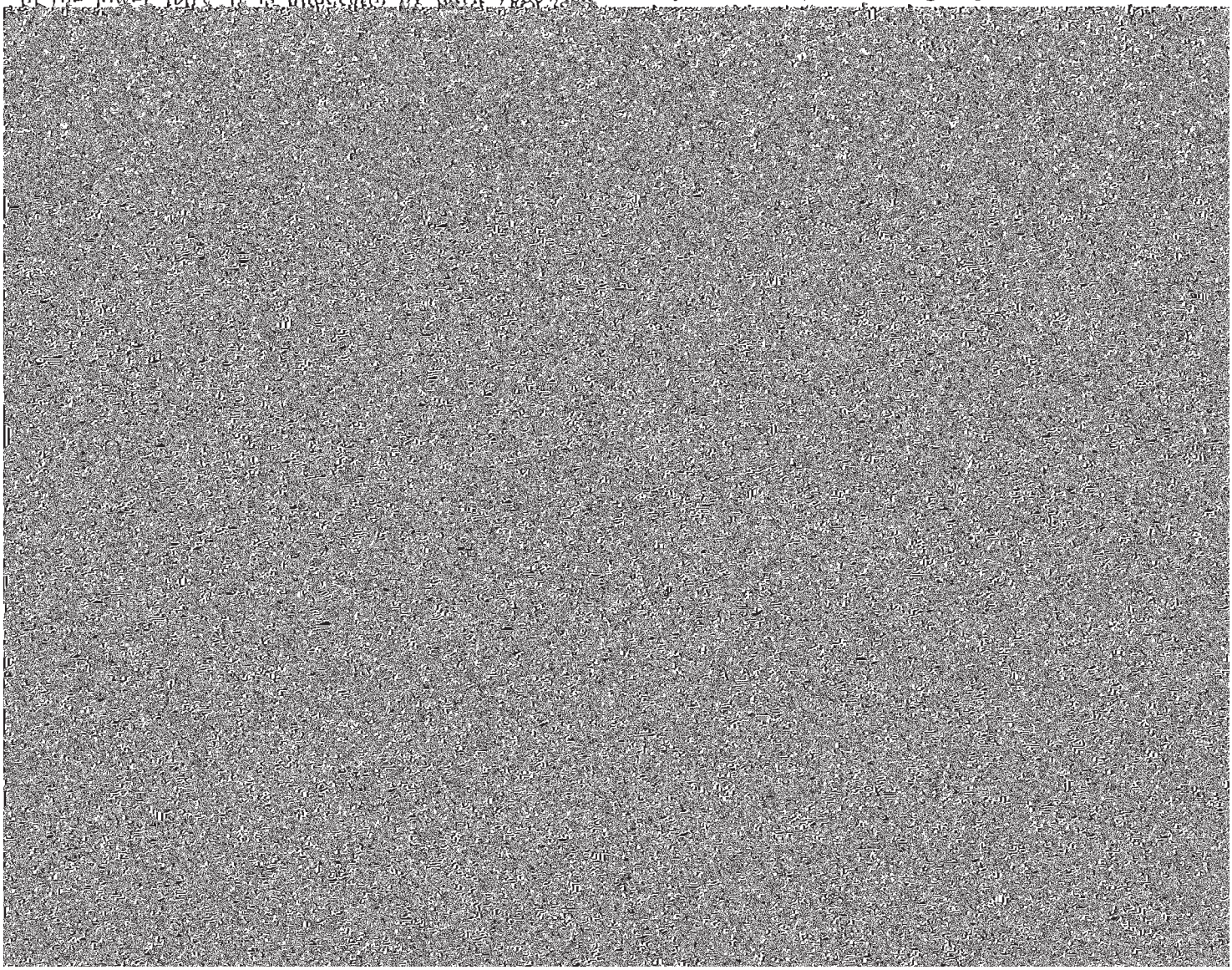
Meridian soils are adjacent to Eleva, Pillot, and Billett soils. They have slightly more silt and clay than Eleva soils and are underlain by loose sand rather than sandstone. Meridian soils lack the moderately deep silt mantle that is characteristic of Pillot soils. They contain more silt and clay than Billett soils.

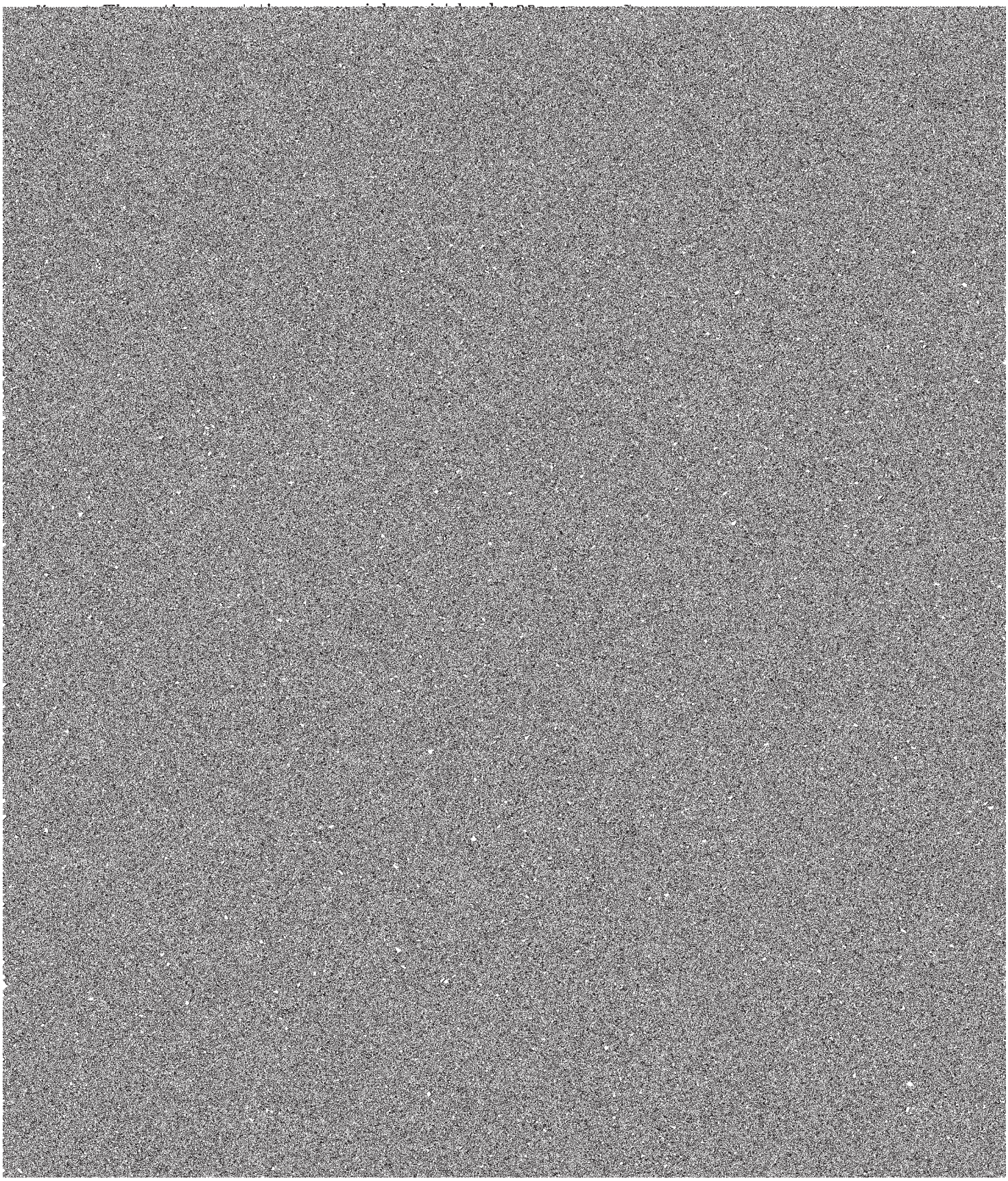
Meridian loam, 0 to 2 percent slopes (MdA).—This soil is in irregularly shaped areas on stream and river terraces. It has the profile described as representative of the series.

Included with this soil in mapping are a few areas of moderately well drained loams and a few areas of loams that have loamy bands in the substratum. Also included are a few areas of soils that have a darker surface layer than this soil and a few small areas of Billett and Eleva soils.

Available water capacity is moderate, and natural fertility is medium.

This soil is suited to corn and other row crops. Capability unit IIs–1; woodland group 12; wildlife group 1.



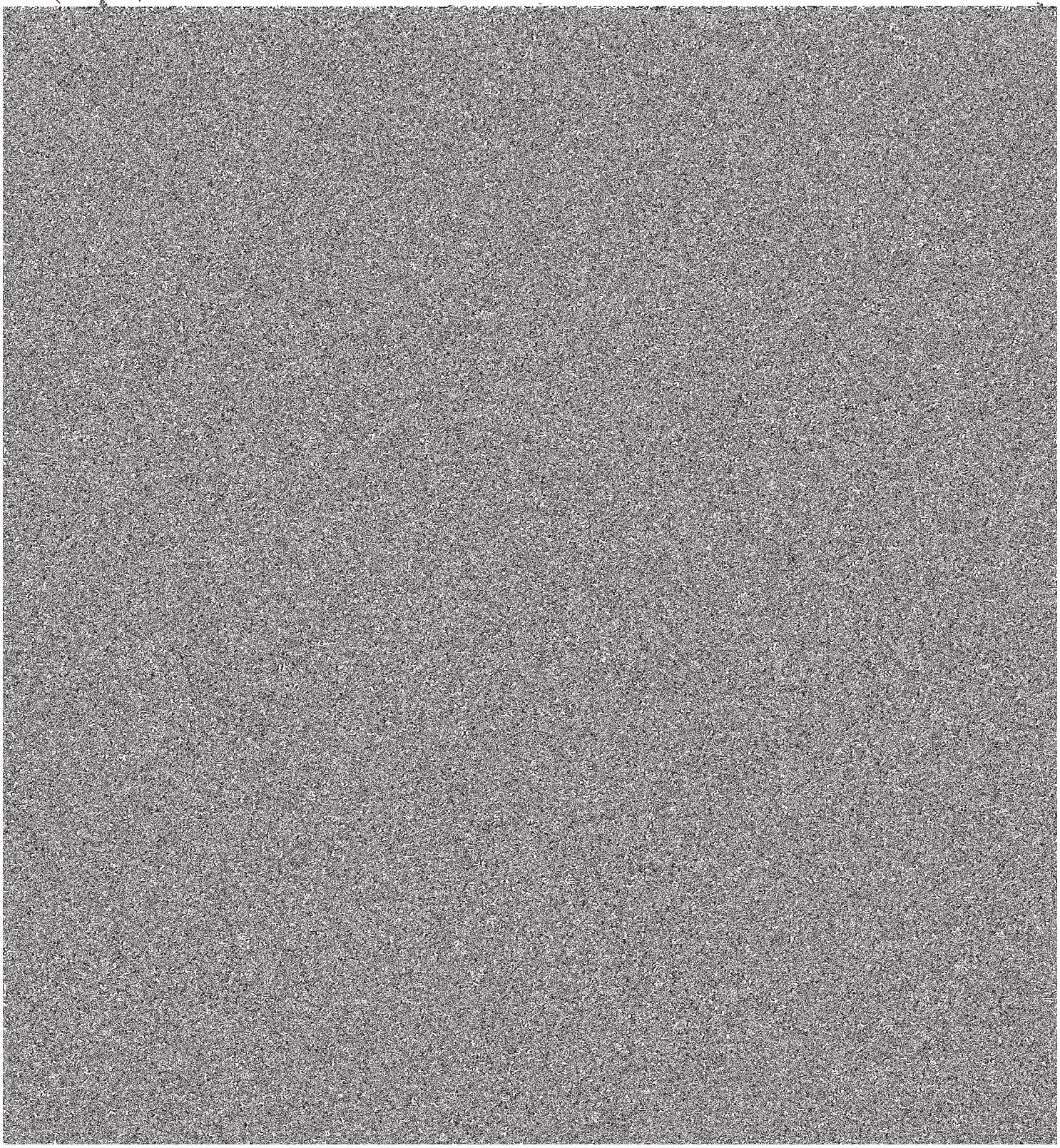


The solum ranges from 36 to 48 inches in thickness. The silty sediment ranges from 4 to 12 feet in thickness.

The A horizon ranges from very dark grayish brown (10YR 3/2) in the upper part to very dark brown (10YR 2/2) in the lower part. The A horizon ranges from 10 to 20

fine, subangular blocky and to fine, granular; friable; medium acid; clear, smooth boundary.

IIB2t—12 to 20 inches, dark-brown (7.5YR 4/4) loam; medium, subangular blocky structure that parts to fine, subangular blocky; few, thin, patchy clay films



soils that have a dark-colored surface layer and a few areas of loams that have a loamy substratum. Also included are a few small areas of Gale and La Farge soils and a few small areas of soils that are less sloping or more sloping than this Norden soil.

[illegible] is moderate, and natural

most places the tilth and organic-matter content of the surface layer have been adversely affected by erosion. The sandstone residuum is unstable when wet. Where this soil is cultivated intensively, small gullies form in drainageways.

This soil is suited to alfalfa and grasses. Control of

coarse, subangular blocky; friable; common roots; slightly acid; clear, smooth boundary.

Oa3—10 to 14 inches, black (N 2/0) sapric material; strong, very coarse, platy structure that parts to moderate, thick, platy; thin, patchy organic films on horizontal ped faces; friable; common roots; slightly acid; clear, smooth boundary.

Oa4—14 to 19 inches, black (10YR 2/1) sapric material that has common, fine to coarse, dark reddish-brown (5YR 3/4) herbaceous fibers; 20 percent fiber content reduced to less than 5 percent by rubbing; strong, very coarse, platy structure; slightly acid; abrupt, smooth boundary.

Oa5—19 to 32 inches, black (N 2/0) sapric material; many, fine to coarse, dark yellowish-brown (10YR 4/4) herbaceous fibers; 25 percent fiber content reduced to less than 5 percent by rubbing; massive; slightly acid; abrupt, smooth boundary.

IIC—32 to 60 inches, black (N 2/0) silt loam; massive; mildly alkaline.

The solum ranges from 24 to 52 inches in thickness.

The Oa1 horizon is granular sapric material that ranges from 4 to 12 inches in thickness and is black (N 2/0), dark gray (7.5YR to 10YR 3/1), dark brown (7.5YR 2/2), or very dark brown (10YR 2/2). It commonly is slightly acid or neutral, but in limed areas it is slightly alkaline or neutral in reaction. The underlying organic layers are black (N 2/0), dark-gray (10YR 3/1), or very dark brown (7.5YR to 10YR 2/2) sapric material. In some areas the Oa4 layer has bands of very dark brown (7.5YR to 10YR 2/2), dark grayish-brown (10YR 4/2), dark yellowish-brown (10YR 4/4), dark reddish-brown (5YR 3/4), or dark-brown (7.5YR 4/4) hemic and fibric materials. Where the water table is lowered somewhat, the Oa4 layer has granular or platy structure or prismatic structure that parts to medium and coarse, subangular blocky. The Oa5 layer is massive sapric material that has a few bands of hemic fibric material and is underlain by stratified sediment of very fine sand, silt, and silty clay.

Palms soils are adjacent to poorly drained Houghton, Wallkill, and Ettrick soils and areas of Wet alluvial land. They formed in thinner deposits of organic matter than Houghton soils. They lack the silty alluvium underlain by deposits of organic matter that is typical of Wallkill soils. They lack the deep silty alluvium that is typical of Ettrick soils. Palms soils lack the stratified, recent alluvium that is typical of Wet alluvial land.

Palms muck (Pa).—This nearly level soil is in uniformly shaped areas on bottom lands and flood plains. It has the profile described as representative for the series.

Included with this soil in mapping are a few small areas of Houghton and Wallkill soils and of Wet alluvial land. Also included are a few areas of soils that are underlain by sand, a few areas of peat, and a few areas that have slopes of slightly more than 2 percent.

The water table is at or near the surface in most areas. In a few areas the water table has been lowered by stream entrenchment or other natural conditions. The hazards of erosion along streams and of soil blowing in cultivated areas are severe. The hazard of subsidence of cultivated tracts is moderate. A few areas of shallow muck that are underlain by loamy sand or sand are not suited to drainage and cultivation.

Most areas of this soil are used for wetland pasture, as wildlife habitat, and for water storage basins. Where drained, this soil is suited to corn. Control of erosion along streambanks and in cultivated areas is a good management practice. Capability unit IIw–8; woodland group 10; wildlife group 6.

Palsgrove Series

The Palsgrove series consists of gently sloping to moderately steep, well-drained soils on the top and sides of ridges. These soils formed mainly in silty loess and clay residuum underlain at a depth of more than 60 inches by limestone bedrock. The most prominent limestone uplands are Oak and Arcadia Ridges in the southern part of the county. The native vegetation was hardwood trees, mainly red and white oaks.

In a representative profile the plow layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer is brown, platy silt loam about 4 inches thick. The subsoil is about 41 inches thick. It is brown silt loam in the upper part, dark yellowish-brown and brown silty clay loam in the middle part, and yellowish-red and dark reddish-brown clay in the lower part. It is underlain by yellowish-red clay residuum weathered from limestone.

Permeability is moderately slow. Available water capacity and natural fertility are high.

Most areas of these soils are in corn, oats, and alfalfa. The underlying dolomitic limestone is quarried and crushed for road fill.

Representative profile of Palsgrove silt loam, 2 to 6 percent slopes, in a plowed field 1,000 feet south of intersection of County Highway G and State Highway 93, 200 feet east of State Highway 93 in SE¼SE¼ sec. 16, T. 20 N., R. 9 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium and fine, granular structure; very friable; many roots; medium acid; abrupt, wavy boundary.

A2—8 to 12 inches, brown (10YR 5/3) silt loam; moderate, thin, platy structure; very friable; many roots; medium acid; clear, wavy boundary.

B1—12 to 19 inches, brown (10YR 4/3) heavy silt loam; moderate, medium and fine, subangular blocky structure; firm; many roots; medium acid; clear, wavy boundary.

B21t—19 to 27 inches, dark yellowish-brown (10YR 4/4) to brown (7.5YR 4/4) light silty clay loam; strong, medium and fine, subangular blocky structure; few, continuous, light yellowish-brown (10YR 6/4) to brown (7.5YR 4/4) clay films on ped faces; firm; common roots; medium acid; abrupt, smooth boundary.

B22t—27 to 38 inches, dark yellowish-brown (10YR 4/4) to brown (7.5YR 4/4) light silty clay loam; strong, coarse, subangular blocky structure; many continuous, dark yellowish-brown (10YR 4/4) and brown (7.5YR 4/4) clay films on ped faces; firm; common roots; few chert fragments of pebble size; medium acid; abrupt, smooth boundary.

IIB23t—38 to 42 inches, dark reddish-brown (5YR 3/4) clay; strong, coarse, angular blocky structure; few, continuous, brown (10YR 4/3) clay films on ped faces; very firm; few roots; few chert fragments of pebble size; medium acid; clear, smooth boundary.

IIB3t—42 to 53 inches, yellowish-red (5YR 5/6) clay; strong, coarse, prismatic structure; thin clay films; very firm; few roots; few chert fragments of pebble size; medium acid; gradual, wavy boundary.

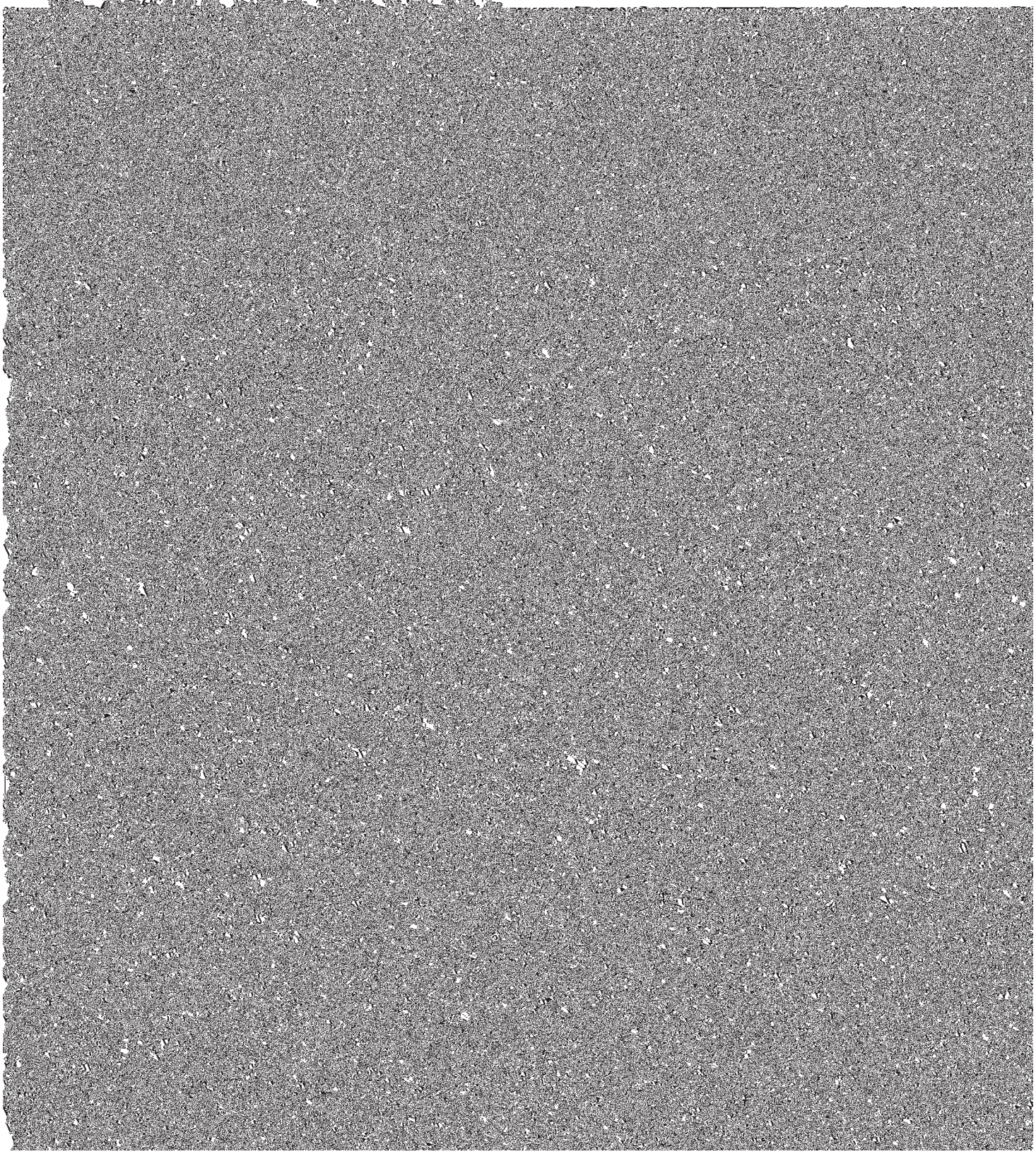
IIC—53 to 60 inches, yellowish-red (5YR 4/6) clay; common, medium, prominent, light-gray (10YR 7/2) mottles; massive; very firm; few roots; few chert fragments of pebble size; medium acid.

The Ap horizon is dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). It has a dry value greater than 5 and a dry chroma greater than 3. In uncultivated areas the A1 horizon is very dark brown (10YR 2/2) or very dark gray (10YR 3/1) and is 3 to 6 inches thick. The silty loess mantle ranges from 30 to 50 inches in thickness. Beneath this mantle is clayey limestone residuum, which is underlain at a depth of 5 to 12 feet by limestone bedrock.

Palsgrove soils are adjacent to Palsgrove soils, clayey subsoil variant, Seaton soils, and Stony and rocky land. Palsgrove soils have a thicker mantle of silt than Palsgrove soils, clayey subsoil variant. They did not form in deep silt

Palsgrove Series, Clayey Subsoil Variant

The Palsgrove series, clayey subsoil variant, consists



4/2). It has a dry value greater than 5 and a dry chroma greater than 3. In uncultivated areas the A1 horizon is very dark brown (10YR 2/2) or very dark gray (10YR 3/1) and ranges from 3 to 5 inches in thickness. The A horizon commonly is neutral, but the Ap horizon ranges from neutral to medium acid. The mantle of silty loess ranges from 15 to 30 inches in thickness. It is underlain by clay residuum that is underlain at a depth of 5 to 12 feet by limestone bedrock.

Palsgrove soils, clayey subsoil variant, are adjacent to Palsgrove, Fayette, and Seaton soils and to areas of Stony and rocky land. Palsgrove soils, clayey subsoil variant, have a thinner silt mantle than Palsgrove soils. They did not form in deep silty loess more than 50 inches thick, as did Fayette and Seaton soils. Palsgrove soils, clayey subsoil variant, are deeper, less variable, and have more silt and clay than Stony and rocky land.

Palsgrove silt loam, clayey subsoil variant, 2 to 6 percent slopes (P1B).—This soil is in irregularly shaped areas on ridgetops of limestone uplands. It has a profile similar to the one described as representative of the series, but the silt mantle is slightly thicker.

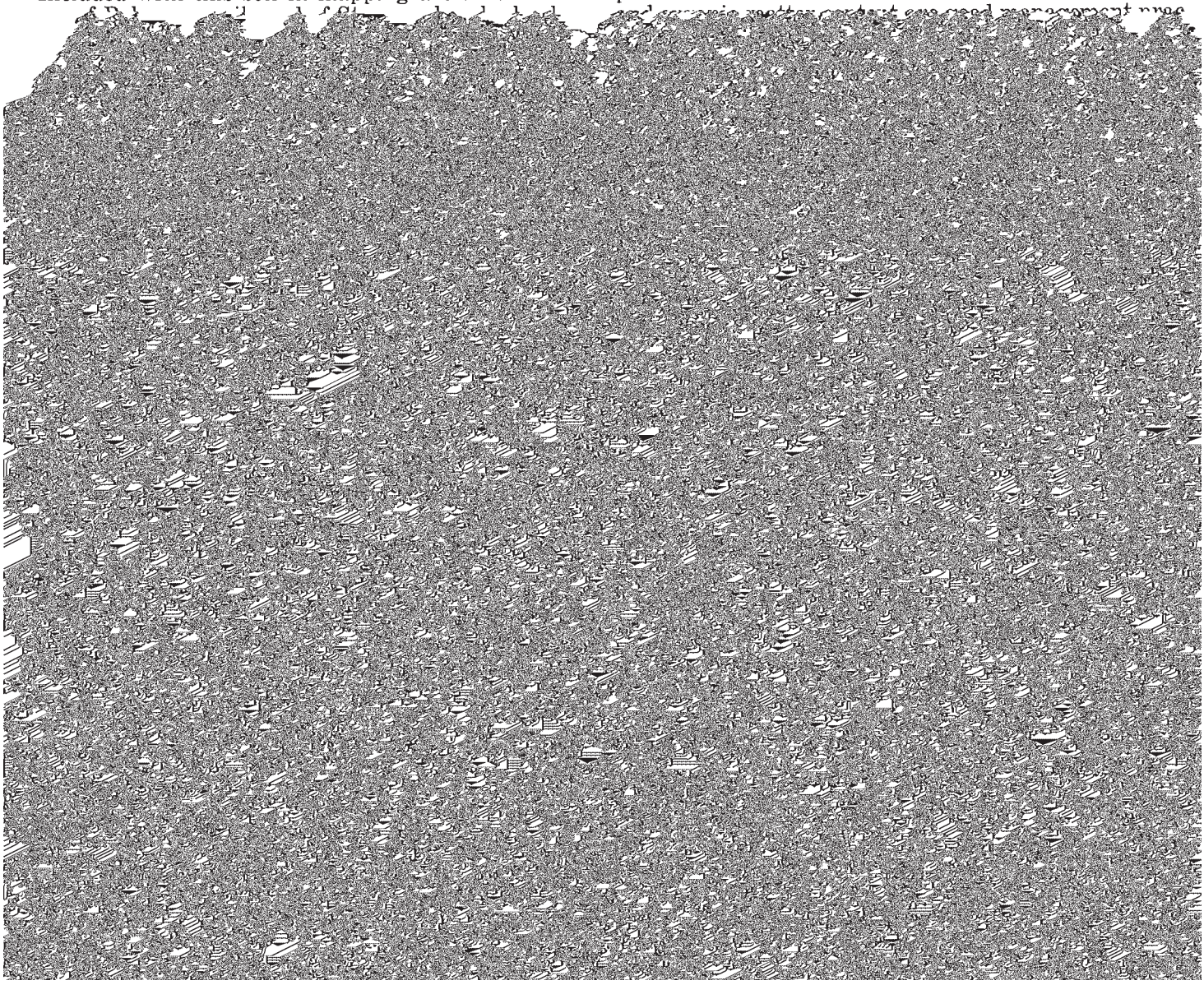
Included with this soil in mapping are a few small

percent slopes, eroded (P1D2).—This soil is in irregularly shaped areas on the sides of limestone ridges. It has a profile similar to the one described as representative of the series, but the surface layer is lighter colored. In some areas where this soil is cultivated, part of the material from the subsoil is mixed with that in the plow layer.

Included with this soil in mapping are a few areas of Palsgrove and Seaton soils. Also included are a few small areas of shallow and moderately deep soils that are underlain by limestone bedrock, and a few small areas of soils that are less sloping or more sloping than this Palsgrove soil, clayey subsoil variant.

The hazard of erosion is severe. In some areas the tilth and organic-matter content of the surface layer have been adversely affected by erosion. Permeability is moderately slow.

Most areas of this soil are in crops and pasture. This soil is suited to grasses and alfalfa for hay and pasture. Control of erosion annd maintenance of tilth



adversely affected by erosion. This soil has poor tilth, and preparing a seedbed is difficult. Permeability is moderately slow.

Most areas of this soil are in crops and pasture. This soil is suited to grasses and alfalfa for pasture. It is also well suited to hardwoods, such as red and white oaks. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit VIe–1; woodland group 1; wildlife group 1.

Pillot Series

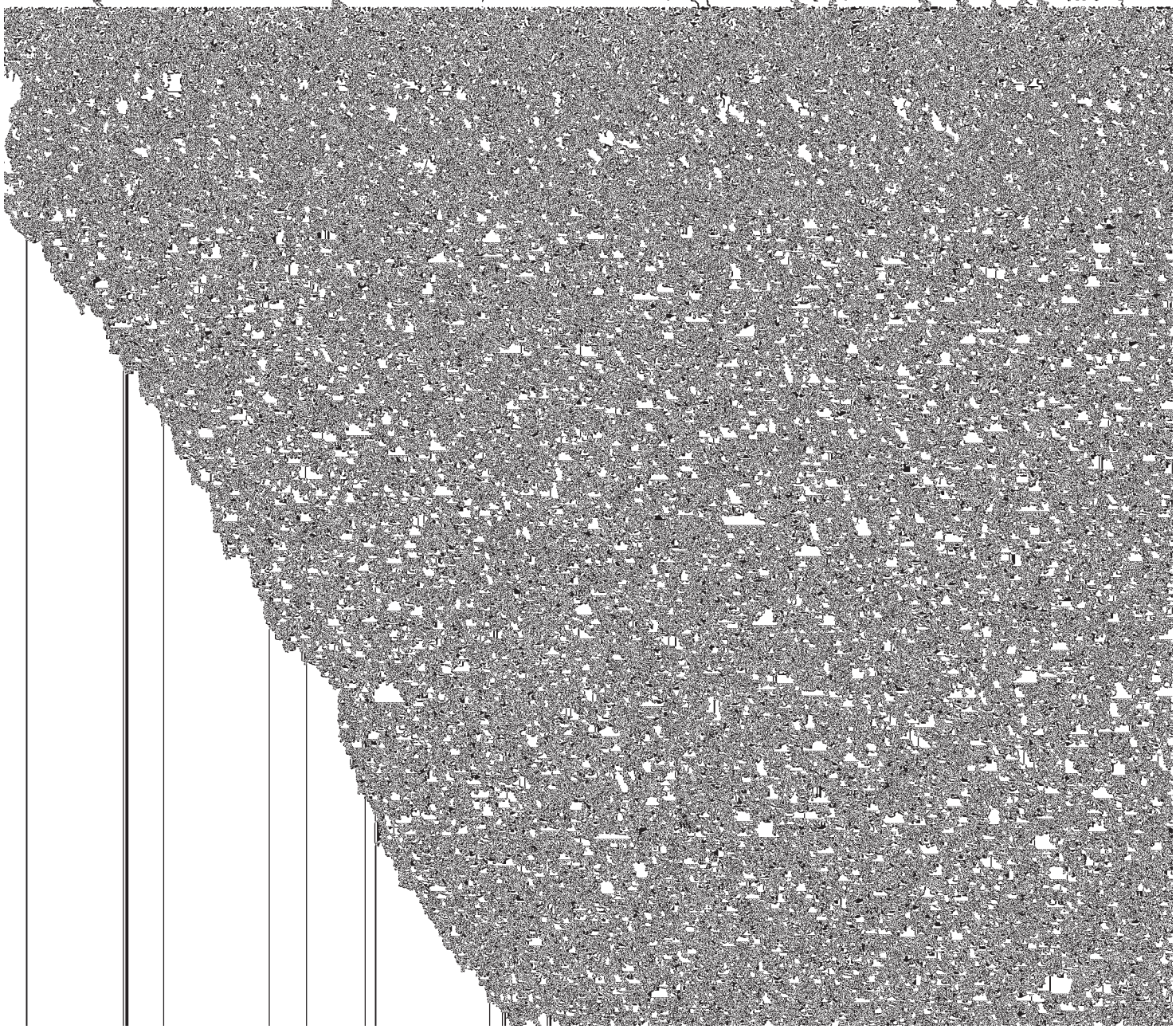
The Pillot series consists of nearly level to sloping, well-drained soils on high stream and river terraces. These soils mainly formed in silty sediment underlain at a depth of about 34 inches by loose sand. The native soil is in irregularly shaped areas on stream and river terraces. It has the profile described as representative for the series.

Included with this soil in mapping are a few areas of moderately well drained silty soils and a few areas of soils that have a lighter colored surface layer than this soil. Also included are a few small areas of Huntsville soils.

Available water capacity is moderate. Permeability is moderate in the silty upper part of this soil and rapid in the sandy lower part.

This soil is suited to row crops, such as corn. Maintenance of tilth and structure is a major concern in areas where this soil is in continuous row crops. Capability unit IIs–1; woodland group 12; wildlife group 4.

Pillot silt loam, 2 to 6 percent slopes (PoB).—This soil is in irregularly shaped areas on stream and river



benches are underlain at a depth of more than 60 inches by loose sand. The native vegetation was oak savanna.

In a representative profile the surface layer is very dark brown and dark-brown silt loam about 12 inches thick. The subsoil is about 48 inches thick. It is brown silt loam in the upper part and dark yellowish-brown silt loam in the lower part. It is underlain by brown silt loam.

Permeability is moderate. Available water capacity is very high. Natural fertility is high. The coarse silty loess in the substratum and in the lower part of the subsoil is unstable when wet.

Most gently sloping to moderately steep areas of these soils are in corn, oats, and alfalfa. The steep areas are in pasture or woodland.

Representative profile of Port Byron silt loam, 2 to 6 percent slopes, in a cornfield on a valley bench 150 yards west of State Highway No. 93 in the SE¼NE¼ sec. 9, T. 24 N., R. 9 W.:

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam; moderate, coarse and medium, subangular blocky structure that parts to weak, medium and fine, granular; very friable; few roots; neutral; abrupt, smooth boundary.

A3—9 to 12 inches, dark-brown (10YR 3/3) silt loam; weak, coarse and medium, subangular blocky structure that parts to weak, medium and fine, granular; very friable; few roots; neutral; clear, wavy boundary.

B21t—12 to 20 inches, brown (10YR 4/3) silt loam; weak, medium and fine, subangular blocky structure; few, thin, patchy, dark-brown clay films on ped faces; very friable; few roots; medium acid; gradual, smooth boundary.

soils that are less or more sloping than this Port Byron soil.

The hazard of erosion is slight on this soil.

Most of this soil is in corn. Maintenance of tilth and structure is a major concern where this soil is used for corn or other row crops year after year. Control of erosion is a good management practice. Capability unit IIe–1; woodland group 12; wildlife group 4.

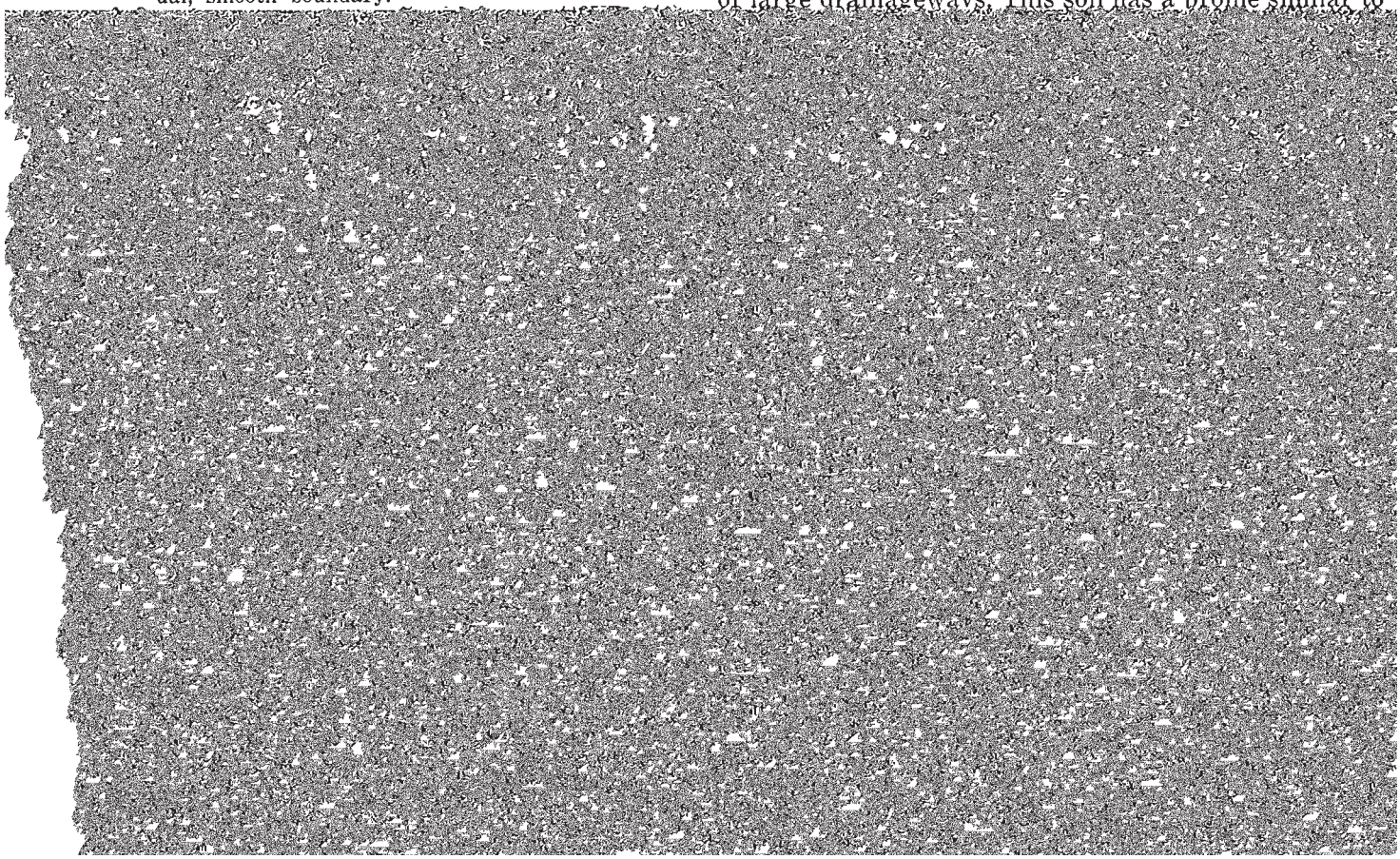
Port Byron silt loam, 6 to 12 percent slopes, eroded (PrC2).—This soil generally is in concave areas on valley benches and side slopes. A few areas are on ridgetops. This soil has a profile similar to the one described as representative of the series, but the surface layer is lighter colored. In small areas where this soil is cultivated, part of the material from the subsoil is generally mixed with that in the plow layer.

Included with this soil in mapping are a few areas of uneroded Port Byron soils and a few small areas of Downs and Seaton soils. Also included are a few small areas of soils that are less sloping or more sloping than this Port Byron soil.

The hazard of erosion is moderate on this soil. The tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to oats, alfalfa, and a limited amount of corn. Control of erosion and maintenance of tilth are good management practices. Capability unit IIIe–1; woodland group 12; wildlife group 4.

Port Byron silt loam, 12 to 20 percent slopes, eroded (PrD2).—This soil is in concave areas on the sides of valleys. These areas commonly are near the upper end of large drainageways. This soil has a profile similar to



coarse, silty subsoil and substratum are unstable where they are wet. In a few areas gullies have formed.

This soil is suited to alfalfa and grasses for pasture. Some areas are in hardwoods, such as red and white oaks. Trees do not grow so well in areas where slopes face south and southwest as they do in areas where slopes face in other directions. Control of erosion is a good management practice. Capability unit VIe–1; woodland group 12; wildlife group 4.

Sandy Alluvial Land

Sandy alluvial land (Sa) is in nearly level areas on the bottom lands of rivers and streams throughout the county. It consists of light-colored and dark-colored, stratified sediment deposited by floodwater. The areas vary in texture, drainage, and reaction, but they are mainly well drained and moderately well drained sand, loamy sand, and sandy loam and range from strongly acid to mildly alkaline.

Included with this land type in mapping are small areas of well-drained Gotham and Sparta soils, mod-

Seaton Series

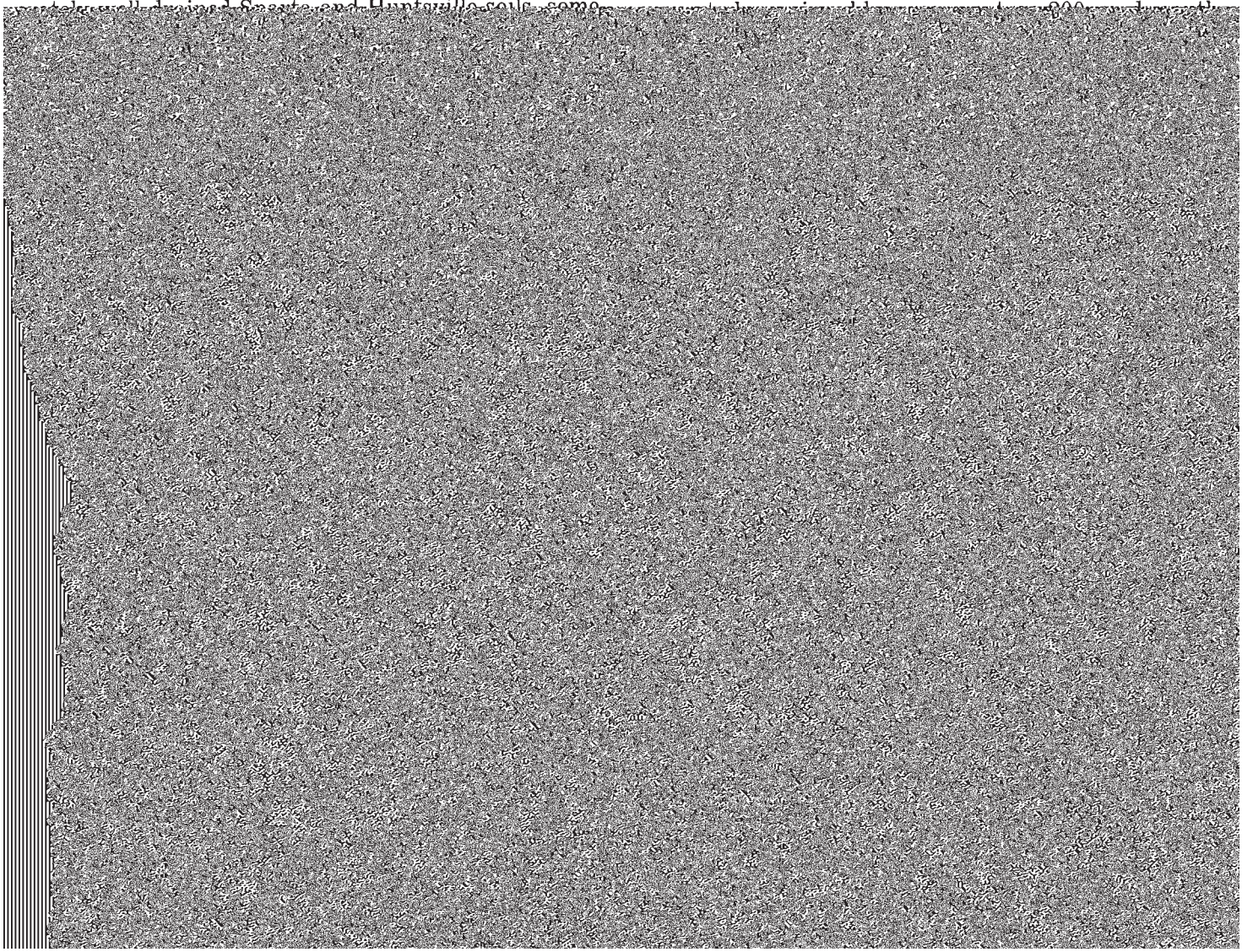
The Seaton series consists of gently sloping to steep, well-drained soils. Most areas of these soils are concave and occur on valley benches and on the sides of valleys. A few areas are on ridges. These soils formed in deep silty loess that is underlain at a depth of more than 60 inches by sandstone bedrock. The native vegetation was hardwoods, mainly red and white oaks.

In a representative profile the plow layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer is platy silt loam 3 inches thick. The subsoil is about 31 inches thick. It is dark yellowish-brown loam in the upper part and brown silt loam in the lower part. It is underlain by brown silt loam.

Permeability is moderate. Available water capacity is very high. Natural fertility is high. The coarse, silty loess in the substratum and the lower part of the subsoil are unstable where they are wet.

Most gently sloping to moderately steep areas of these soils are in corn, oats, and alfalfa. The steep areas are in pasture or woodland.

Representative profile of Seaton silt loam, 6 to 12



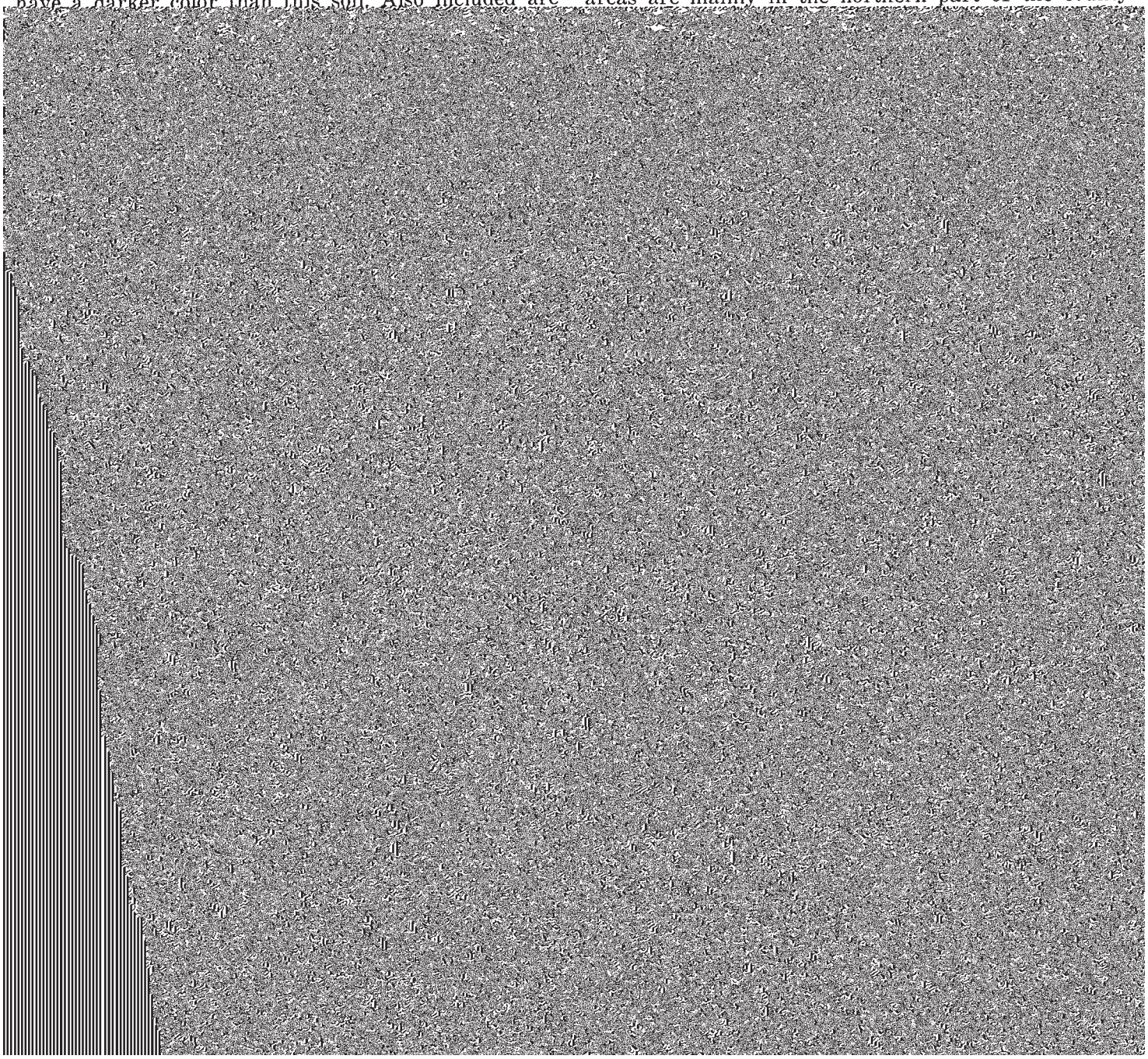
in the subsoil than Port Byron soils. Seaton soils have a subsoil that has coarser silt and less clay than that of Fayette soils, and it lacks the loamy sandstone residuum that is typical of La Farge soils. Seaton soils formed in deep silty loess, but Stony and rocky land formed in shallow loamy soil material over bedrock.

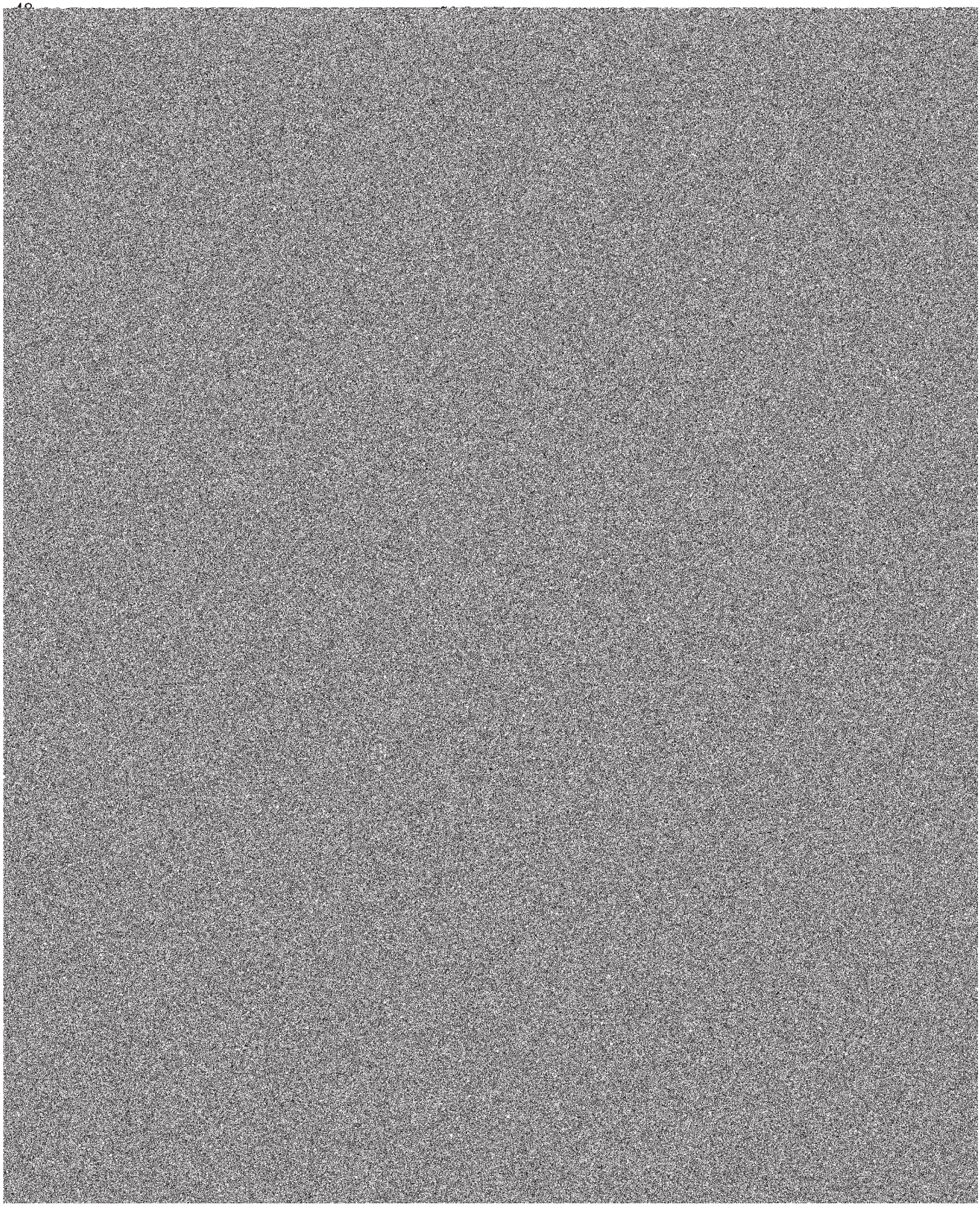
Seaton silt loam, 2 to 6 percent slopes (SeB).—This soil is in concave areas on valley benches and the sides of valleys. A few large areas are on ridgetops. These areas are mainly in the northern part of the county near the Buffalo River. This soil has a profile similar to the one described as representative of the series, but the surface layer is slightly darker.

Included with this soil in mapping are small areas of soils, on or near the bottoms of drainageways, that have a darker color than this soil. Also included are the surface layer have been adversely affected by erosion. The coarse silty subsoil and substratum are unstable where they are wet. Gullies have formed where areas of these soils along natural drainageways have been intensively cultivated.

This soil is suited to oats, alfalfa, and a limited amount of corn. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit IIIe–1; woodland group 1; wildlife group 1.

Seaton silt loam, 12 to 20 percent slopes, eroded (SeD2).—This soil is in concave areas on the sides of valleys. Most areas are at the upper end of drainageways. A few areas are on the sides of ridges. These areas are mainly in the northern part of the county





natural fertility are low. The hazard of soil blowing is severe.

Most areas of these soils are in pasture or pine tree plantations. Some nearly level to gently sloping areas, however, are in soybeans and alfalfa.

Representative profile of Sparta loamy sand, 6 to 12 percent slopes, 250 yards south of U.S. Highway No. 10 in the NW¼SE¼ sec. 13, T. 24 N., R. 9 W.:

A—0 to 16 inches, very dark grayish-brown (10YR 3/2) loamy sand; weak, coarse, subangular blocky structure that parts to weak, fine, subangular blocky; very friable; common roots; strongly acid; gradual, wavy boundary.

B2—16 to 30 inches, brown (7.5YR 4/4) loamy sand; weak, coarse and medium, subangular blocky structure; very friable; strongly acid; gradual, wavy boundary.

C—30 to 60 inches, brownish-yellow (10YR 6/6) medium and coarse sand; single grained; loose; strongly acid.

The solum ranges from 16 to 34 inches in thickness. The A horizon ranges from 10 to 20 inches in thickness and is very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), or dark brown (10YR 3/3). Generally this horizon is strongly acid, but some limed areas are neutral in reaction. Sparta soils near the Mississippi River have more fine and very fine sand than other Sparta soils in the county.

Sparta soils are on sandy terraces adjacent to Gotham, Dickinson, Billett, and Meridian soils. Sparta soils have less silt and fine sand and more medium and coarse sand than Dickinson soils. They have a thicker A horizon and a B horizon that has more coarse sand and slightly less clay than Gotham soils. They have much more sand and less clay and silt than Billett and Meridian soils.

Sparta loamy sand, 0 to 2 percent slopes (SpA).—This soil is in irregularly shaped areas on stream and river terraces. It has a profile similar to the one described as representative of the series, but the surface layer is thinner. Also, in most places the surface layer is darker. In areas near the Mississippi River, this soil has more fine and very fine sand.

Included with this soil in mapping are a few small areas of Gotham and Dickinson soils. Also included are a few areas of loamy sands that have a dark-colored surface layer that ranges from 20 to 36 inches in thickness.

Available water capacity and natural fertility are low. The hazard of soil blowing is severe. In places irrigation is feasible on large areas of this soil.

Most areas of this soil are cultivated, but some large areas are in pine trees. This soil is suited to grasses, alfalfa, and pine tree plantations. In some areas, this soil is well suited to corn, lima beans, potatoes, and other specialty crops where irrigation is possible. Control of erosion and maintenance of fertility and organic-matter content are good management practices. Capability unit IVs–3; woodland group 4; wildlife group 3.

Sparta loamy sand, 2 to 6 percent slopes (SpB).—This soil is in irregularly shaped areas on stream and river terraces. It has a profile similar to the one described as representative of the series, but the surface layer is thinner. Also, in most places the surface layer is darker. In areas near the Mississippi River, this soil has more fine and very fine sand. The solum ranges from 16 to 36 inches thick. Also included are a few small areas of Gotham and Dickinson soils and a few small areas of soils that are less sloping or more sloping than this Sparta soil.

Available water capacity and natural fertility are low. The hazard of soil blowing is severe. In places, irrigation is feasible on large areas of this soil, mainly where slopes are 2 or 3 percent.

Most areas of this soil are cultivated, but some large areas are in pine trees. This soil is suited to grasses, alfalfa, and pine tree plantations. Where irrigation is feasible, some areas are well suited to lima beans, corn, potatoes, and other specialty crops. Control of erosion and maintenance of fertility and organic-matter content are good management practices. Capability unit IVs–3; woodland group 4; wildlife group 3.

Sparta loamy sand, 6 to 12 percent slopes (SpC).—This soil is in irregularly shaped areas on stream and river terraces. It has the profile described as representative for the series. Eroded areas and areas of this soil that have convex slopes have a thinner, lighter colored surface layer.

Included with this soil in mapping are areas of loamy sand soils that have a dark surface layer that ranges from 20 to 36 inches in thickness. Also included are a few small areas of Gotham soils and a few areas of soils that are less sloping or more sloping than this Sparta soil.

Available water capacity and natural fertility are low. The hazard of soil blowing is severe, and the hazard of water erosion is moderate.

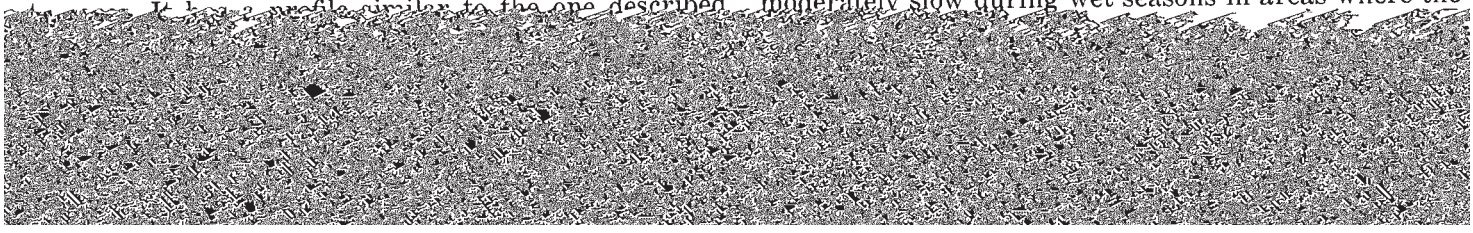
Most of this soil is in pasture or pine trees. This soil is suited to grasses and alfalfa for pasture and to pine tree plantations. Control of erosion and maintenance of fertility and organic-matter content are good management practices. Capability unit VIs–3; woodland group 4; wildlife group 3.

Sparta Series, Mottled Subsoil Variant

The Sparta series, mottled subsoil variant, consists of nearly level to gently sloping, moderately well drained and somewhat poorly drained soils on river terraces. These soils are mostly in depressions and on low terraces along the Buffalo and Mississippi Rivers. They formed in deep, sandy sediment. The native vegetation was bur oak savanna and prairie grasses.

In a representative profile the surface layer is about 19 inches thick. It is very dark grayish-brown loamy fine sand in the upper part and dark-brown loamy sand that has dark yellowish-brown mottles in the lower part. The subsoil is about 6 inches thick. It is dark yellowish-brown loamy sand that has a few dark-brown mottles. It is underlain by loose, light yellowish-brown and yellow coarse and medium sand that has dark-brown and brownish-yellow mottles.

Permeability is rapid, but percolation of water is moderately slow during wet seasons in areas where the



mottled subsoil variant, 0 to 3 percent slopes, in a pasture on a low terrace west of road in the SE¼SE¼ sec. 32, T. 18 N., R. 8 W.:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) loamy fine sand; weak, medium, granular structure; very friable; strongly acid; abrupt, smooth boundary.

A12—6 to 13 inches, very dark grayish-brown (10YR 3/2) loamy fine sand; weak, medium and fine, subangular blocky structure; very friable; strongly acid; clear, smooth boundary.

A13—13 to 19 inches, dark-brown (10YR 3/3 to 4/3) loamy sand that has few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, subangular blocky structure; very friable; strongly acid; clear, irregular boundary.

B2—19 to 25 inches, dark yellowish-brown (10YR 4/4) loamy sand that has few, fine, faint, dark-brown (7.5YR 3/4 to 4/4) mottles; weak, coarse and medium, subangular blocky structure; very friable; strongly acid; clear, smooth boundary.

C1—25 to 36 inches, light yellowish-brown (10YR 6/4) coarse and medium sand that has common, medium, prominent and distinct, dark-brown (7.5YR 3/4 to 4/4) and brownish-yellow (10YR 6/6) mottles; single grained; loose; strongly acid; clear, smooth boundary.

C2—36 to 60 inches, yellow (10YR 7/6) coarse and medium sand that has common, medium, faint, brownish-yellow (10YR 6/6) mottles; single grained; loose; strongly acid; clear, smooth boundary.

The solum ranges from 24 to 36 inches in thickness. Generally the Ap horizon is strongly acid, but it is slightly acid

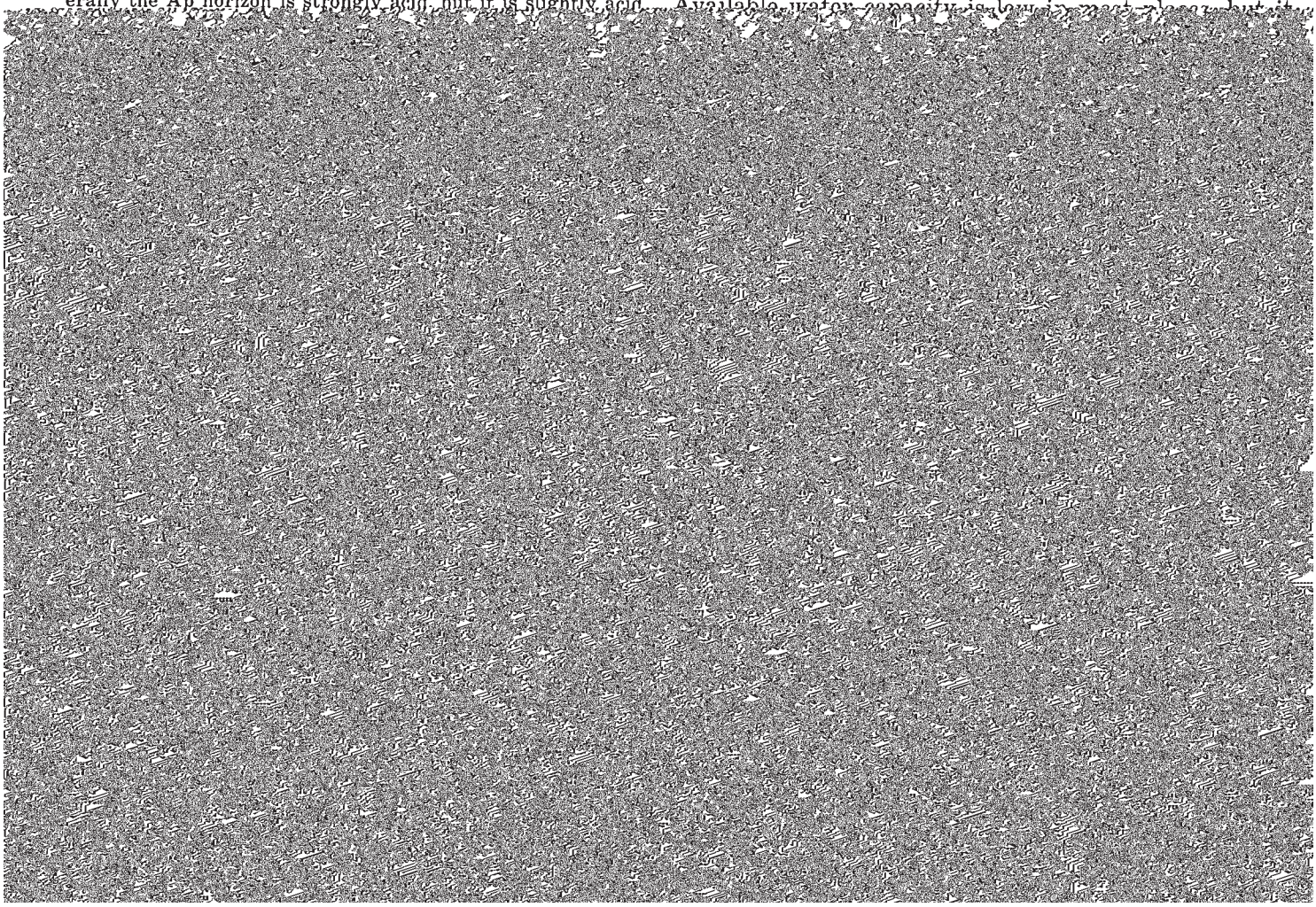
(fig. 15). The most prominent are Oak and Arcadia Ridges in the southern part of the county. The native vegetation was hardwoods, mainly red and black oaks.

Stony and rocky land is about 20 percent exposed rock, 60 percent shallow soil, and 20 percent moderately deep and deep soils. Rock fragments and flagstones consist of chert, hard sandstone, and sandy dolomitic limestone. These fragments and flagstones range from hand size to several feet in length. The soils are mostly neutral to slightly alkaline in reaction. The soils vary but they consist mostly of somewhat excessively drained and well-drained soils that are shallow to large flagstones of bedrock.

The surface layer is very dark brown or very dark grayish-brown silt loam 1 to 4 inches thick. The subsoil is dark-brown to yellowish-brown sandy loam, loam, or silt loam 2 to 20 inches thick. It is underlain by sandstone, sandy limestone, and chert rock. A small amount of soil material is between the rocks and in rock fractures.

Included with this land type in mapping are small areas of excessively drained Boone and Eleva soils near sandstone outcrop; well-drained Palsgrove soils, clayey subsoil variant; and Gale, Hixton, Urne, La Farge, and Seaton soils. Also included are a few small areas of soils that have slopes of less than 30 percent.

Runoff is rapid, and the hazard of erosion is severe. Available water capacity is low in most places, but it



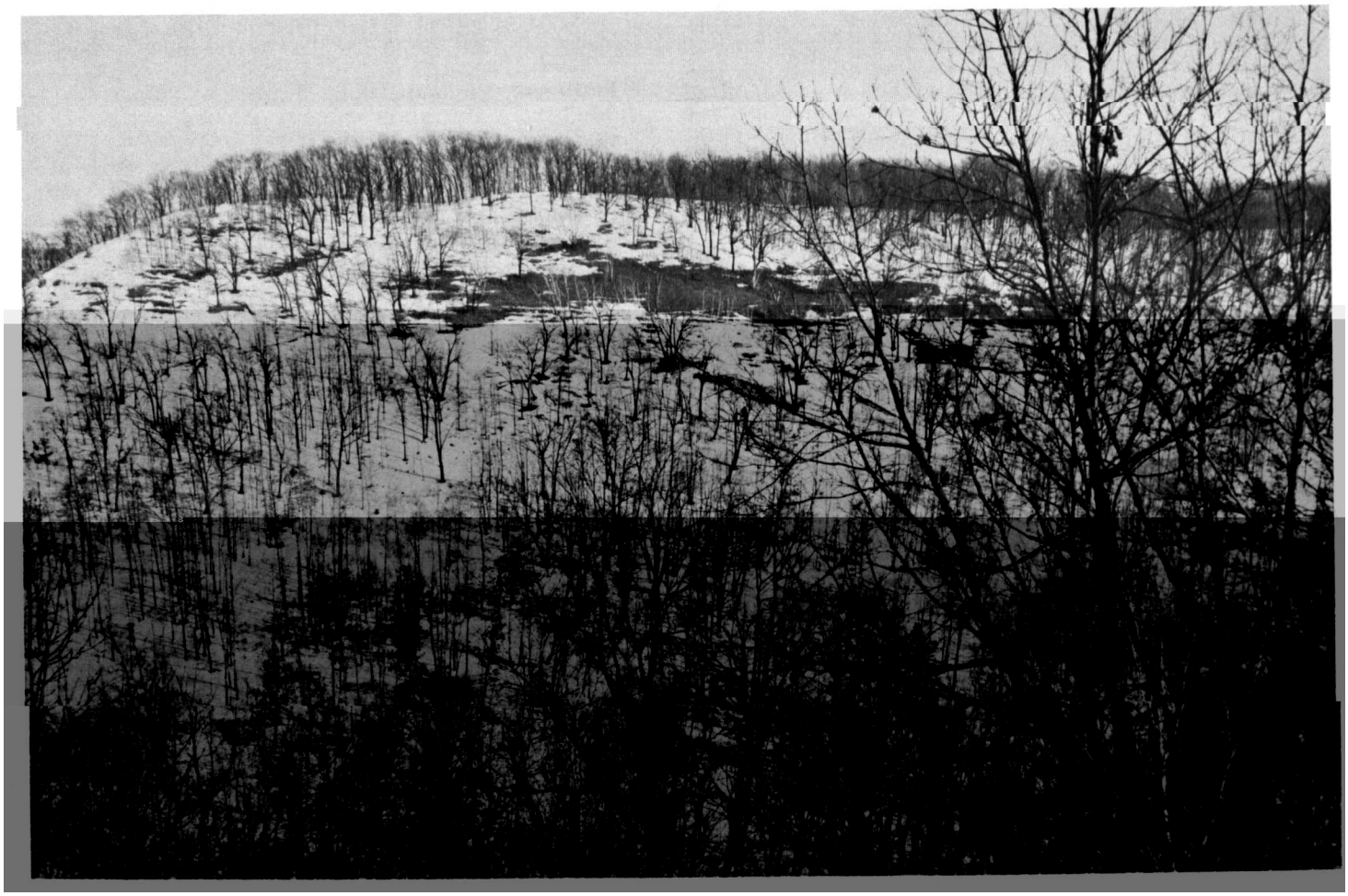
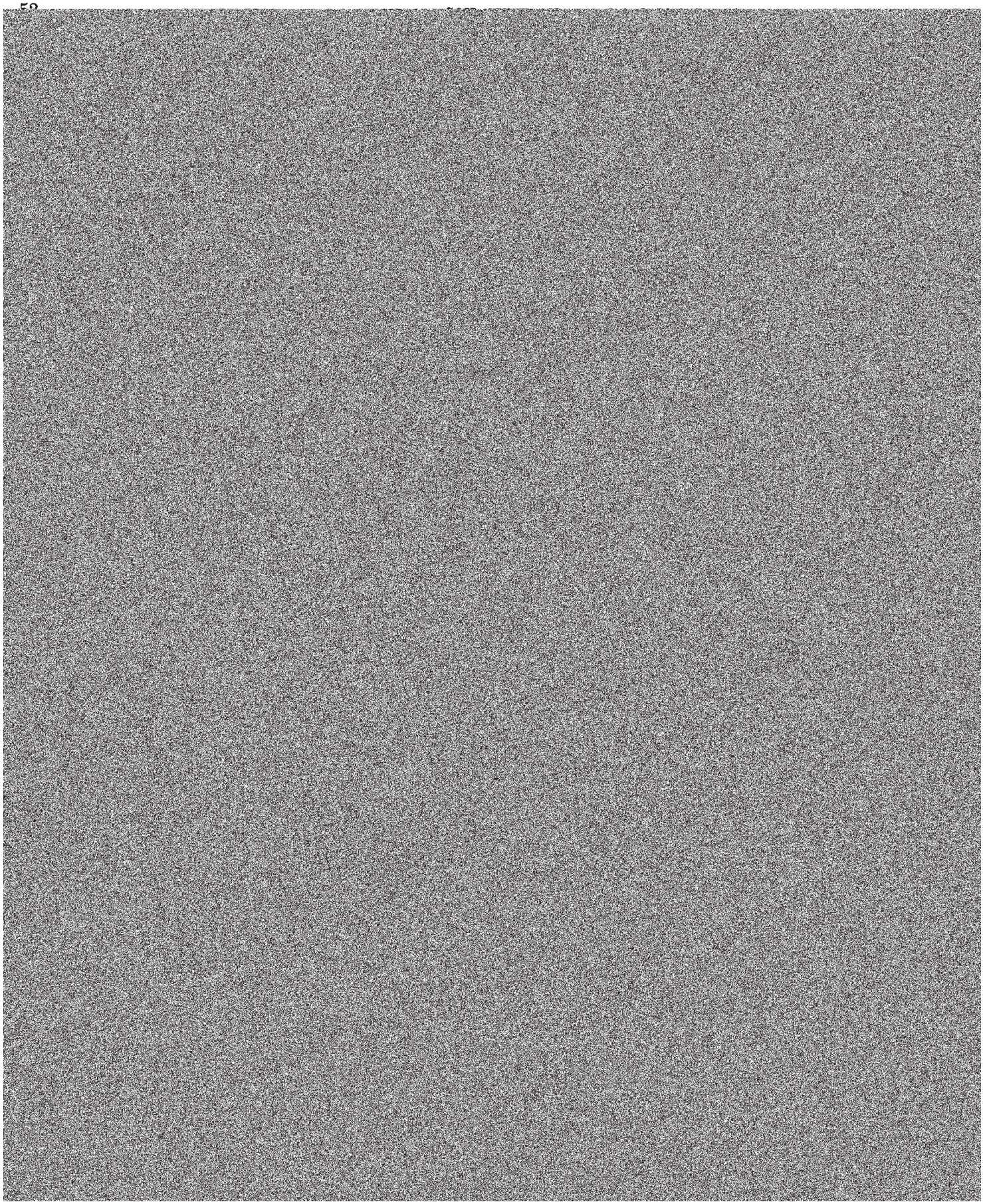


Figure 15.—**Area of Stony and rocky land along Oak Ridge.**

very friable; few fibrous roots; strongly acid; clear, wavy boundary.

C1—23 to 29 inches, dark reddish-brown (2.5YR 3/4) fine sand; loose; single grained; strongly acid; gradual,

areas of Trempealeau and Dunnville soils and Sandy terrace escarpments. Also included are a few small areas of soils that are less sloping or more sloping



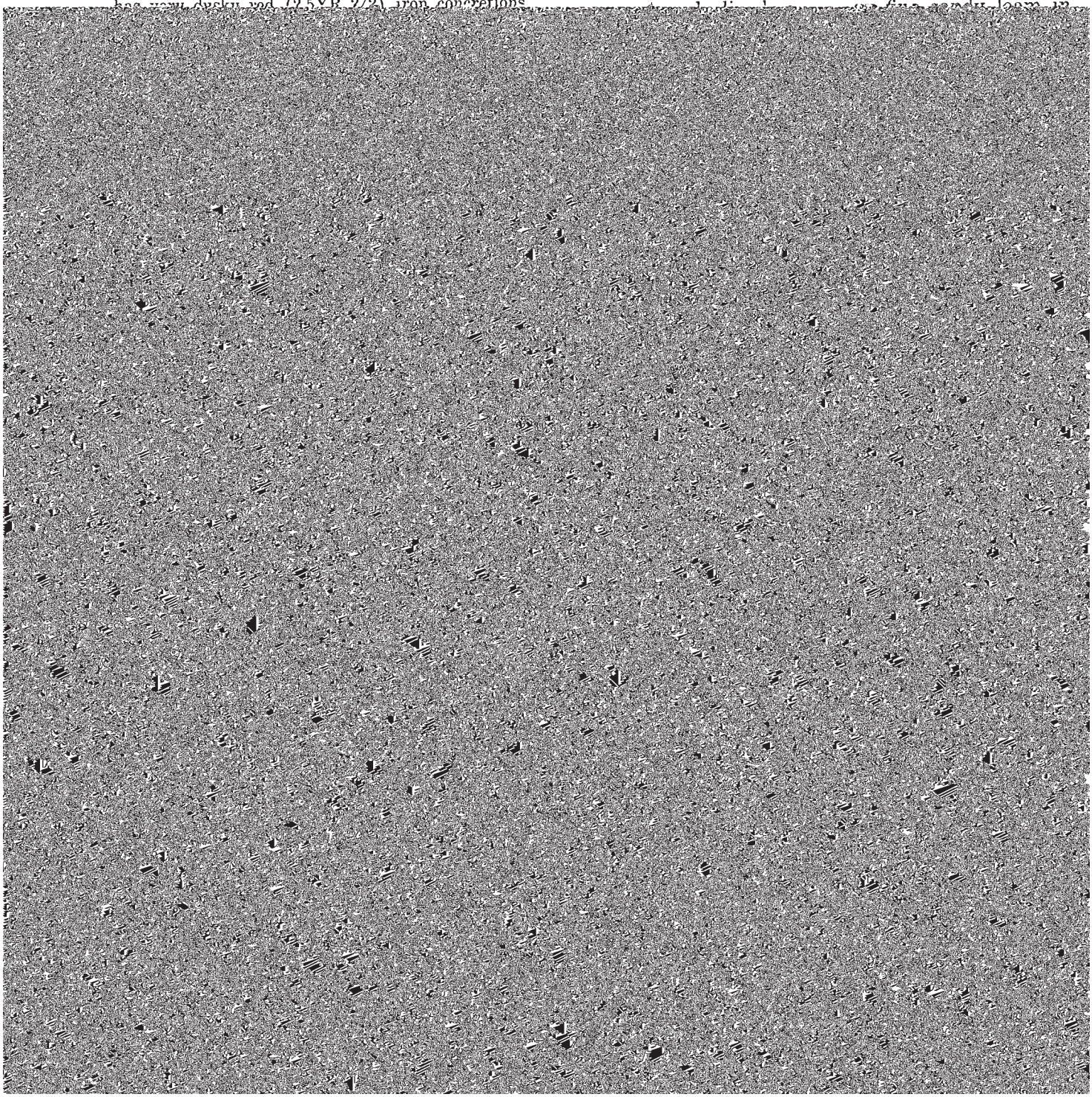
B21tcn—12 to 16 inches, dark reddish-brown (5YR 3/3) light loam that has many, medium and coarse, very dusky red (2.5YR 2/2) iron concretions; weak, very fine, subangular blocky structure; thin, patchy clay films; friable; medium acid; gradual, smooth boundary.

B22cn—16 to 27 inches, dark-brown (7.5YR 4/4) sandy loam that has common, medium and coarse, very dusky red (2.5YR 2/2) iron concretions; weak, fine and medium, subangular blocky structure; friable; strongly acid; gradual, wavy boundary.

B3—27 to 32 inches, brown (7.5YR 4/4) loamy sand that has [illegible] dusky red (2.5YR 2/2) iron concretions [illegible] fine sandy loam in

steep, well-drained soils on shaly sandstone uplands. Most areas of these soils are on ridgetops and side slopes throughout the county. They formed mainly in loamy, glauconitic sandstone residuum that is underlain by soft, shaly sandstone. Some areas of these soils have a thin mantle of silt. The native vegetation was hardwoods, mainly red and black oaks.

In a representative profile the plow layer is dark-brown silt loam about 6 inches thick. The subsoil is about 18 inches thick. It is brown silt loam in the



the profile has more sand and less silt. Also, the surface layer is slightly thicker and darker.

Included with this soil in mapping are a few areas of eroded Urne soils and a few small areas of Eleva, Norden, and Gale soils and Gale soils, shallow phase. Also included are a few small areas of soils that are less sloping or more sloping than this Urne soil.

Available water capacity is low. Natural fertility is medium. The hazard of erosion is slight.

This soil is suited to oats, alfalfa, and corn. Control of erosion is a good management practice. Capability unit IIe–2; woodland group 3; wildlife group 3.

Urne fine sandy loam, 6 to 12 percent slopes, eroded (UfC2).—This soil is in irregularly shaped areas on narrow ridgetops. It has a profile similar to the one described as representative of the series, but the upper part of the profile has more sand and less silt. In most areas where this soil has been cultivated, part of the material from the subsoil is mixed with that in the plow layer.

Included with this soil in mapping are a few areas of uneroded Urne soils, a few areas of soils that have a thick, dark-colored surface layer, and a few small areas of Norden, Eleva, and Gale soils and Gale soils, shallow phase. Also included are small areas of soils that are less sloping or more sloping than this Urne soil.

Available water capacity is low. Natural fertility is medium. The hazard of erosion is moderate. In most areas the tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to grass, alfalfa, and a limited amount of corn. Control of erosion and maintenance of tilth and organic-matter content are good management

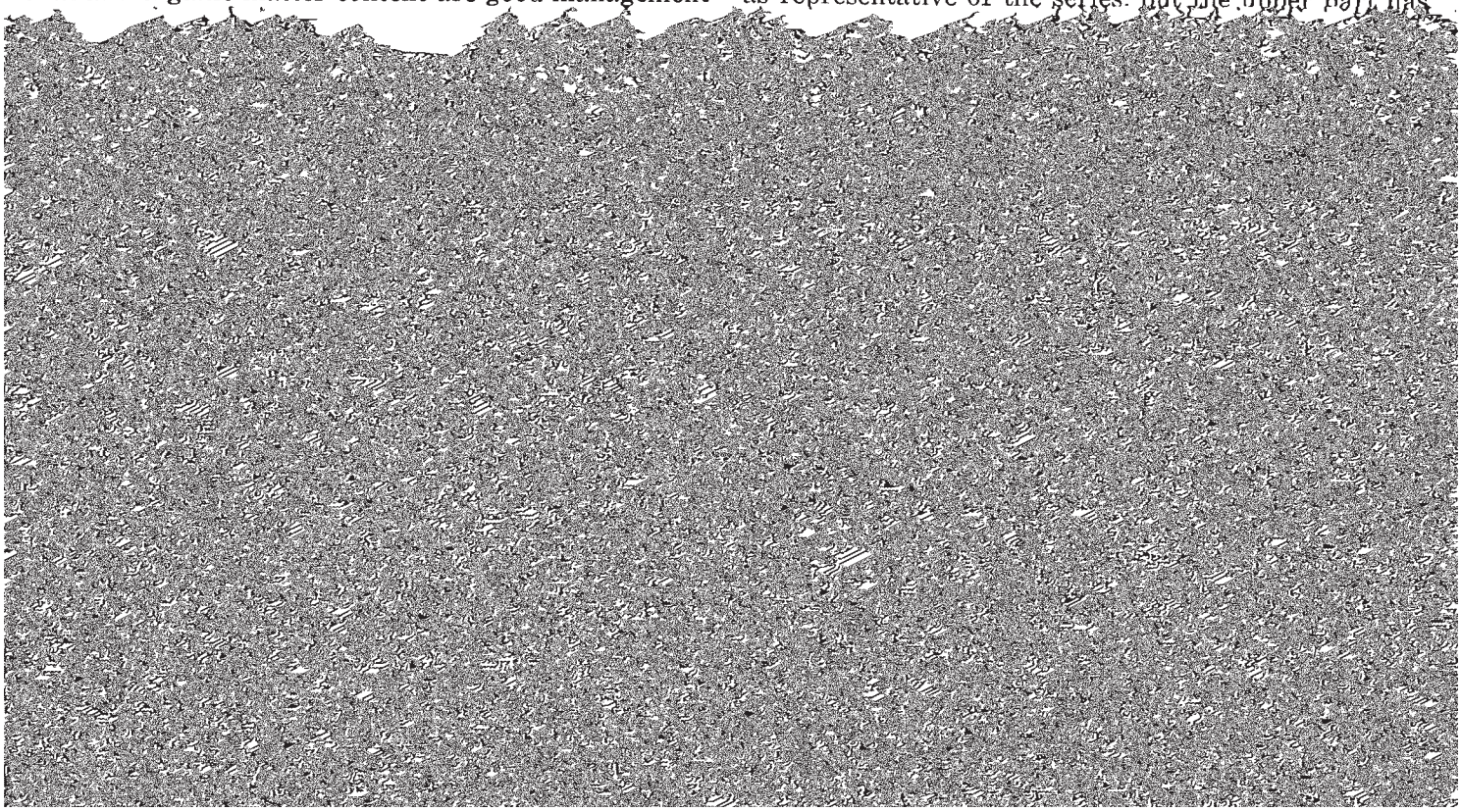
Urne fine sandy loam, 20 to 30 percent slopes, eroded (UfE2).—This soil is in irregularly shaped areas on the sides of ridges. It has a profile similar to the one described as representative of the series, but it has more sand and less silt in the upper part of the profile. In some eroded areas, the subsoil is exposed and a few sandstone flags are on the surface.

Included with this soil in mapping are a few areas of uneroded Urne soils, a few areas of soils that have a thick, dark-colored surface layer, and a few small areas of Eleva and Gale soils and Gale soils, shallow phase. Also included are a few small areas of soils that have bedrock at a depth of less than 20 inches and a few small areas of soils that are less sloping or more sloping than this Urne soil.

Available water capacity is low. Natural fertility is medium. The hazard of erosion is severe. The tilth and organic-matter content of the surface layer have been adversely affected by erosion. The sandstone residuum is unstable in wet areas. Small gullies form in areas along drainageways if this soil is heavily pastured or disturbed.

This soil has good potential for forage and timber crops. It is suited to grasses for pasture and to red or white pines of good quality. Trees do not grow so well in areas where slopes face south and southwest as they do in areas where slopes face in other directions. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit VIe–2; woodland group 3; wildlife group 3.

Urne fine sandy loam, 30 to 45 percent slopes (UfF).—This soil is in irregularly shaped areas on the sides of ridges. It has a profile similar to the one described as representative of the series, but the upper part has



Norden soils and Gale soils, shallow phase. Also included are a few small areas of soils where depth to bedrock is less than 20 inches and a few small areas of soils that are less sloping or more sloping than this Urne soil.

Available water capacity is low. Natural fertility is medium. The hazard of erosion is moderate. The tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to grass, alfalfa, and a limited amount of corn. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit IIIe–2; woodland group 3; wildlife group 3.

Urne silt loam, 12 to 20 percent slopes, eroded (UnD2).—This soil is in irregularly shaped areas on the sides of ridges. It has a profile similar to the one described as representative of the series, but in most places it has a thinner silt mantle. In most areas where this soil is cultivated, material from the subsoil and a few sandstone flags are mixed into the plow layer.

Included with this soil in mapping are a few areas of uneroded Urne soils and a few small areas of Norden soils and Gale soils, shallow phase. Also included are a few small areas of soils where depth to bedrock is less than 20 inches and a few small areas of soils that are less sloping or more sloping than this Urne soil.

Available water capacity is low. Natural fertility is medium. The hazard of erosion is severe. The tilth and organic-matter content of the surface layer have been adversely affected by erosion. The sandstone residuum is unstable where it is wet. A few small gullies form in areas along drainageways if this soil is cultivated intensively.

This soil is suited to grasses and alfalfa for hay or pasture. It also is well suited to red and white pines of good quality. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit IVe–2; woodland group 3; wildlife group 3.

Urne silt loam, 20 to 30 percent slopes, eroded (UnE2).—This soil is in irregularly shaped areas on the sides of ridges. It has the profile described as representative of the series, but in most places it has a thinner surface layer and the depth to bedrock is less. In some areas erosion has exposed the subsoil, and a few sandstone flags are on the surface.

Included with this soil in mapping are a few areas of uneroded Urne soils and a few small areas of Norden soils and Gale soils, shallow phase. Also included are a few small areas of soils where the depth to bedrock is less than 20 inches and a few small areas of soils that are less sloping or more sloping than this Urne soil.

Available water capacity is low. Natural fertility is medium. The hazard of erosion is severe. In some areas the tilth and organic-matter content of the surface layer have been adversely affected by erosion.

This soil is suited to grasses for pasture. It also is well suited to red and white pines of good quality and black and red oaks of medium quality. Trees do not grow so well in areas where slopes face south and southwest as they do in areas where slopes face in other directions. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit VIe–2; woodland group 3; wildlife group 3.

Urne-Norden complex, 12 to 20 percent slopes, eroded (UrD2).—The soils in this complex are in areas on soft, shaly sandstone uplands throughout the county. Generally, the sandstone is between the valley bottom and the high limestone ridges. The moderately deep soils of this complex formed in very fine sandy loam, fine sandy loam, and loam residuum. In many areas there is a shallow to moderately deep mantle of silt. Urne soils are in convex areas on side slopes, knobs, or knolls. Norden soils are in areas on ridgetops or in concave areas on side slopes (fig. 16). These soils are so intermingled and the areas are so small that it is impractical to map them separately. Urne soils make up about 50 percent of the acreage, and Norden soils about 50 percent. The native vegetation was hardwoods, mainly red and black oaks.

The Urne soils have a profile similar to the one described as representative of the series, but the surface layer is dark-brown very fine sandy loam, fine sandy loam, loam, or silt loam, and the subsoil is dark yellowish brown and in a few places has a few small sandstone fragments. Norden soils have a profile similar to the one described as representative of the Norden series, but the surface layer is fine sandy loam, loam, or silt loam, and in some areas the subsoil is brown.

Included with this complex in mapping are a few small areas of La Farge and Seaton soils near drainageways or in concave areas on side slopes and a few small areas of Eleva, Hixton, and Gale soils in convex areas. Also included are a few small areas of soils that have slopes of less than 12 percent or more than 20 percent.

The hazard of erosion is severe on these soils. The sandstone residuum is unstable where it is wet. Small gullies form if these soils are cultivated intensively.

The soils in this complex are mostly in pasture and crops. These soils have good potential for hay and timber crops. They are well suited to alfalfa-brome hay and to red and white pines of good quality and red and black oaks of medium to good quality. Control of erosion and maintenance of tilth and organic-matter content are good management practices. Capability unit IVe–2; woodland group 1; wildlife group 1.

Urne-Norden complex, 20 to 30 percent slopes (UrE).—The soils in this complex are in areas on soft, shaly, sandstone uplands throughout the county. Generally, the sandstone is between the valley bottom and the high limestone ridges. The moderately deep soils of this complex formed in very fine sandy loam, fine sandy loam, and loam residuum. In many areas of the complex there is a shallow or moderately deep mantle of silt. Urne soils are in convex areas on slope breaks and knobs. Norden soils are on narrow ridgetops and in concave areas on side slopes. These soils are so intermingled and the areas so small that it is impractical to map them separately. Urne soils make up slightly more than 50 percent of the acreage, and Norden soils make up slightly less than 50 percent. The native vegetation was hardwoods, mainly red and black oaks.

The Urne soils have a profile similar to the one de-

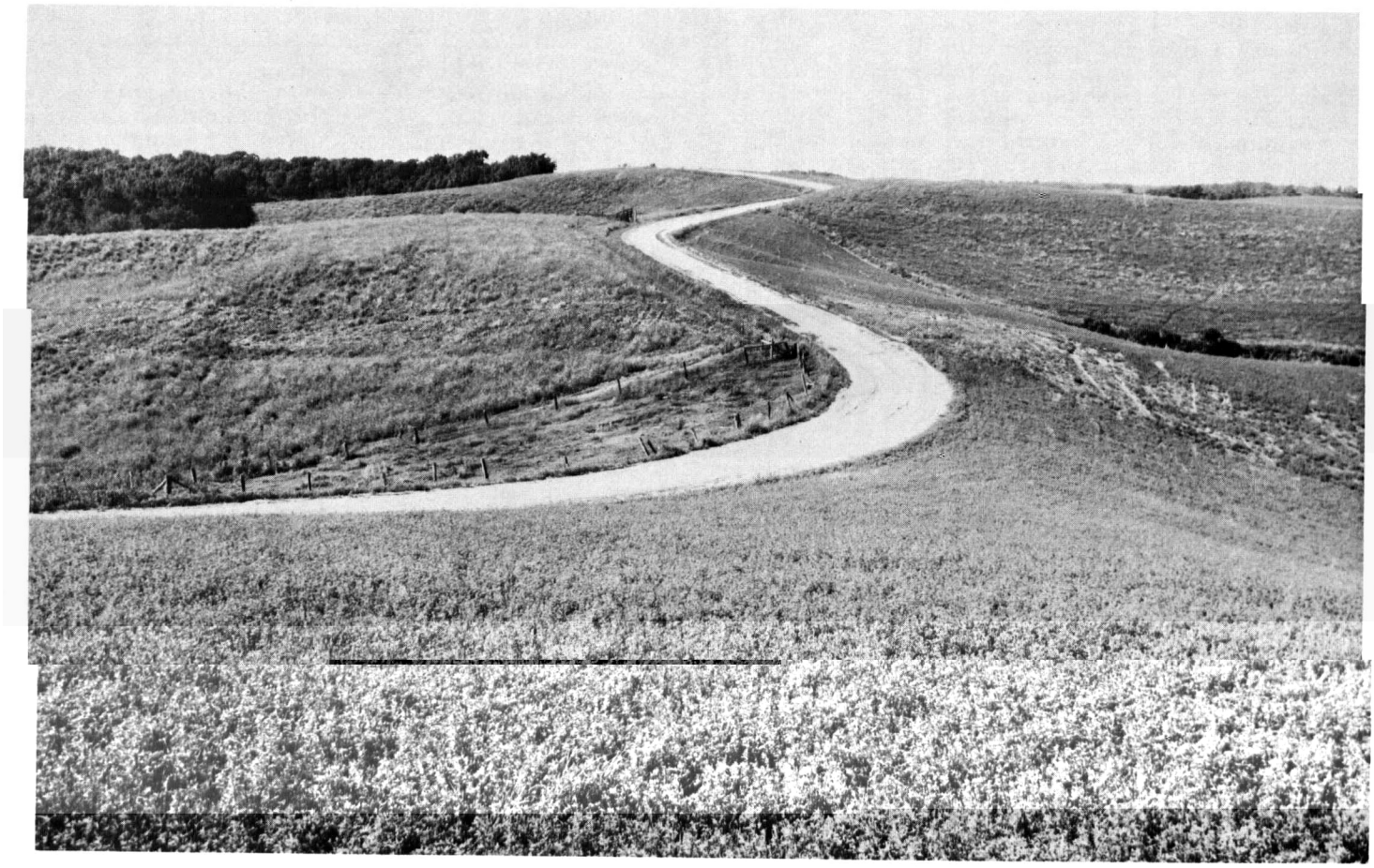


Figure 16.—Area of Urne-Norden soils on narrow ridgetops.

surface layer in most areas is very dark grayish-brown very fine sandy loam, fine sandy loam, or silt loam 1 to 4 inches thick, and in many areas the subsoil contains less sand and more clay. Norden soils have a profile similar to the one described as representative for the Norden series, but the surface layer is very dark grayish-brown silt loam or loam and the subsoil in many areas contains more clay and less sand.

Included with this complex in mapping are a few small areas of Eleva soils near convex slope breaks, and areas of La Farge, Seaton, Fayette, and Huntsville soils near drainageways and in concave areas on side slopes. Also included are a few small areas of soils that

erosion is a good management practice. The soft, shaly sandstone is used for road fill. Capability unit VIe–2; woodland group 1; wildlife group 1.

Urne-Norden complex, 30 to 45 percent slopes (UrF).—The soils in this complex are in areas on soft, shaly, sandstone uplands throughout the county. Generally, the sandstone is intermediate between the valley bottom and the high limestone ridges. The moderately deep soils of this complex formed in very fine sandy loam and loam residuum. In many areas of the complex there is a shallow to moderately deep mantle of silt. Urne soils are in convex areas on side slopes and knobs. Norden soils are on ridgetops and in concave areas on

loam 1 to 4 inches thick and in many areas the subsoil has more clay and less sand.

Included with this complex in mapping are a few small areas of Eleva soils near convex slope breaks and areas of La Farge, Seaton, Fayette, and Huntsville soils near drainageways and in concave areas on side

IIC3—24 to 60 inches; black (10YR 2/1) sapric material that has many fine, herbaceous fibers; massive; friable; 40 percent fiber content, less than 10 percent when rubbed; massive; mildly alkaline.

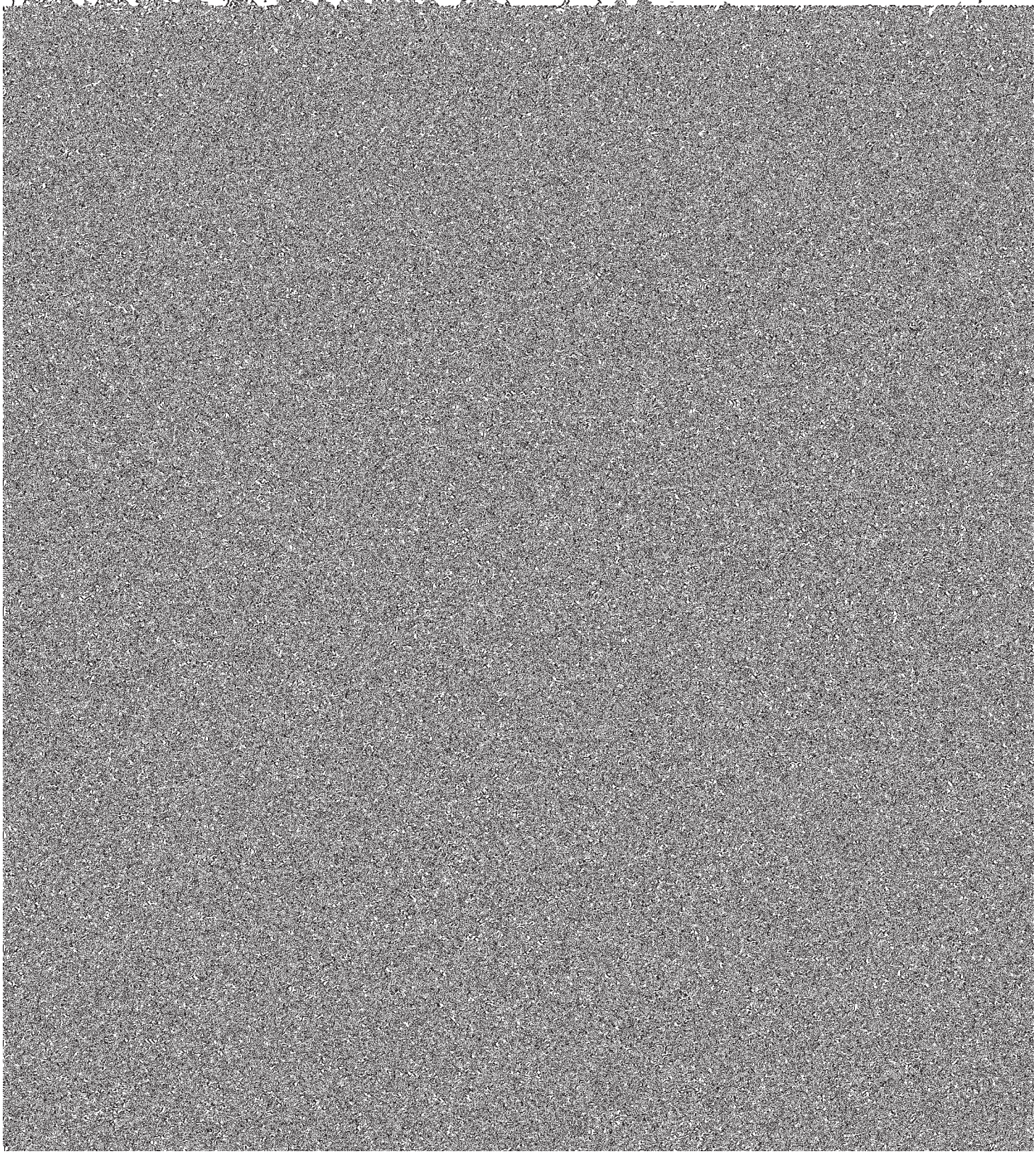
The A1 horizon is very dark brown (10YR 2/2), very dark grayish-brown (10YR 3/2), or dark grayish-brown (10YR 4/2) silt loam that ranges from 1 to 4 inches in

Whitehall Series

The Whitehall series consists of nearly level to gently sloping, well drained and moderately well drained soils on low stream and river terraces. These

the C horizon. High-chroma mottles are present in the C horizon and the lower part of the B horizon. Where present, the B3g horizon has low-chroma mottles in some areas.

Whitehall soils are adjacent to Pillot and Trempealeau soils and Trempealeau soils, mottled subsoil variant. White-



B2—34 to 42 inches; brown (10YR 4/3) silt loam; weak, coarse, platy structure that parts to weak, medium, subangular blocky; organic coatings on ped faces; very friable; slightly acid; clear, smooth boundary.

as soybeans, lima beans, peas, and sweet corn, are grown, especially on soils on the sandy terraces along the Mississippi River. About two-thirds of the soils in the county have slopes of more than 6 percent. On

increase water intake, decrease runoff, and control erosion. A large supply of organic matter helps to maintain structure and fertility in nearly level loams and silt loams on which row crops are generally grown.

Maintaining soil structure and tilth.—Soils that

tivation, it is commonly subject to soil blowing or water erosion. About two-thirds of the soils of Trempealeau County have slopes of 6 percent or more. Erosion-control practices, such as contour stripcropping, suitable cropping systems, pasture renovation, grassed

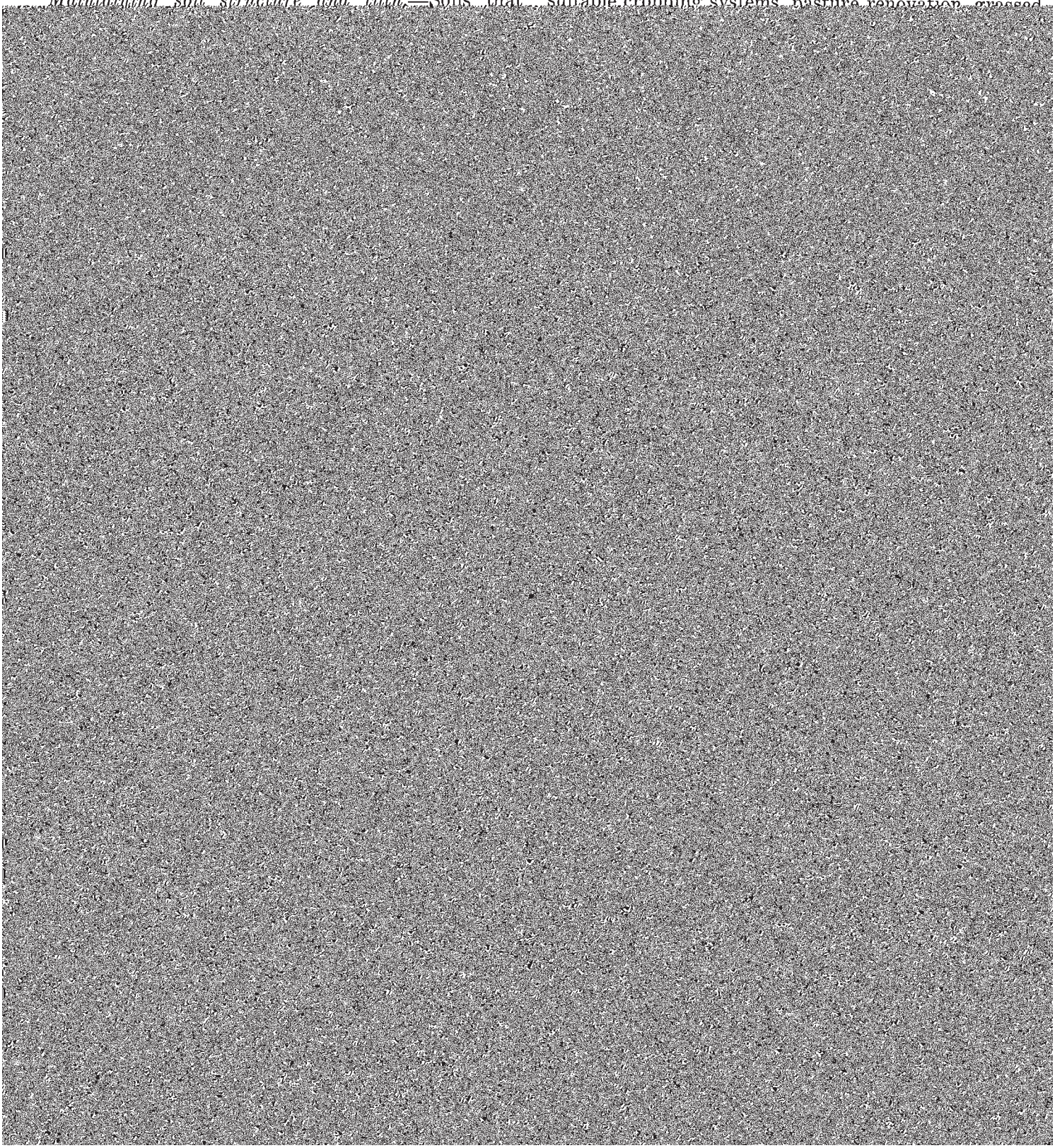


Figure 17.—Contour strips and an earthern dam help to control runoff and to prevent erosion in a narrow upland valley.

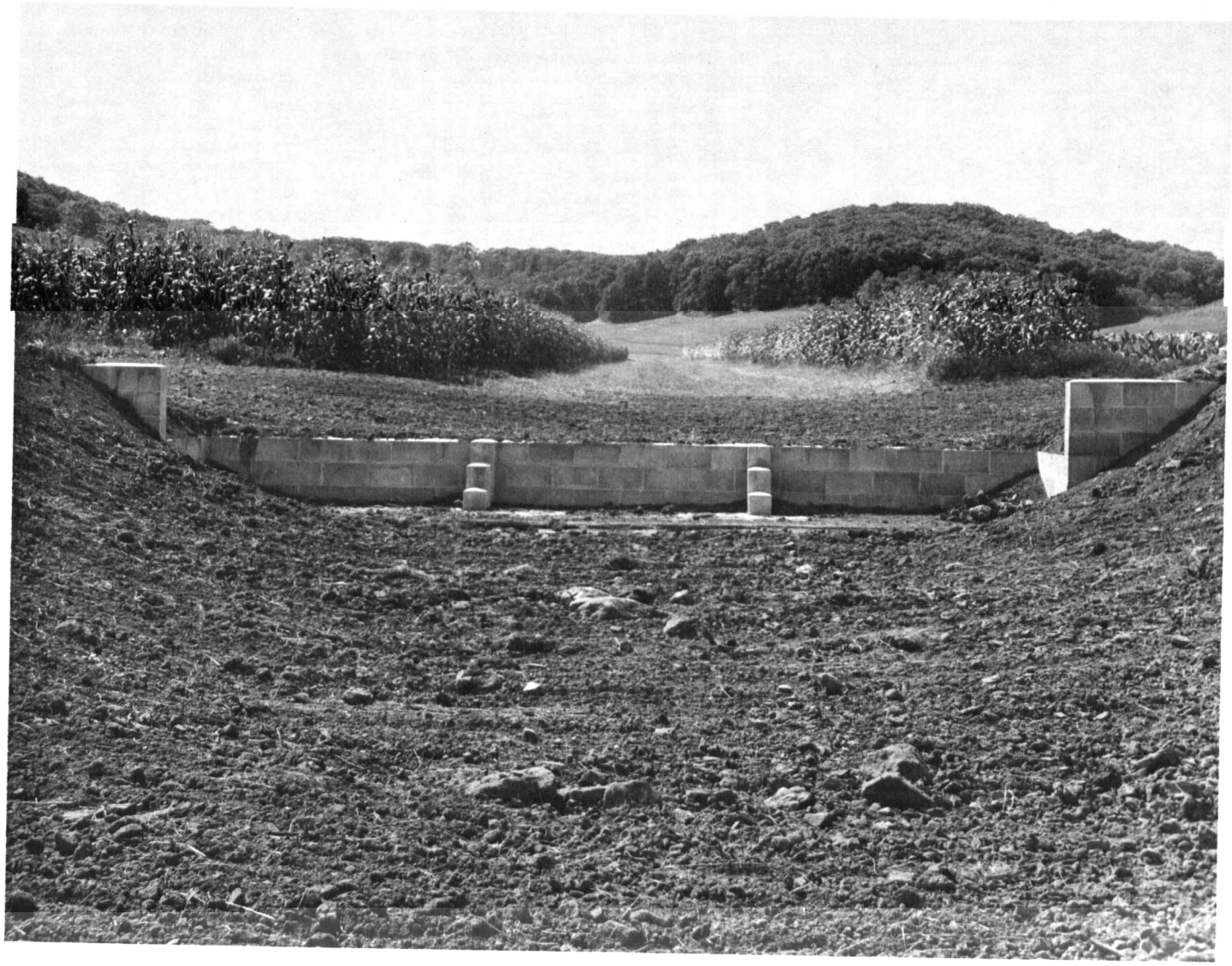


Figure 18.—**A newly constructed toewall across natural drainageway. Gully that was formerly in the foreground has been filled.**

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, 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 largely to pasture, range, woodland, or wildlife.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes.

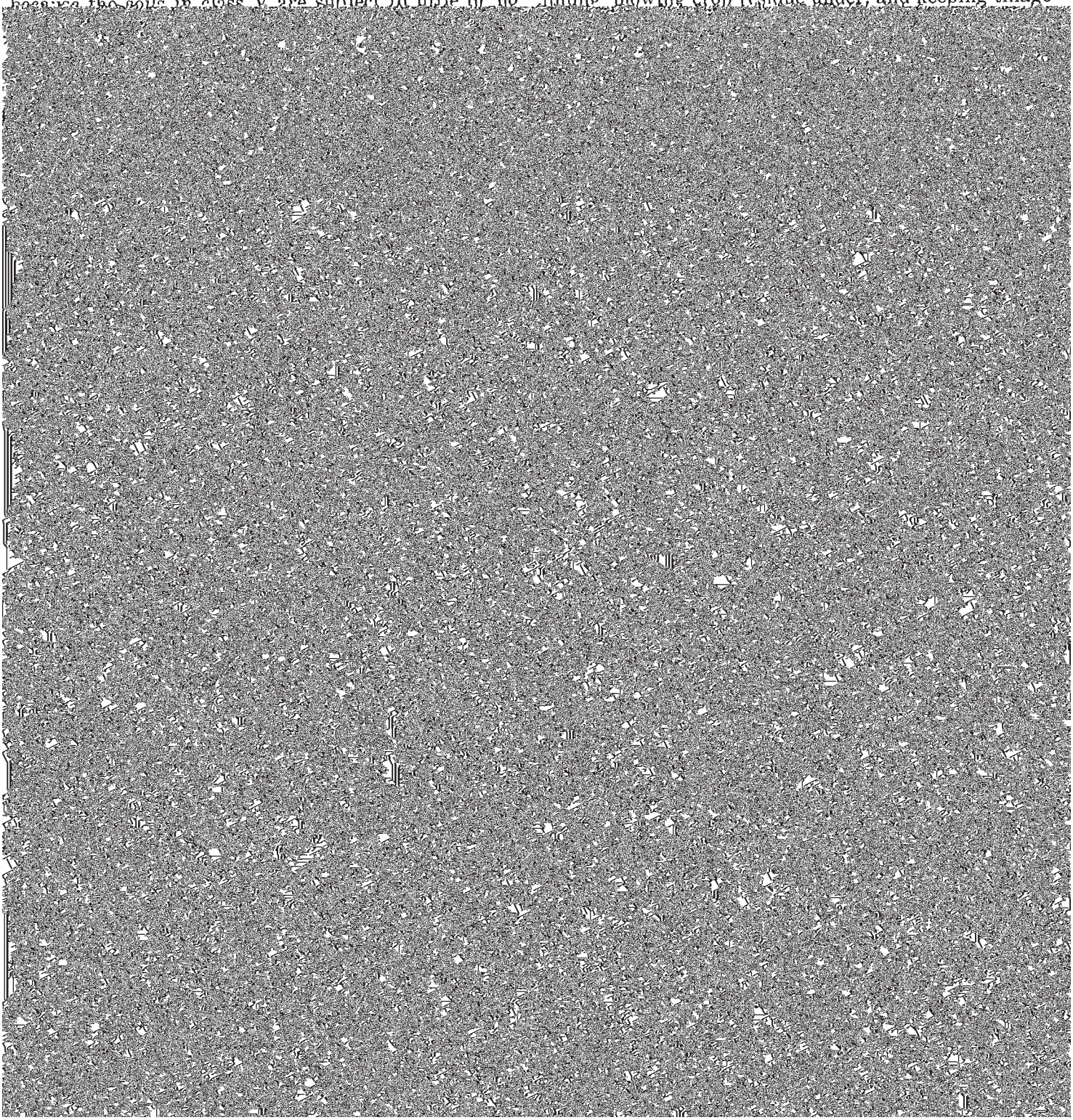
CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in 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 some parts of the United States but not in Trempealeau County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no

The soils in this unit are suited to all crops commonly grown in the county. Corn, oats, and alfalfa are the main crops. Some areas of these soils on uplands are well suited to pasture and woodland.

The major management needs are the control of erosion and the maintenance of organic-matter content, fertility, and structure. Manuring, fertilizing, liming, plowing crop residue under, and keeping tillage



increases pore space and restores structure that is partly destroyed by intensive cultivation. Diversions, grassed waterways, toewalls, and earthen dams help to control runoff and erosion.

CAPABILITY UNIT IIw-1

This unit consists of deep, nearly level to gently sloping, poorly drained soils in the Denrock series, wet subsoil variant, Ettrick series, clayey subsoil variant, and Ettrick series. These soils have a surface layer of silt loam and a subsoil of silty clay loam or silty clay.

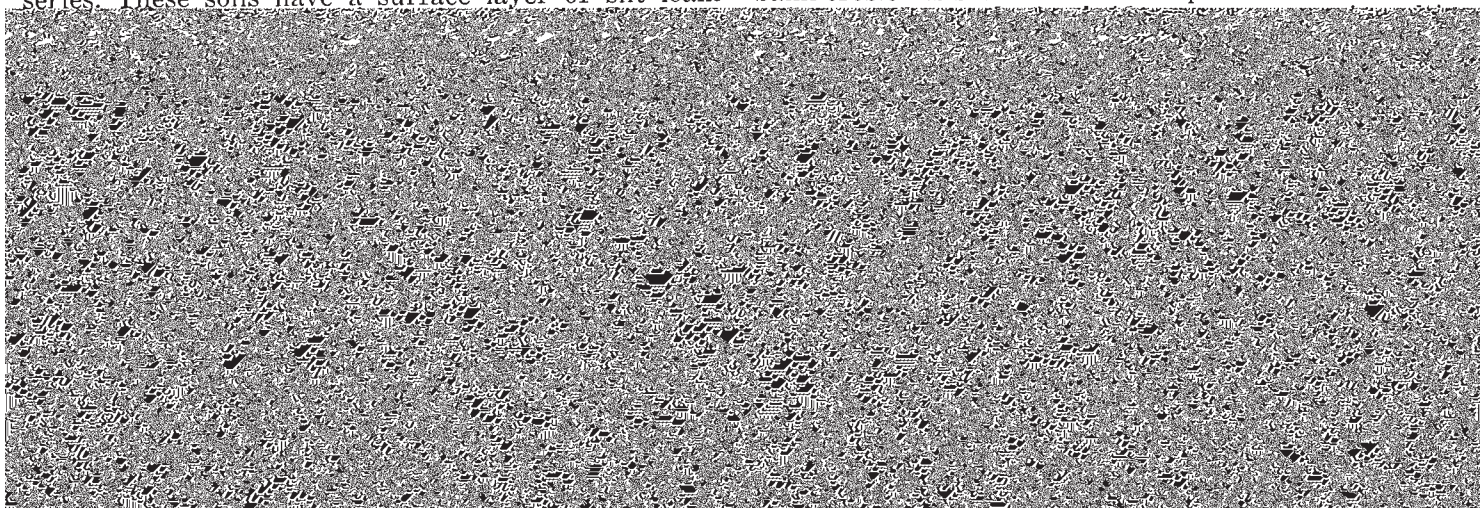
Permeability ranges from moderately slow to slow. Natural fertility, available water capacity, and organic-matter content are high and very high. The hazard of flooding is moderate. These soils have a seasonal high water table. The hazard of streambank erosion is severe in cultivated or pastured areas. Denrock and Ettrick soils that have a clayey subsoil are difficult to work. Good tilth is difficult to maintain, especially in areas where tillage has extended down into the clayey subsoil. In these areas the soils are sticky when wet and hard when dry. Tillage must be done when the moisture content is optimum. Most areas of these soils are cultivated.

Corn and soybeans are the main crops. Wet areas are suited to pasture or wildlife habitat.

The major management needs are maintenance of structure and tilth, provision of adequate drainage, and protection from stream overflow and runoff from the uplands. Manuring, plowing crop residue under, keeping tillage to a minimum, and developing a good fertility program are practices that help to maintain the organic-matter content, fertility, tilth, and structure. Surface or tile drains, or both, help to provide adequate drainage. Ditching down to the loose, permeable, sandy substratum also helps to drain some areas where wetness is caused by the slow permeability of the clayey subsoil. Dikes and diversions help to protect these soils from flooding by stream overflow and upland runoff from higher-lying areas. Streambank riprap and fencing off of cattle help to prevent streambank erosion.

CAPABILITY UNIT IIw-2

This unit consists of deep, nearly level, somewhat poorly drained soils in the Denrock and Muscatine series. These soils have a surface layer of silt loam



residue under, restricting tillage to a minimum, and fertilizing are practices that help to maintain organic-matter content, fertility, and structure. Dikes and diversions help to provide adequate drainage and protection from runoff and stream overflow. Ditching down to the loose, permeable, sandy substratum helps to drain areas of Denrock soils that are seasonally wet because of slow permeability in the clayey subsoil.

CAPABILITY UNIT IIw-5

This unit consists of deep, nearly level to gently sloping, somewhat poorly drained and poorly drained soils in the Kato and Shiffer series; the Kato series, sandy loam variant; and the Trempealeau series, mottled subsoil variant. These soils have a surface layer of loam or silt loam and a subsoil of sandy loam, loam, or silt loam.

Permeability is moderate in the upper part of these soils and rapid in the lower part. Available water capacity ranges from moderate to high, and natural fertility ranges from medium to high. In wet seasons these soils are subject to flooding and have a high water table.

These soils are suited to corn, oats, hay, and soybeans. Corn is the main crop. Areas of these soils that are wet or that are subject to flooding are suited to pasture and wildlife.

The major management needs are the provision of adequate drainage and protection from stream overflow and runoff from higher lying areas. Keeping tillage to a minimum, plowing crop residue under, manuring, liming, and fertilizing are practices that help to maintain the organic-matter content, fertility, and structure. Dikes and diversions help to provide flood protection, and ditches and surface drains help to provide adequate drainage in wet areas.

CAPABILITY UNIT IIw-8

Deep, nearly level, very poorly drained Palms muck is the only soil in this unit. The subsoil is muck that has partly decomposed plant fibers. It is underlain by loamy sediment.

Available water capacity and organic-matter content are very high. Natural fertility ranges from medium to moderately low. The hazard of flooding is severe. The water table is high in most areas. Streambank erosion is severe in areas of pasture. The hazards

layer is thick, dark-colored silt loam. It is underlain by silt loam sediment.

Permeability is moderate. Available water capacity is very high. Natural fertility and organic-matter content are high. This soil is subject to flooding from stream overflow and runoff from higher lying areas. The hazard of gully erosion is severe where runoff water concentrates.

Most areas of this soil are cultivated. Corn is the main crop, but some oats and hay crops are also grown. This soil is suited to all crops commonly grown in the county.

The major management needs are maintenance of soil structure and protection from runoff and stream overflow. Manuring, liming, fertilizing, plowing crop residue under, and keeping tillage to a minimum are practices that help to maintain organic-matter content, fertility, and soil structure. Also, growing deep-rooted alfalfa helps to restore pore space and structure that are destroyed by intensive cultivation. Diversions, toewalls, earthen dams, and grassed waterways help to protect the soil from runoff and gully erosion.

CAPABILITY UNIT IIw–13

This unit consists of deep, nearly level to gently sloping, somewhat poorly drained and poorly drained soils in the Boaz, Lawson, and Wallkill series, and areas of Loamy alluvial land. These soils have a surface layer of loam and silt loam and a subsoil mainly of loam or silt loam. Wallkill soils are underlain by muck at a depth of about 24 inches.

Permeability is moderate. Available water capacity ranges from high to very high. Natural fertility is medium to high. The hazard of flooding is moderate to severe because of stream overflow and runoff from higher lying areas. The water table of these soils, especially that of Wallkill soils and Loamy alluvial land, is high in wet seasons. In some areas, the hazard of gully

beans are the main crops, but some oats, alfalfa, and such special cash crops as lima beans and sweet corn are also grown.

The major management needs are the maintenance of organic-matter content, fertility, soil structure, and moisture. Manuring, liming, fertilizing, plowing crop residue under, and keeping tillage to a minimum are practices that help to maintain the organic-matter content, fertility, and structure. Plowing under large amounts of manure and crop residue also helps to increase moisture content. Growing deep-rooted alfalfa helps to restore pore space and soil structure that are destroyed by intensive cultivation.

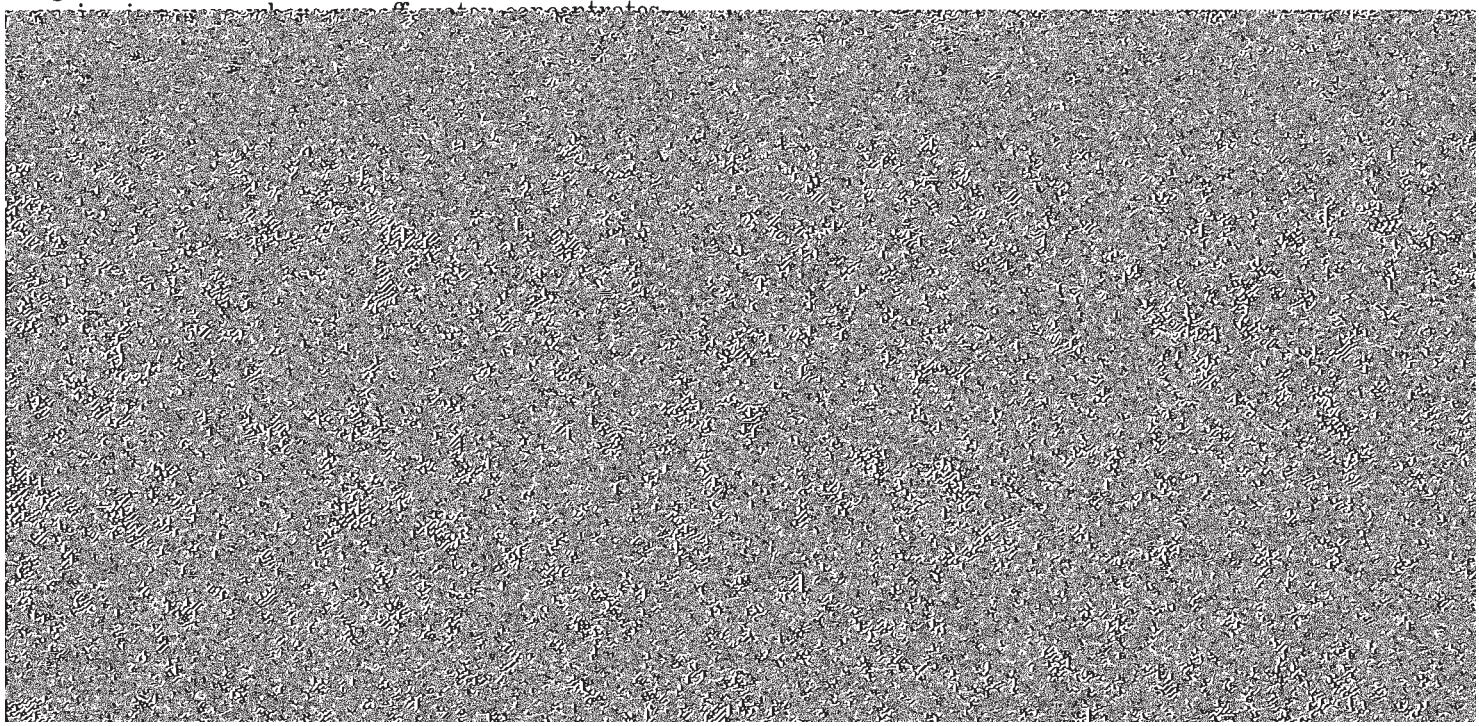
CAPABILITY UNIT IIIe–1

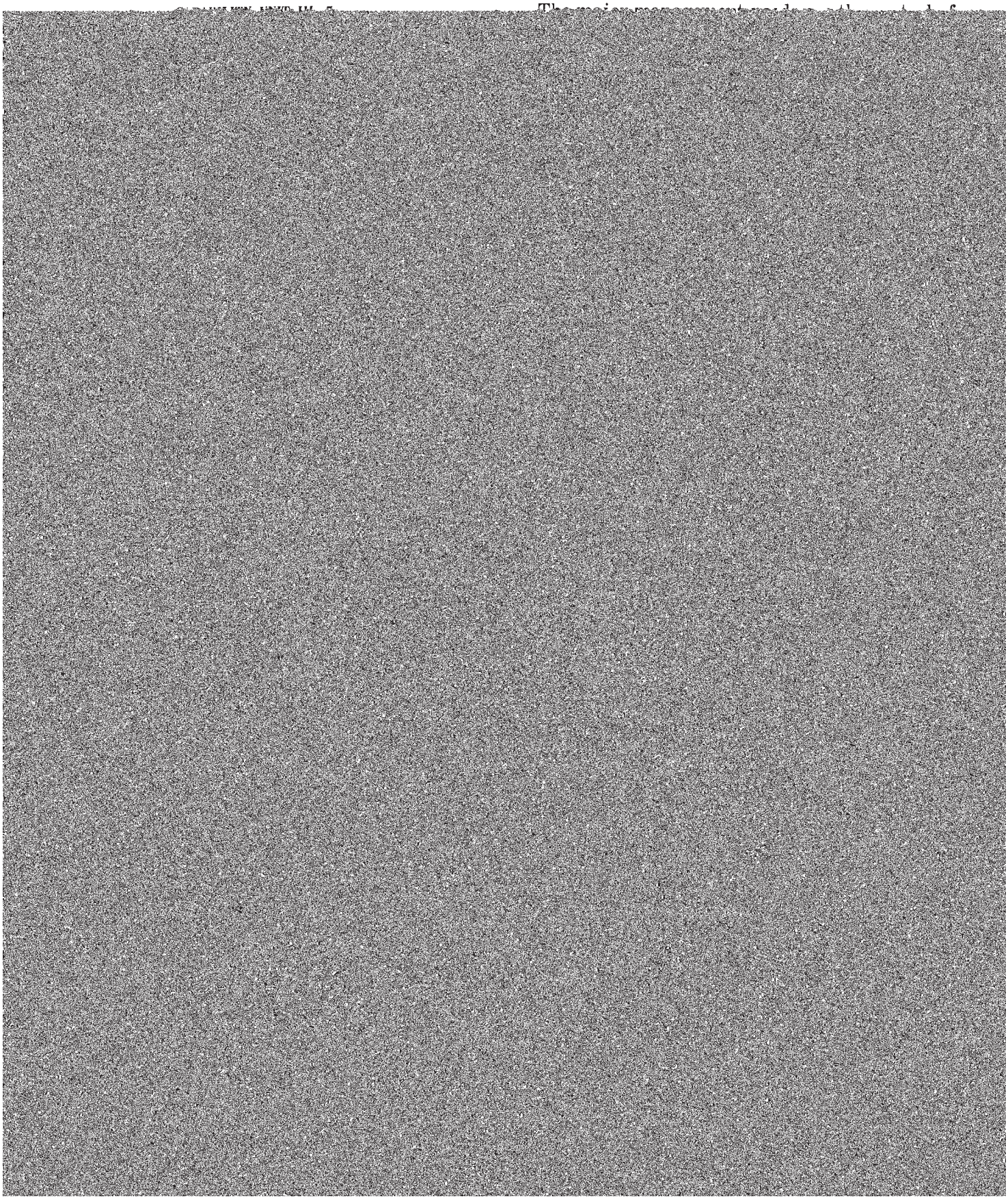
This unit consists of deep, sloping, well-drained soils in the Downs, Fayette, Palsgrove, Port Byron, and Seaton series and the Palsgrove series, clayey subsoil variant. These soils have a surface layer of silt loam and a subsoil of silt loam, silty clay loam, or clay.

Permeability is moderate and moderately slow. Available water capacity ranges from moderate in Palsgrove soils, clayey subsoil variant, to very high in Port Byron and Seaton soils. Natural fertility is high. The hazard of erosion is moderate.

These soils are suited to all crops commonly grown in the county. Corn, oats, and hay are the main crops. These soils are also well suited to pasture.

The major management needs are the control of erosion and the maintenance of tilth and soil structure. Plowing crop residue under, manuring, liming, and fertilizing are practices that help to maintain the organic-matter content, fertility, tilth, and structure. Also, growing deep-rooted alfalfa helps to restore pore space and soil structure. These practices, along with grassed waterways, terraces, contour strips, and cover crops, help to control runoff and erosion.





Permeability is moderate. Available water capacity is low to moderate, and natural fertility is low to medium. The hazard of erosion is moderate. If further erosion is not controlled, these soils become shallower and more droughty. Sandstone fragments are in eroded

Sparta, and Trempe series. These soils have a surface layer of loamy sand or loamy fine sand and a subsoil of sandy loam, sand, or loamy fine sand.

Permeability is rapid. Available water capacity is very low or low. Natural fertility is low. The hazard of

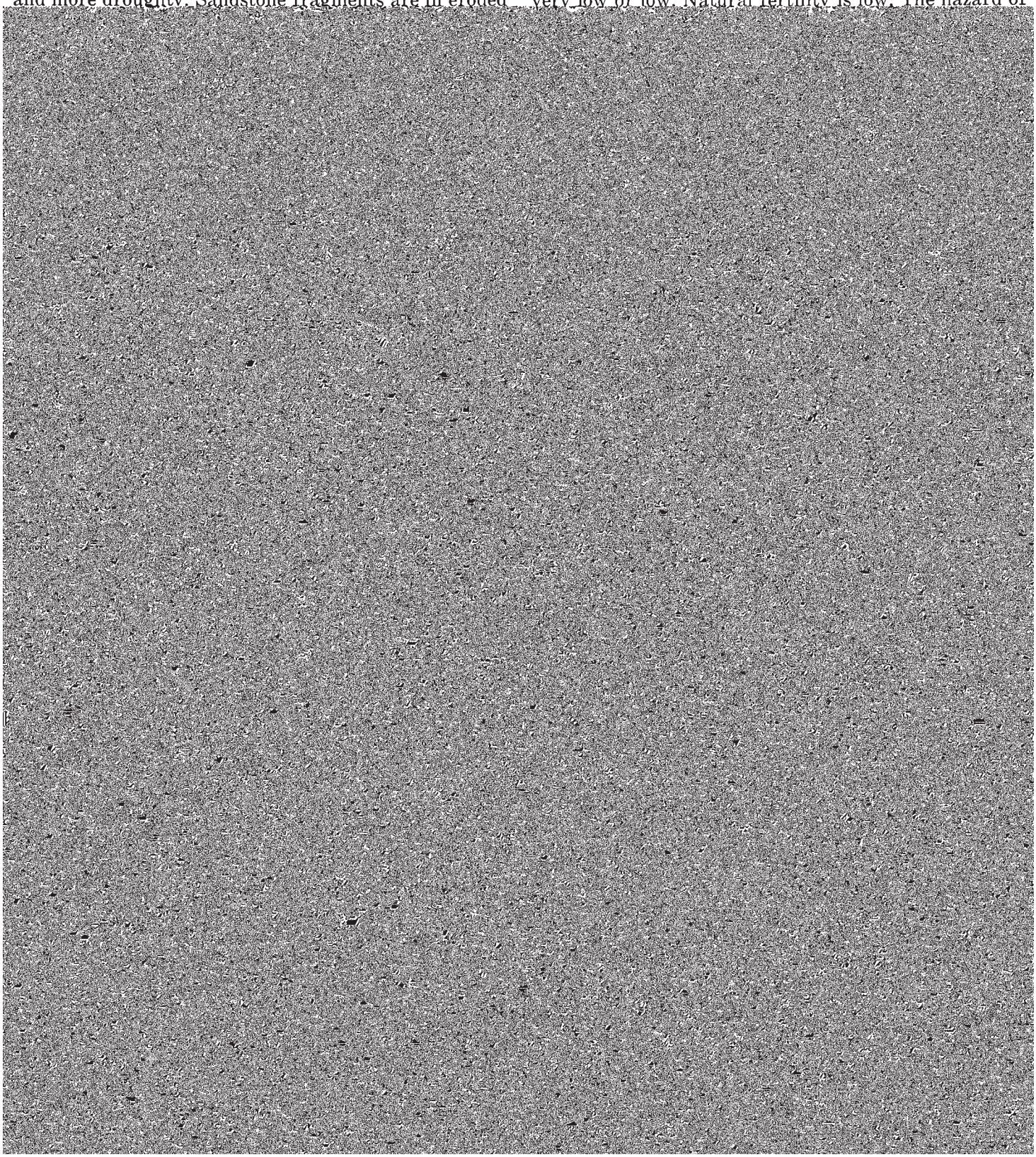


Figure 19.—Tree plantings in an area of an Urne-Norden complex in capability unit VIe–2. The very steep Stony and rocky land in the background is in capability unit VIIs–6.

drained soils of the Hixton, La Farge, Norden, and Urne series. These soils have a surface layer of fine sandy loam, loam, or silt loam and a subsoil of very fine sandy loam to silty clay loam. Soils of the Eleva-Gale complex, 20 to 30 percent slopes, are included in this unit. Some areas of Urne and Norden soils in this unit occur in a complex (fig. 19).

Permeability is moderate. Available water capacity is generally moderate, but it ranges to low in Urne soils. Natural fertility is medium. The hazard of erosion is very severe. Most areas of these soils are eroded, and gullies are in some drainageways where runoff water concentrates.

These soils are suited to grasses and alfalfa for pasture. They are also well suited to hardwoods, such as red and white oaks.

The major management need is the control of erosion. Pasture renovation and controlled grazing are practices that help control erosion and to promote good growth of pasture crops. Toewalls and earthen dams also help to control gully erosion.

this unit. This soil is underlain at a depth of about 24 inches by cemented sandstone.

Permeability is moderate. Available water capacity is moderately low to medium, and natural fertility is moderately low to moderate. The hazard of erosion is severe. If further erosion is not controlled, these soils will become more shallow and droughty. Many sandstone fragments are in some severely eroded areas where tillage extends into the sandstone bedrock.

This soil is suited to pasture, pine tree plantations, and wildlife areas.

The major management needs are control of erosion and maintenance of organic-matter content and tilth. Pasture renovation, controlled grazing, and protection of timber and wildlife areas are practices that help to control erosion and to promote the good growth of pasture crops, timber, and wildlife habitat.

CAPABILITY UNIT VIe–7

Moderately deep, steep, well-drained Eleva sandy loam, 20 to 30 percent slopes, eroded, is the only soil

These soils are well suited to grasses and alfalfa for pasture. They are also well suited to pine tree plantations and wildlife habitat.

The major management needs are maintenance of organic-matter content, conservation of moisture, and control of water erosion. Before reseeding the areas, pasture renovation procedures should be used to help

Protection of these soil areas from grazing helps to control erosion and increase the growth of trees and wildlife.

CAPABILITY UNIT VIIe–2

This unit consists of moderately deep, very steep,

of soil and water by helping to control runoff and erosion.

CAPABILITY UNIT VIIs-3

This unit consists of moderately deep and deep, steep and very steep, excessively drained soils in the Boone

of rivers and streams, mainly Beaver Creek and the Trempealeau, Black, and Mississippi Rivers. The areas of Marsh consist of loamy alluvium or muck and are covered by shallow water for a large part of each year.

These areas are too wet to cultivate or to pasture.

Natural vegetation consists of rushes, sedges, cat-

TABLE 2.—*Predicted yields per acre of principal field crops and pasture under a high level of management*

[Absence of a figure indicates that the soil is not suited to the crop or that the crop is not ordinarily grown on the soil]

Soil	Corn	Oats	Alfalfa-brome	Pasture	Soil	Corn	Oats	Alfalfa-brome	Pasture
	Bu	*Bu*	*Tons*	*Animal-unit-days* [1]		*Bu*	*Bu*	*Tons*	*Animal-unit-days* [1]
Billett fine sandy loam, 0 to 2 percent slopes	75	60	2.5	90	Fayette silt loam, 12 to 20 percent slopes, severely eroded	--	50	3.0	115
Billett fine sandy loam, 2 to 6 percent slopes	75	58	2.4	85	Fayette silt loam, 20 to 30 percent slopes	--	--	3.2	115
Billett fine sandy loam, 6 to 12 percent slopes, eroded	65	55	2.0	75	Gale silt loam, 2 to 6 percent slopes	90	65	3.5	120
Billett fine sandy loam, 12 to 20 percent slopes, eroded	55	45	1.8	65	Gale silt loam, 6 to 12 percent slopes	85	60	3.5	110
Boaz silt loam, 0 to 3 percent slopes [2]	95	65	3.5	130	Gale silt loam, 6 to 12 percent slopes, eroded	83	58	3.5	105
Boone loamy sand, 2 to 6 percent slopes	45	35	1.8	50	Gale silt loam, 12 to 20 percent slopes	80	55	3.3	95
Boone loamy sand, 6 to 12 percent slopes, eroded	35	35	1.5	40	Gale silt loam, 12 to 20 percent slopes, eroded	75	50	3.0	90
Boone loamy sand, 12 to 30 percent slopes, eroded	--	--	---	---	Gale silt loam, shallow, 6 to 12 percent slopes, eroded	70	55	2.8	80
Denrock silt loam [2]	95	60	4.0	120	Gale silt loam, shallow, 12 to 20 percent slopes, eroded	--	50	2.5	75
Denrock silt loam, wet subsoil variant [2]	85	60	4.0	110	Gale silt loam, shallow, 20 to 30 percent slopes, eroded	--	--	2.0	65
Dickinson fine sandy loam, 0 to 2 percent slopes	70	55	2.5	85	Gotham loamy fine sand, 0 to 2 percent slopes	60	60	2.5	65
Dickinson fine sandy loam, 2 to 6 percent slopes	68	55	2.5	75	Gotham loamy fine sand, 2 to 6 percent slopes	60	60	2.0	60
Dickinson loam, 0 to 3 percent slopes	80	60	3.0	100	Gotham loamy fine sand, 6 to 12 percent slopes	50	55	2.0	55
Downs silt loam, 0 to 2 percent slopes	120	75	4.5	150	Gotham loamy fine sand, 12 to 20 percent slopes, eroded	--	50	2.0	50
Downs silt loam, 2 to 6 percent slopes	115	75	4.5	150					

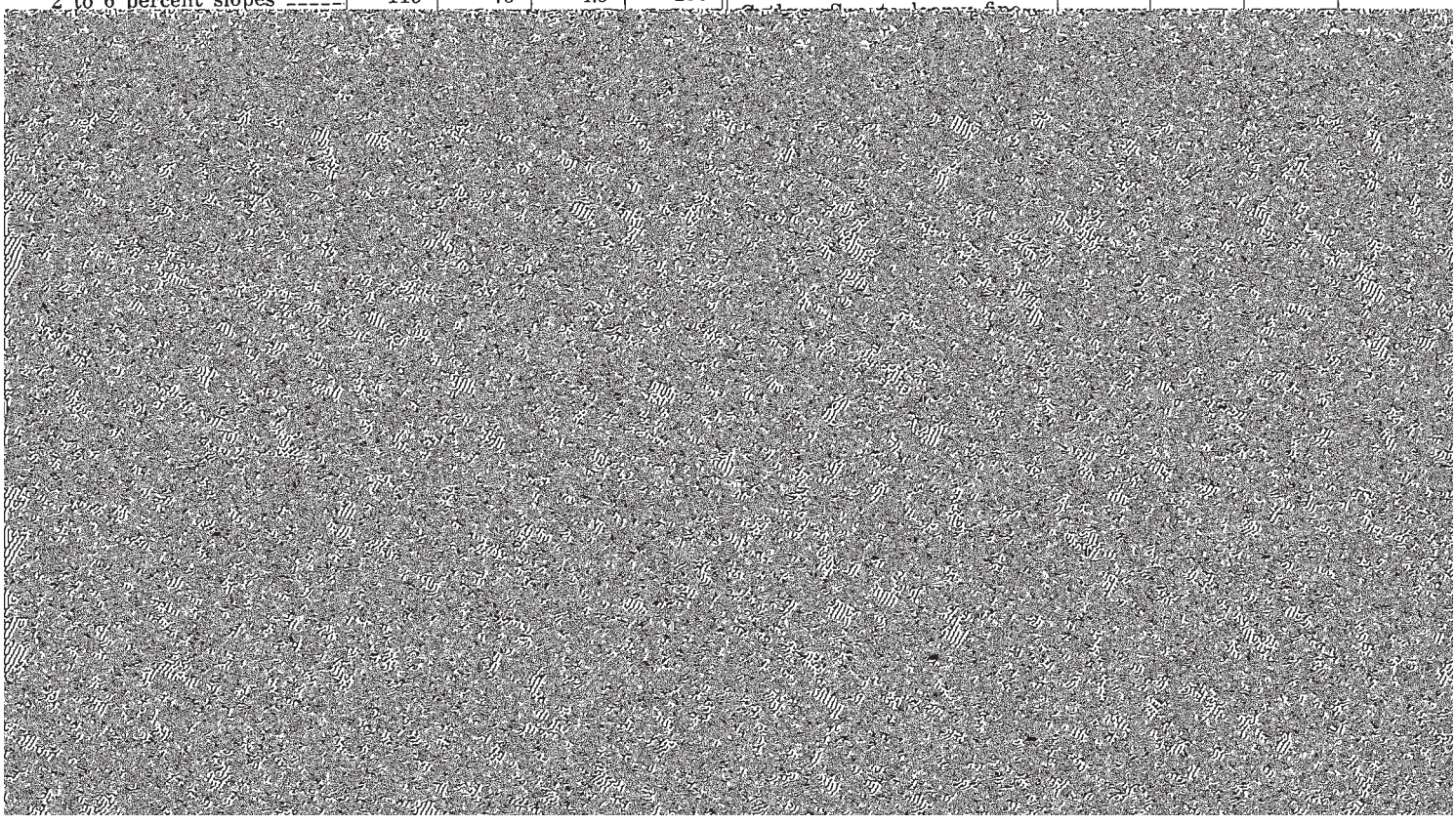


TABLE 2.—*Predicted yields per acre of principal field crops and pasture under a high level of management* —Continued

Soil	Corn	Oats	Alfalfa-brome	Pasture
	Bu	*Bu*	*Tons*	*Animal-unit-days* [1]
Meridian loam, 0 to 2 percent slopes	85	70	3.0	130
Meridian loam, 2 to 6 percent slopes	80	65	3.0	125
Meridian loam, 6 to 12 percent slopes, eroded	75	60	2.5	120
Morocco loamy sand, 0 to 3 percent slopes [2]	55	45	2.3	85
Muscatine silt loam, 0 to 3 percent slopes [2]	130	70	4.5	155
Norden loam, 4 to 12 percent slopes, eroded	90	65	4.0	115
Norden loam, 12 to 20 percent slopes, eroded	70	55	3.2	105
Norden silt loam, 2 to 6 percent slopes, eroded	95	70	4.0	130
Norden silt loam, 6 to 12 percent slopes, eroded	90	65	3.8	125
Norden silt loam, 12 to 20 percent slopes, eroded	75	60	3.5	110
Norden silt loam, 20 to 30 percent slopes, eroded	--	--	3.0	110
Palms muck [2]	100	40	2.1	110
Palsgrove silt loam, 2 to 6 percent slopes	110	70	4.0	150
Palsgrove silt loam, 6 to 12 percent slopes, eroded	85	65	3.8	135
Palsgrove silt loam, 12 to 20 percent slopes, eroded	75	55	3.0	125
Palsgrove silt loam, clayey subsoil variant, 2 to 6 percent slopes	100	65	3.8	135
Palsgrove silt loam, clayey subsoil variant, 6 to 12 percent slopes	95	60	3.5	130
Palsgrove silt loam, clayey subsoil variant, 12 to 20 percent slopes	75	55	2.8	115
Palsgrove silt loam, clayey subsoil variant, 12 to 20 percent slopes, eroded	70	50	2.5	110
Palsgrove silt loam, clayey subsoil variant, 20 to 30 percent slopes	--	--	2.5	105
Palsgrove soils, clayey subsoil variant, 12 to 20 percent slopes, severely eroded	--	38	2.0	95
Pillot silt loam, 0 to 2 percent slopes	90	65	3.5	140
Pillot silt loam, 2 to 6 percent slopes	90	60	3.5	130
Pillot silt loam, 6 to 12 percent slopes, eroded	80	55	3.0	120
Port Byron silt loam, 2 to 6 percent slopes	110	75	4.3	155
Port Byron silt loam, 6 to 12 percent slopes, eroded	105	70	4.0	140
Port Byron silt loam, 12 to 20 percent slopes, eroded	100	65	3.7	135
Port Byron silt loam, 20 to 30 percent slopes	--	--	3.5	120
Sandy alluvial land	55	40	2.5	35
Sandy terrace escarpments	--	--	---	---
Seaton silt loam, 2 to 6 percent slopes	110	75	4.2	150
Seaton silt loam, 6 to 12 percent slopes	105	70	4.5	135
Seaton silt loam, 6 to 12 percent slopes, eroded	100	70	4.0	130
Seaton silt loam, 12 to 20 percent slopes, eroded	85	65	3.4	125
Seaton silt loam, 20 to 30 percent slopes	--	--	3.0	115
Seaton silt loam, 20 to 30 percent slopes, eroded	--	--	2.6	110
Shiffer loam, 0 to 3 percent slopes [2]	90	65	3.0	125
Sparta loamy sand, 0 to 2 percent slopes	55	45	2.5	70
Sparta loamy sand, 2 to 6 percent slopes	50	40	2.2	65
Sparta loamy sand, 6 to 12 percent slopes	43	35	2.0	55
Sparta loamy fine sand, mottled subsoil variant, 0 to 3 percent slopes [2]	60	48	2.7	85
Stony and rocky land	--	--	---	---
Trempe loamy sand, 0 to 2 percent slopes	45	40	2.0	70
Trempe loamy sand, 2 to 6 percent slopes	45	38	2.0	70
Trempealeau loam, 0 to 3 percent slopes	80	65	3.0	120
Trempealeau loam, mottled subsoil variant, 0 to 3 percent slopes [2]	75	65	3.0	110
Urne fine sandy loam, 2 to 6 percent slopes	70	60	3.0	120
Urne fine sandy loam, 6 to 12 percent slopes, eroded	65	58	3.0	110
Urne fine sandy loam, 12 to 20 percent slopes, eroded	--	50	2.7	95
Urne fine sandy loam, 20 to 30 percent slopes, eroded	--	--	2.0	65
Urne fine sandy loam, 30 to 45 percent slopes	--	--	---	50
Urne silt loam, 6 to 12 percent slopes, eroded	75	60	3.4	110
Urne silt loam, 12 to 20 percent slopes, eroded	--	55	3.0	100
Urne silt loam, 20 to 30 percent slopes, eroded	--	--	2.2	90
Urne-Norden complex, 12 to 20 percent slopes, eroded	60	50	3.2	110
Urne-Norden complex, 20 to 30 percent slopes	--	--	2.8	105
Urne-Norden complex, 30 to 45 percent slopes	--	--	---	70
Wallkill silt loam, 0 to 3 percent slopes [2]	100	50	3.0	100
Wet alluvial land	--	--	---	65
Whitehall silt loam, 0 to 3 percent slopes	100	70	3.5	130
Worthen silt loam, 0 to 3 percent slopes [3]	115	75	4.0	145

[1] Animal-unit-day is a term used to express the carrying capacity of pasture. It indicates the number of days one animal can be maintained on 1 acre of pasture without damage to the sod.

[2] Soil requires adequate drainage and protection from overflow for maximum yields.

[3] Soil requires protection from overflow for maximum yields.

Figure 20.—Open groves of oak trees were native vegetation on most valley benches and terraces when early settlers came to Trempealeau County.

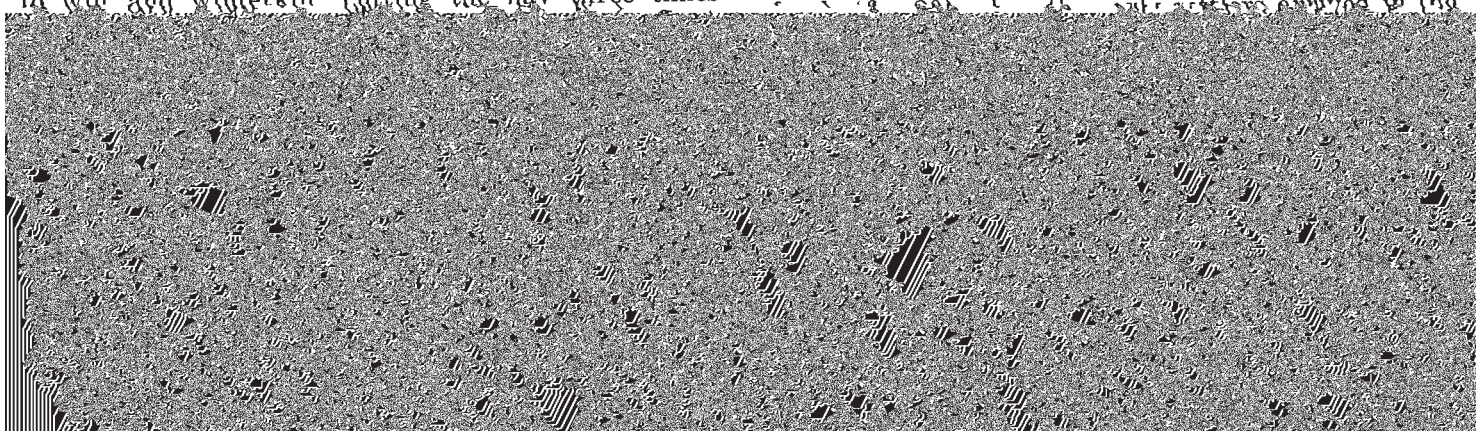
wet; planting seed of a good variety that is suited to the soil; and applying a fertilizer that is high in phosphorus and potash before the crop is seeded or at the time of planting. Both lime and fertilizer are applied in amounts indicated by the results of soil tests.

For hay, especially alfalfa hay, a high level of management consists of applying lime according to the needs indicated by the results of soil tests; growing varieties of grasses and legumes that are resistant to wilt and winterkill; cutting the hay three times

obtained through use of a larger quantity of a suitable fertilizer and more careful management. The county agent or a representative of the Soil Conservation Service can supply information on seeding mixtures and on the amount of lime and the kind and amount of fertilizer to use.

Woodland [2]

Much of the land area of Trempealeau County was in native prairie grasses intermingled with open stands



resulted in sprout growth from fire-damaged trees. Today in some steep areas old, thick-butted oaks that have heavy limbs near the ground are surrounded by much younger trees.

The wooded area of Trempealeau County now exceeds 120,000 acres, more than one-fourth of the land area, and is increasing. Changes in farming are chiefly responsible for this shift in land use. About 40 percent of the forest land is grazed by livestock. Much of this area is heavily grazed. Improved farming practices are reducing the amount of grazed acreage yearly.

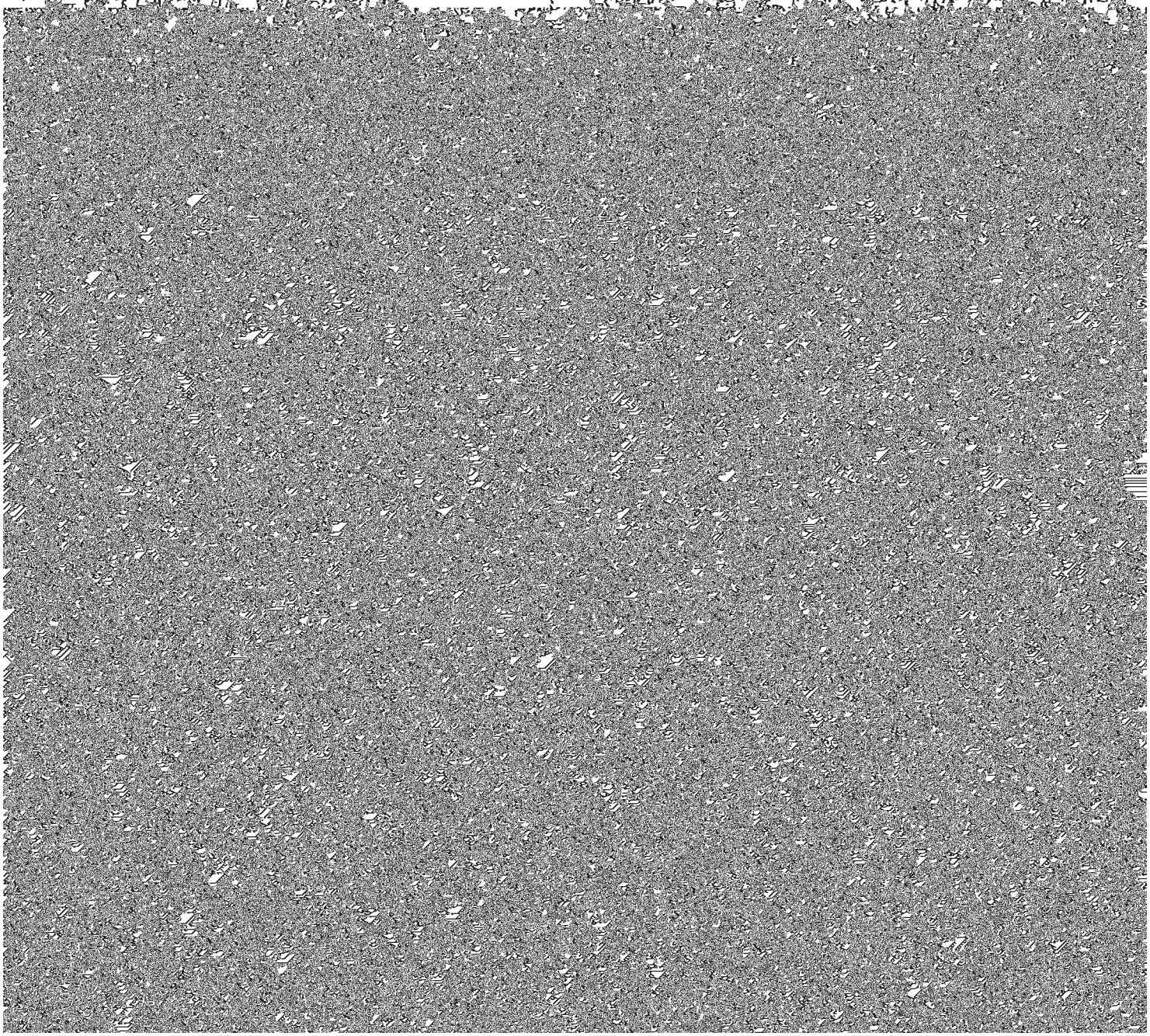
Landowners in Trempealeau County plant about 700,000 trees, reforesting about 700 acres of land, each year. Most of the trees planted are red and white pines, white and Norway spruce, and black walnut. Red pine is the most commonly planted species.

the tree species, woodland management, and timber harvest operations.

The potential tree growth for a woodland group is given as site index. Site index is the expected height of dominant trees in the stand at the age of 50 years. The site indexes given are actual measurements taken in or near Trempealeau County on soils of the group.

Also discussed are ratings for hazards and limitations to woodland management. If a hazard or limitation is slight or slight to moderate, it is not discussed.

Seedling mortality, or establishment hazard, refers to the expected loss of seedlings as a result of unfavorable characteristics of the soil. A rating of *slight* indicates that a loss of not more than 25 percent of the seedlings is expected, or that trees ordinarily regenerate naturally where there are adequate sources

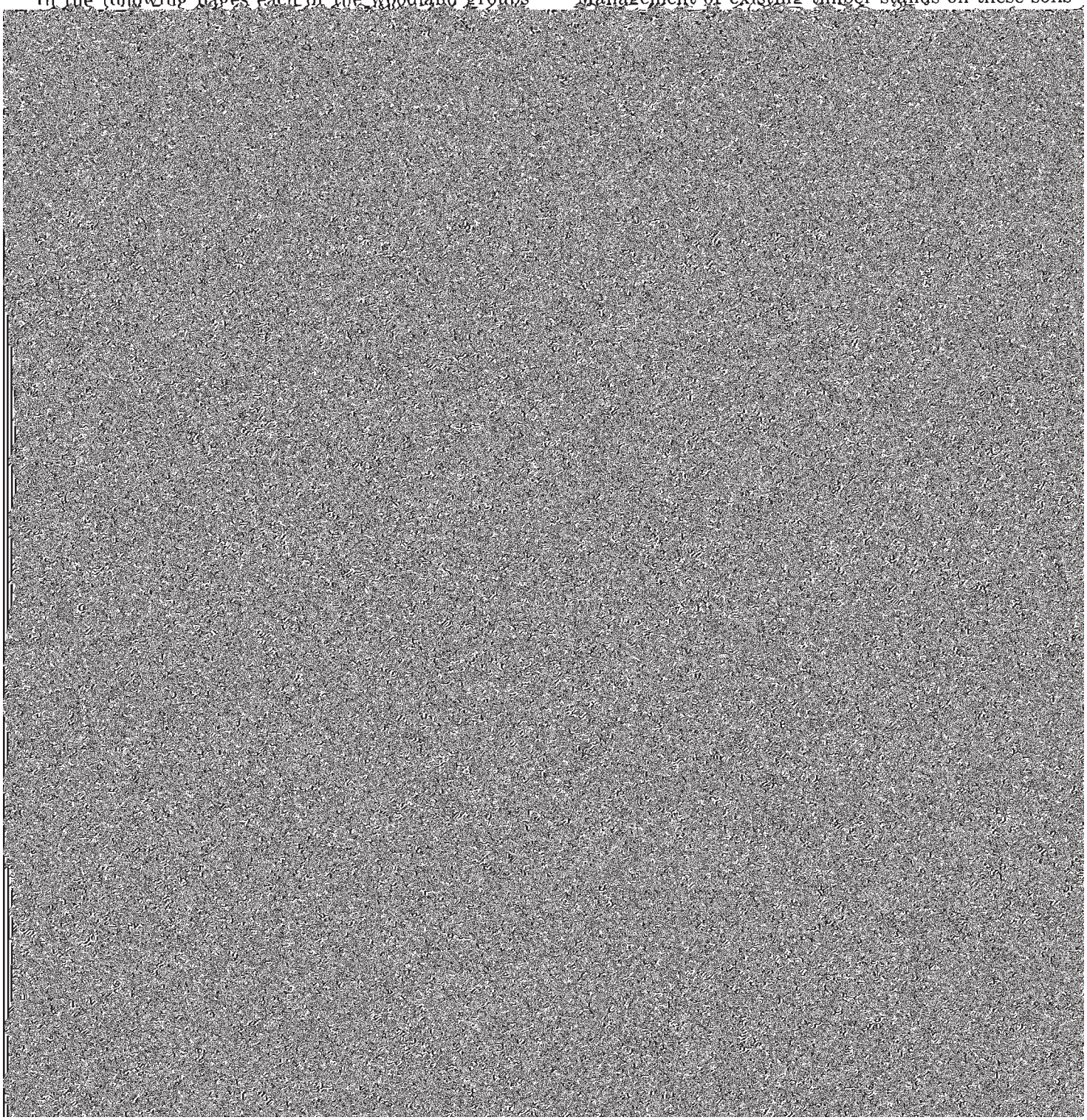


expected. Generally, erosion is slight if slopes range from 0 to 2 percent and runoff is very slow. The erosion hazard is *moderate* where there is a moderate loss of soil, runoff is not controlled, and the plant cover is not adequate for protection. It is *severe* where steep slopes, rapid runoff, slow infiltration and permeability, and past erosion make the soil susceptible to severe erosion.

In the following pages each of the woodland groups

grass is slight or moderate. Seedling mortality is slight to moderate. Available moisture is somewhat limited, but this limitation is offset by a lack of competition from weeds and brush. Equipment limitations and the hazard of erosion are moderate to severe in steep areas. In places the use of equipment is hampered by rock outcrop, particularly in areas of the Eleva-Boone complex.

Management of existing timber stands on these soils



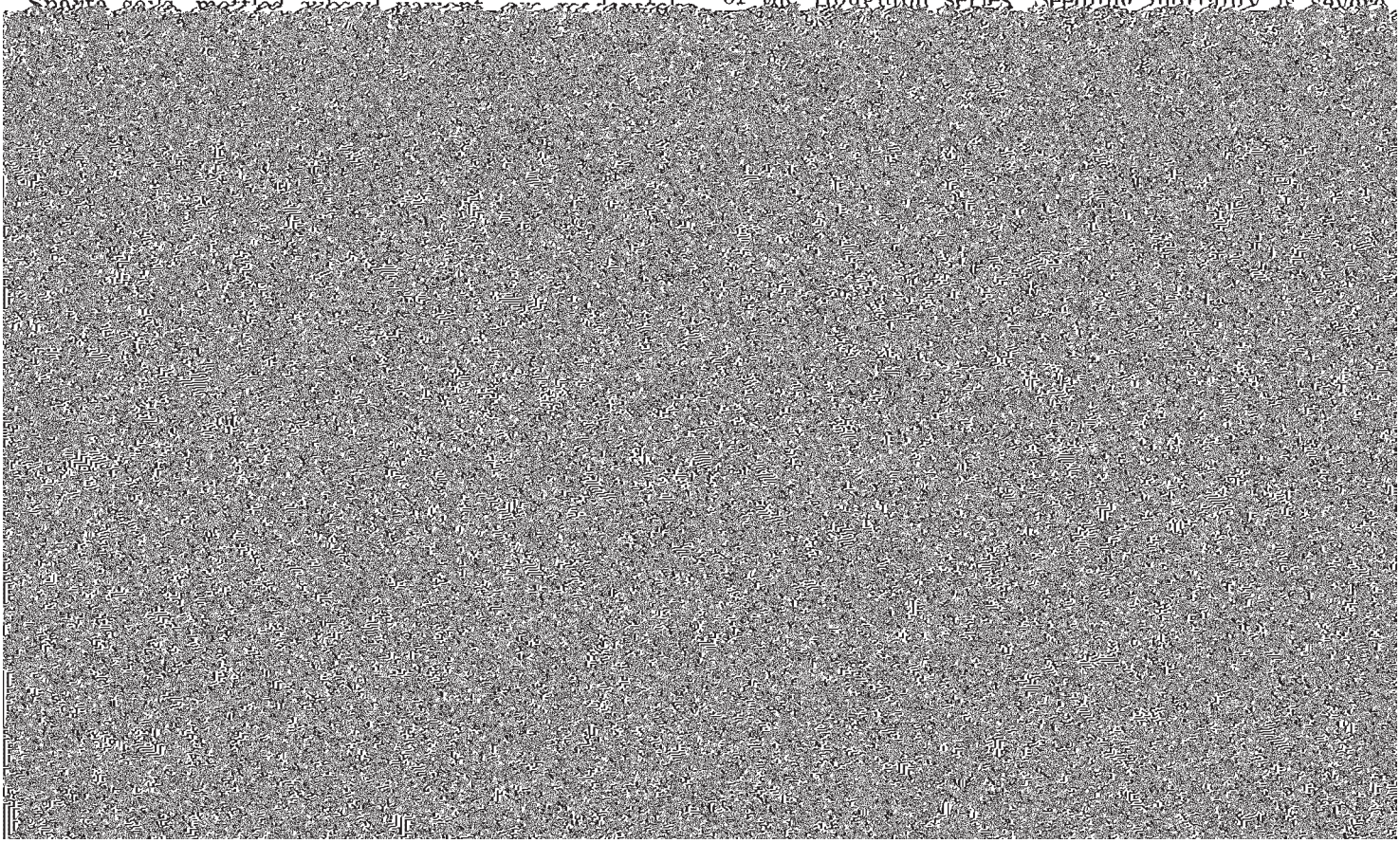
These soils have medium to high fertility. Available water capacity is moderate to high. Most of the soils are moderately permeable to moderately rapidly permeable, but some have a subsoil of silty clay and are slowly permeable. Rooting depth is limited by a seasonally high water table. The hazard of windthrow is high, and harvesting is limited to clearcutting or to very light selective cutting.

The areas of the soils in this group are generally used for crops and are seldom wooded. No site index measurements have been made. Competition from weeds and grass is severe. Seedling mortality is severe for all the soils in this group because of susceptibility to surface ponding and subsequent drownout of the young trees. The hazard of fungus disease is moderate to severe because of the wetness of the sites. Equipment limitations are severe because machinery for planting and harvesting can only be used when the soils are dry or frozen.

The wetland hardwoods that are suited to these soils grow fast. Soft maple, cottonwood, white and green ash, and elms occur naturally on the sites. On most sites, management that favors soft maple and cottonwood is the most profitable. Soft maple, green ash, or cottonwood are well suited to planting, but planting for reforestation is rare on these soils.

WOODLAND GROUP 8

This group consists mainly of somewhat poorly drained soils. Moderately coarse textured and coarse textured Morocco soils and Sparta soils, mottled subsoil variant, are in this group. Some areas of the Sparta soils, mottled subsoil variant, are [illegible]



These soils generally have high fertility, but fertility is medium in Wallkill soils. Available water capacity is high or very high. Permeability is moderate, but a seasonal high water table limits the rooting depth.

Seedling mortality, equipment limitations, and competition from weeds and grass are severe. The hazard of soil-related diseases is moderate to severe, and the hazard of windthrow is high. No site index measurements have been made on the soils of this group.

Cottonwood and the soft maples are commonly occurring species on these soils, and they are suitable to favor in managing existing stands. The soils in this group are generally used for farm crops and are seldom reforested, but either soft maple or cottonwood is well suited to this purpose.

WOODLAND GROUP 10

This group consists of deep, poorly drained organic soils on the valley bottoms. In this group are soils of the Palms and Houghton series and areas of Marsh.

These soils have moderately low or medium fertility. Available water capacity is very high. Although permeability is moderately rapid in the Houghton and Palms soils, a high water table and surface ponding create very wet conditions for tree growth throughout most of the growing season. This wetness also severely limits the rooting zone. The hazard of windthrow is very severe, and harvest operations are limited to clearcutting. Tree growth on organic soils is usually slow. Areas of Marsh seldom support trees, because of the prevailing wet conditions.

No site index measurements have been made on soils of the Houghton series. Seedling mortality is severe

Competition from weeds and grass is severe. The hazard of seedling mortality is severe on these soils, especially those in areas where slopes face south or west. Equipment limitations and the hazard of erosion are severe in steep areas.

Native stands of trees on these soils consisted of widely spaced oaks of the open-grown or savanna type. Few stands remain. White and red pines, Norway and Black Hills spruce, and northern white cedar are well suited to planting for windbreaks. Planting for woodland purposes is very unlikely on the soils of this group consists of soils that require similar management, that respond to management in about the same way, and that have similar hazards or limitations that affect their use. To determine the mapping units in each wildlife group, refer to the "Guide to Mapping Units."

In table 3 each wildlife group is rated good, fair, poor, or very poor for specified elements of wildlife habitat. A rating of *good* indicates that the soil has no limitations or the limitations are easy to overcome; *fair* means that the soils have limitations that can be overcome by average management and manipulation; *poor*

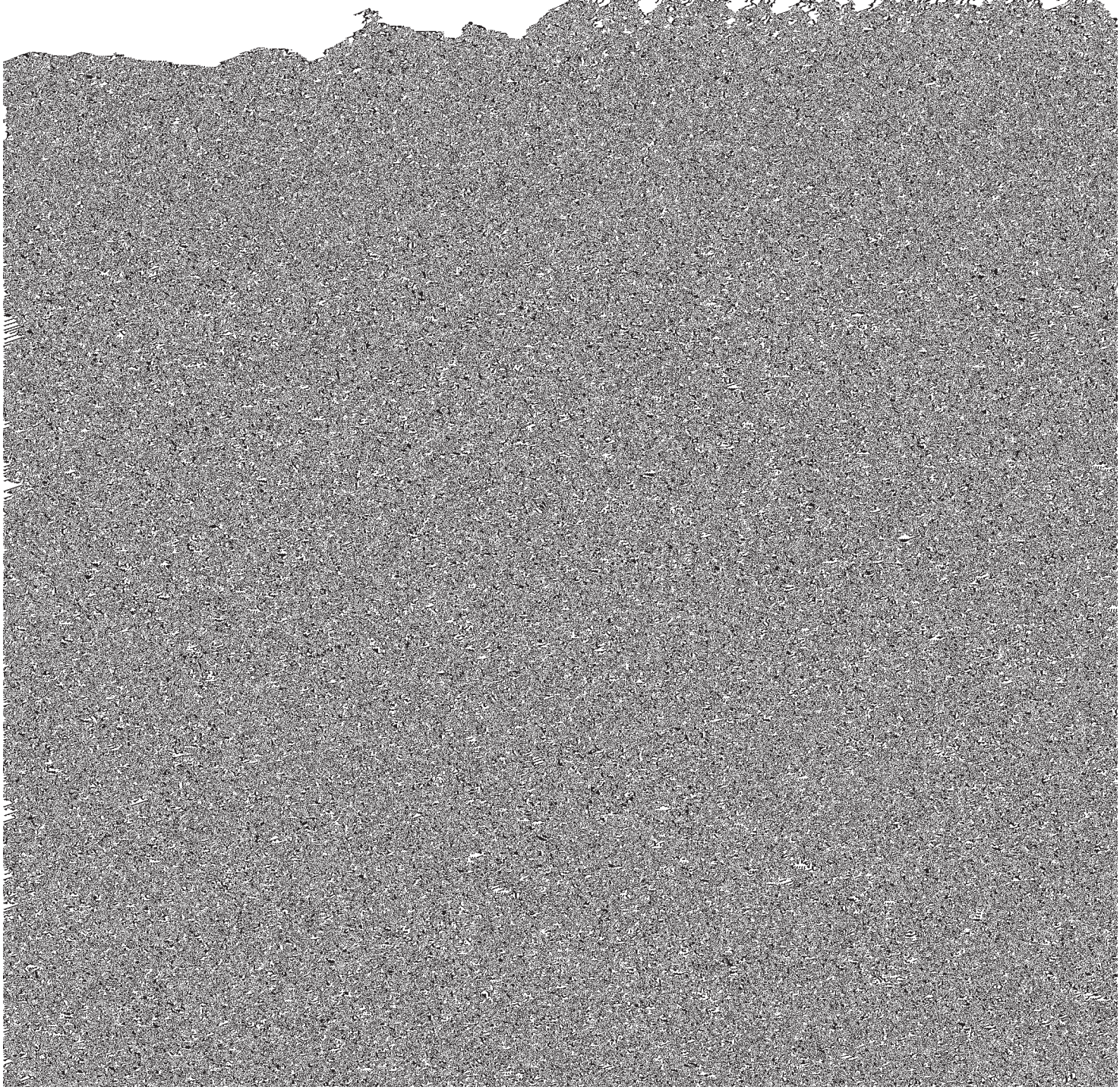


TABLE 3.—*Suitability of soils for elements of wildlife habitat*

Wildlife groups, descriptions of the soils, series, and mapping units	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Woody plants		Wetland plants	Shallow and deep water developments
				Hardwood trees and shrubs	Coniferous trees		
Group 1: Well drained and moderately well drained soils that are loamy throughout and that are not subject to flooding. Downs: DoA, DoB, DoC2, DoD2. Eleva: ElB2, ElC2, ElD2, ElE2, EoE. Fayette: FaB, FaC, FaC2, FaD, FaD2, FaD3, FaE. Gale: GaB, GaC, GaC2, GaD, GaD2. Gullied land: Gu. Hixton: HnB2, HnC2, HnD2, HnE2, HnF. La Farge: LfB2, LfC2, LfD2, LfE, LfE2. Loamy terrace escarpments: Lx. Meridian: MdA, MdB, MdC2. Norden: NoC2, NoD2, NrB2, NrC2, NrD2, NrE2. Palsgrove: PgB, PgC2, PgD2. Palsgrove, clayey subsoil variant: PlB, PlC, PlD, PlD2, PlE, PnD3. Seaton: SeB, SeC, SeC2, SeD2, SeE, SeE2. Urne-Norden complex: UrD2, UrE, UrF.	Good where slopes are 0 to 6 percent; fair where slopes are 6 to 12 percent; poor where slopes are 12 to 20 percent; very poor where slopes are more than 20 percent.	Good where slopes are 0 to 12 percent; fair where slopes are 12 to 20 percent; poor where slopes are more than 20 percent.	Good -------	Good where slopes are 0 to 20 percent; fair where slopes are more than 20 percent.	Good where slopes are 0 to 20 percent; fair where slopes are more than 20 percent.	Poor where slopes are 0 to 2 percent; very poor where slopes are more than 2 percent; few species suited.	Very poor: slopes as steep as 45 percent; moderately to rapidly permeable substratum or slowly permeable substratum underlain by fissured limestone bedrock.
Group 3: Excessively drained to well-drained soils that are sandy or loamy throughout and that have low available water capacity. Billett: BlA, BlB, BlC2, BlD2. Boone: BnB, BnC2, BnE2. Dickinson: DkA, DkB. Dunnville: DuA, DuB, DuC. Eleva: EnF. Gale, shallow phase: GlC2, GlD2, GlE2. Gotham: GoA, GoB, GoC, GoD2, GpD. Sandy terrace escarpments: Sd. Sparta: SpA, SpB, SpC. Trempe: TrA, TrB. Urne: UfB, UfC2, UfD2, UfE2, UfF, UnC2, UnD2, UnE2.	Fair where slopes are 0 to 6 percent; poor where slopes are 6 to 12 percent; very poor where slopes are more than 12 percent; droughty; water erosion hazard.	Fair where slopes are 0 to 12 percent; poor where slopes are more than 12 percent; droughty.	Fair: droughty.	Fair: droughty.	Fair: droughty.	Poor where slopes are 0 to 2 percent; very poor where slopes are more than 2 percent; few species suited.	Very poor: moderately to rapidly permeable subsoil: very pervious substratum.
Group 4: Well drained to moderately well drained soils that have a thick, dark surface layer and that are loamy throughout. Dickinson: DlA. Pillot: PoA, PoB, PoC2. Port Byron: PrB, PrC2, PrD2, PrE. Trempealeau: TuA. Whitehall: WhA. Worthen: WoA.	Good where slopes are 0 to 6 percent; fair where 6 to 12 percent; poor where 12 to 20 percent; very poor where more than 20 percent.	Good where slopes are 0 to 12 percent; fair where 12 to 20 percent; poor where more than 20 percent.	Good -------	Fair: grass competition.	Fair: grass competition; some species not suited.	Poor where slopes are 0 to 2 percent; very poor where more than 2 percent; few species unsuited.	Poor where slopes are 0 to 6 percent; very poor where more than 6 percent; moderately permeable subsoil; pervious to very pervious substratum.

TABLE 3.—*Suitability of soils for elements of wildlife habitat*—Continued

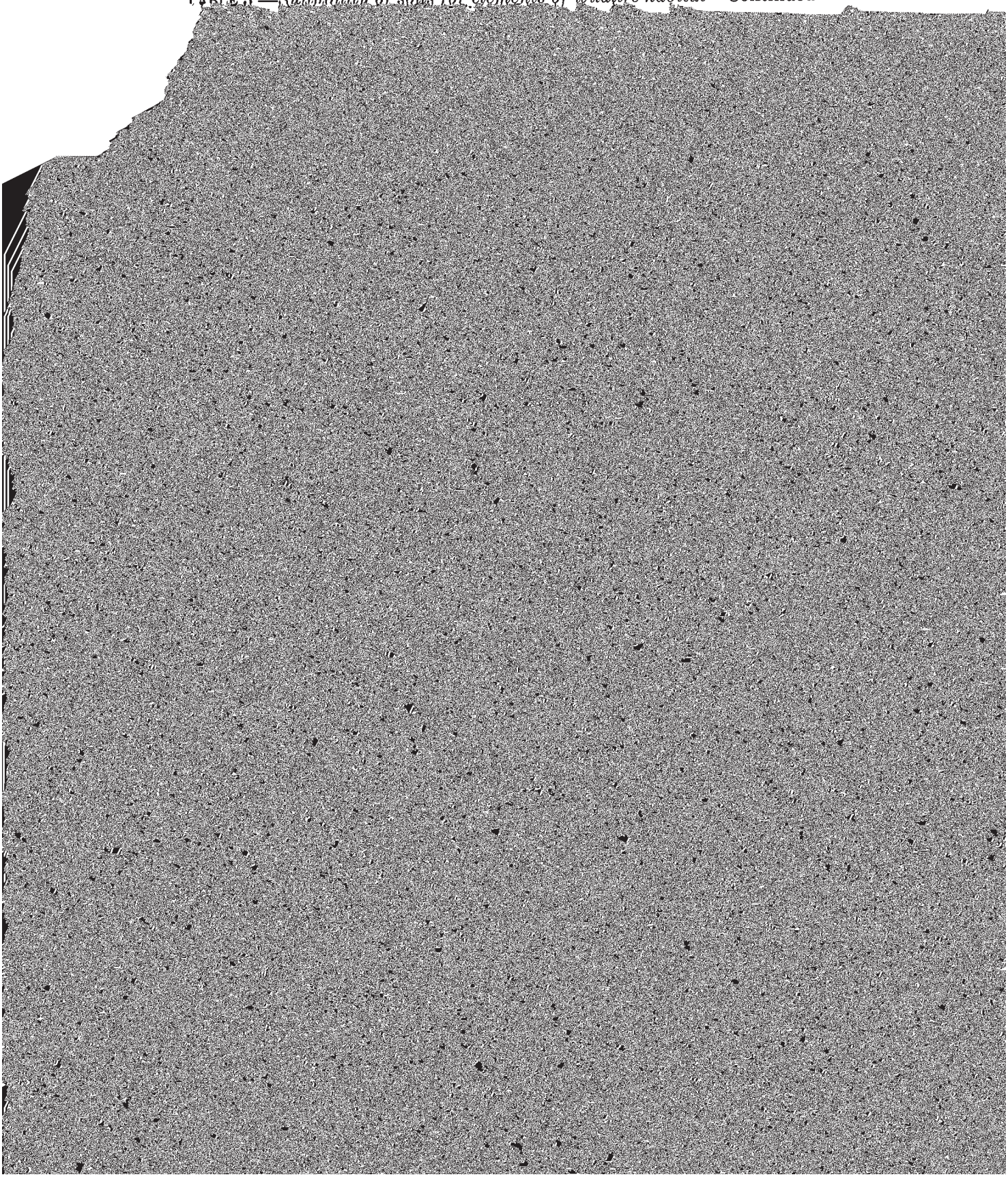


TABLE 4.—*Importance of elements of wildlife habitat for selected species of wildlife*

[A rating of 4 means very important; 3, important; 2, some value; and 1, little or no value. Absence of a rating indicates that the element is not relevant to the species]

Wildlife	Grain and seed crops		Grasses and legumes		Wild herbaceous upland plants	Woody plants			Wetland plants	Water areas	
	Harvested	Unharvested	Harvested	Unharvested		Shrubs	Hardwood trees	Coniferous trees		Shallow water	Deep water
Migratory waterfowl:											
Ducks	3	3	1	3	3	--	1	--	[1]4	[1]4	4
Geese	4	4	4	1	--	--	--	--	2	3	4
Upland game birds:											
Hungarian partridge	4	4	3	4	4	1	--	--	1	--	--
Pheasant	4	4	--	[1]4	[1]4	4	--	1	[1]4	3	--
Quail	4	4	2	4	4	[1]4	2	1	4	3	--
Ruffed grouse	1	1	1	2	2	[1]4	[1]4	3	--	--	--
Sharp-tailed grouse	3	4	3	4	4	4	3	1	4	1	--
Woodcock	--	--	1	3	3	4	4	2	3	--	--
Small game:											
Cottontail rabbit	3	4	3	[1]4	[1]4	[1]4	3	1	2	3	--
Snowshoe rabbit	--	--	--	1	1	[1]4	3	[1]4	1	--	--
Raccoon	3	4	--	1	1	2	4	--	1	[1]4	4
Squirrel	3	4	--	1	1	2	[1]4	1	--	--	--
Large game: Deer	3	4	3	3	4	4	4	4	3	3	2
Fur bearers:											
Beaver	--	--	--	--	--	4	[1]4	--	4	4	[1]4
Red fox	2	3	2	3	3	3	2	1	3	3	1
Mink	--	--	--	--	--	2	1	1	3	[1]4	[1]4
Muskrat	1	1	--	--	--	1	--	--	4	[1]4	[1]4

[1] Key or critical elements for the species.

species not rated, they may be compared to another species having about the same requirements. Songbirds make up an important segment of the wildlife in Trempealeau County, but their habitat elements were not rated. The wide variety of habitat requirements for the numerous species of songbirds prohibits any one set of elements being equally satisfactory for all. In general, the maximum variety of habitat will produce the most variety and highest populations of songbirds.

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissioners, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

[4] ROBERT C. BINTZLER, assistant State conservation engineer, Soil Conservation Service, helped to prepare this section.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, several estimated soil properties significant to engineering; interpretations of engineering properties; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engi-

neering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 5 feet. Also, inspection of sites, especially of small ones, is needed because many delineated areas of a given soil mapping unit contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have different meanings in soil science than in engineering. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*11*), used by the SCS engineers, Department of Defense, and others, and the AASHO system (*1*), adopted by the American Association of State Highway Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example CL-ML.

The AASHO system is used to classify soils accord-

the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 5 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand". "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 5 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in

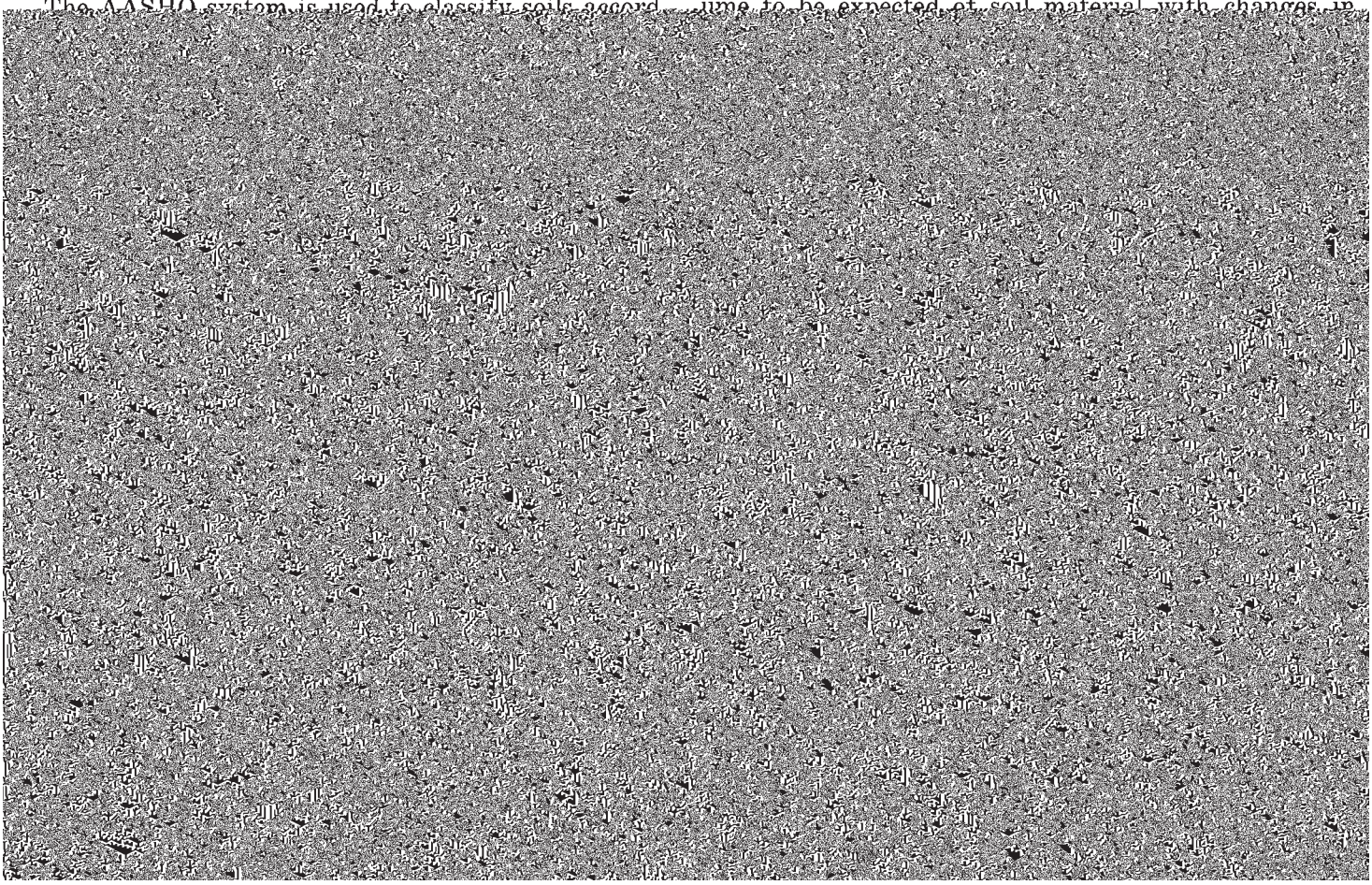
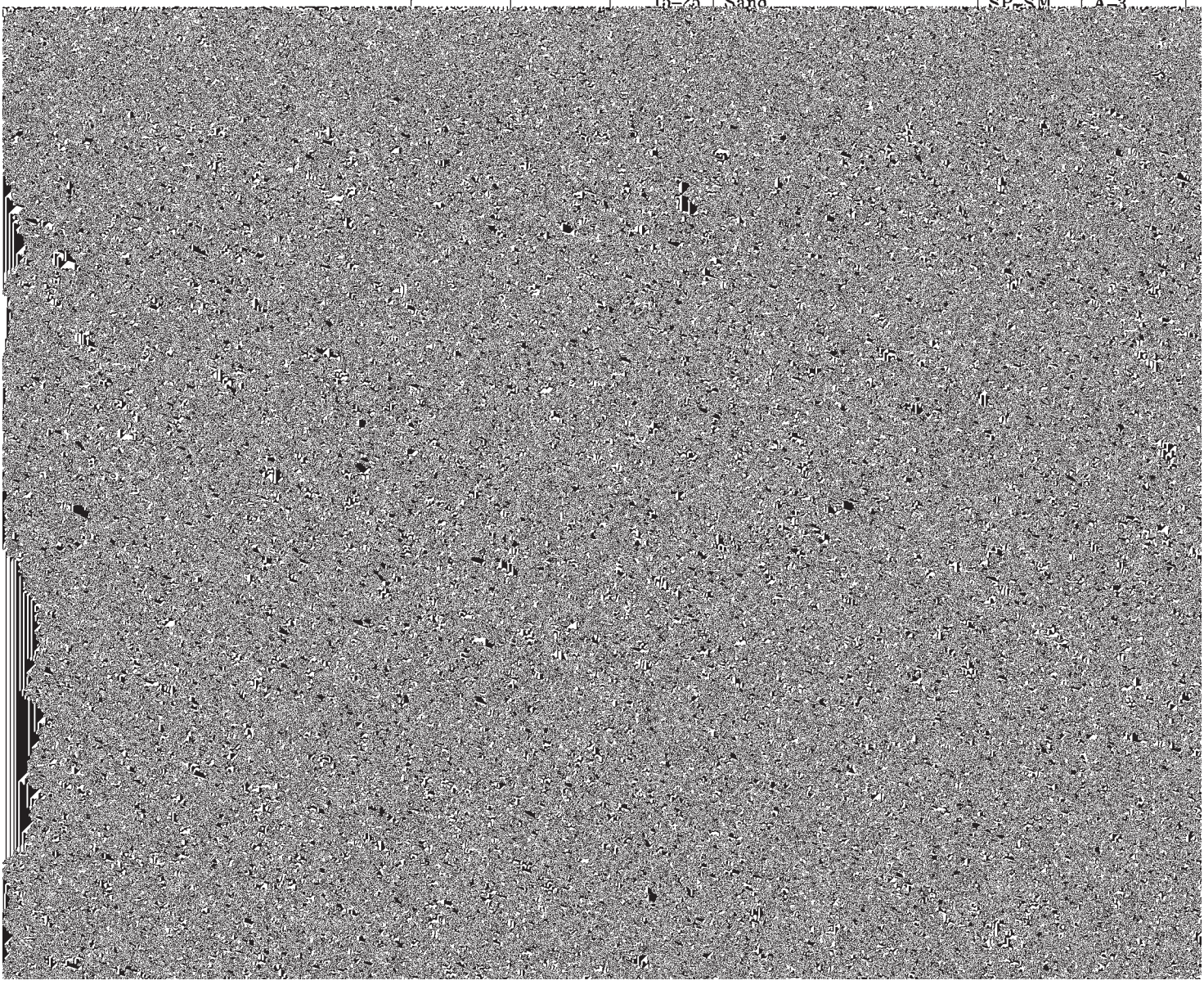


TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. the instructions for referring to other series that appear in

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification	
	Bedrock	Seasonal high water table			Unified	AASHO
	Feet	*Feet*	*Inches*			
Billett: BlA, BlB, BlC2, BlD2	>5	>5	0–9	Fine sandy loam	SM	A–4
			9–30	Fine sandy loam	SM	A–4
			30–60	Sand	SP–SM	A–3
Boaz: BmA	>5	1–3	0–16	Silt loam	CL	A–6
			16–38	Heavy silt loam	CL	A–6
			38–60	Silt loam	CL	A–6
Boone: BnB, BnC2, BnE2	2–4	>5	0–15	Loamy sand	SM	A–2
			15–25	Sand	SP–SM	A–3



significant to engineering

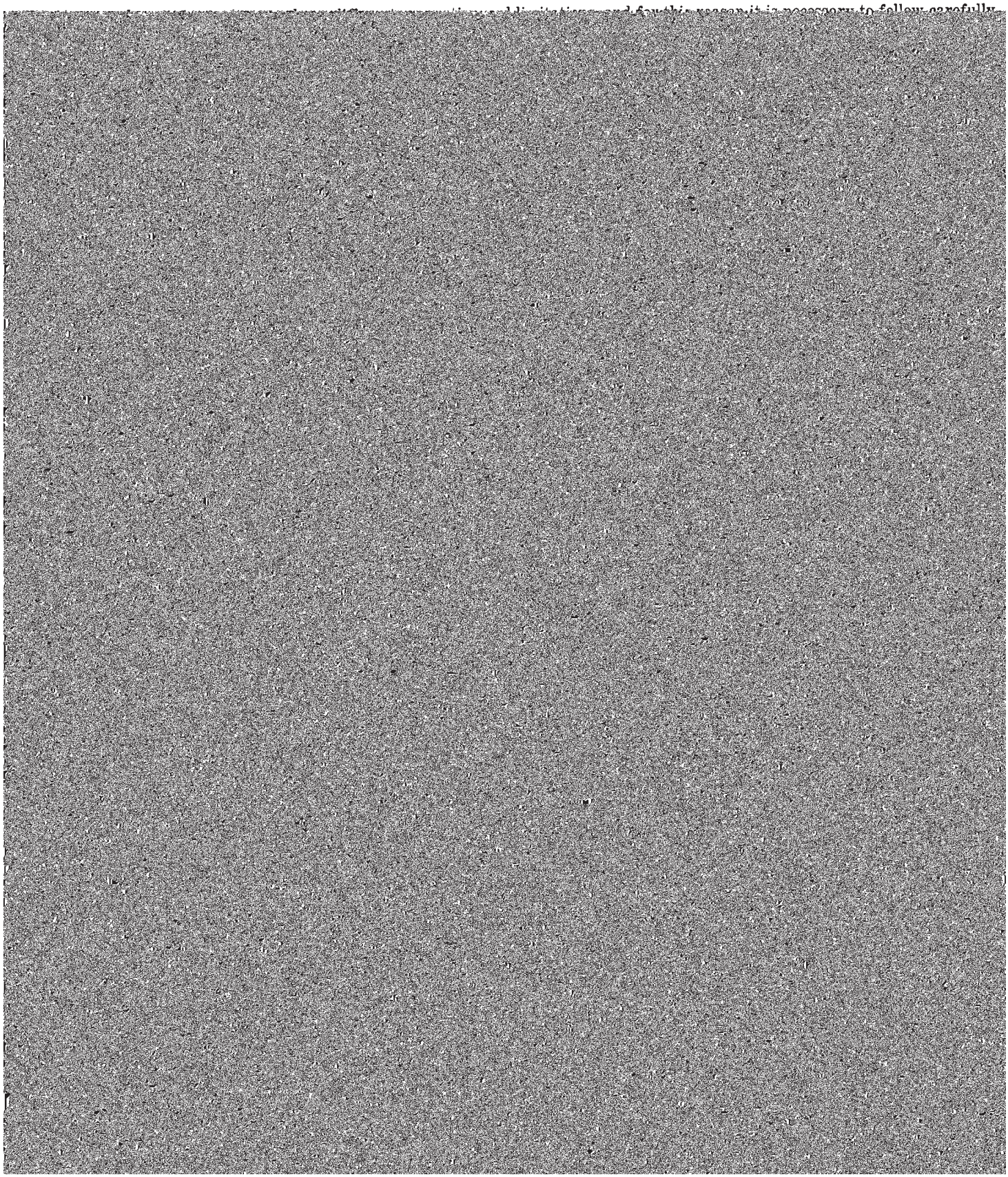


TABLE 5.—*Estimated soil properties*

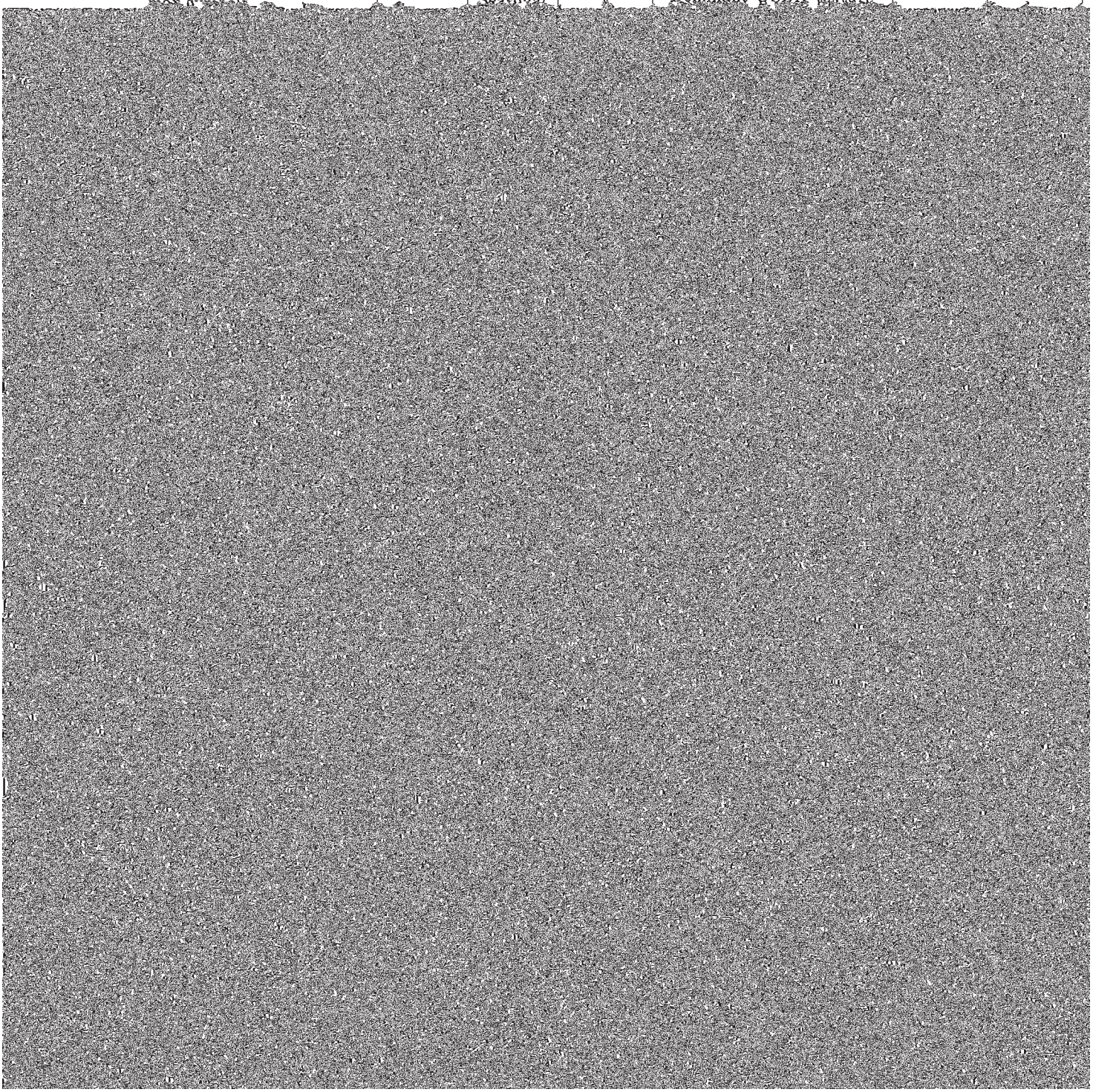
Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification	
	Bedrock	Seasonal high water table			Unified	AASHO
	Feet	*Feet*	*Inches*			
Gullied land: Gu. Variable; no valid estimates can be made.						
Hixton: HnB2, HnC2, HnD2, HnE2, HnF	2–5	>5	0–10	Loam	ML	A–4
			10–34	Loam	ML	A–4
			34–40	Sand	SP–SM	A–3
			40–60	Sandstone.[3]		
Houghton: Ho	>5	0–1	0–60	Muck	Pt	([5])
			60–70	Loamy sand	SM	A–2
Huntsville: HuA	>5	4–6	0–38	Silt loam	ML or CL	A–4 or A–6
			38–60	Silt loam	ML	A–4
Kato, sandy loam variant: Ka	>5	1–2	0–11	Loam	ML	A–4
			11–30	Sandy loam	SM	A–2 or A–4
			30–60	Sand	SP or SM	A–3 or A–2
Kato: KcA	>5	0–1	0–10	Silt loam	CL	A–6
			10–34	Silt loam	CL	A–6
			34–60	Sand	SP–SM	A–3
La Farge: LfB2, LfC2, LfD2, LfE, LfE2	>5	>5	0–9	Silt loam	ML	A–4
			9–29	Silty clay loam	CL	A–6
			29–36	Loam and sandy loam	ML or SM	A–2 or A–4
			36–60	Soft sandstone.[3]		
Lawson: LsA	>5	1–5	0–30	Silt loam	ML or CL	A–6
			30–60	Silt loam	ML or CL	A–6
Loamy alluvial land: Lv	>5	1–5	0–9	Silt loam	ML	A–4
			9–40	Sand and silt	SM or ML	A–2 or A–4
Loamy terrace escarpments: Lx	>5	>5	0–40	Loam and silt loam	ML	A–4
Marsh: Ma. Variable; no valid estimates can be made.						
Meridian: MdA, MdB, MdC2	>5	>5	0–9	Loam	SM or ML	A–4
			9–30	Loam	SC–SM or ML	A–4
			30–60	Sand	SP	A–3
Morocco: MoA	>5	1–3	0–16	Loamy sand	SM	A–2
			16–60	Sand	SP	A–3
Muscatine: MuA	>5	1–3	0–15	Silt loam	CL	A–7
			15–45	Silty clay loam	CH	A–7
			45–60	Silt loam	CL	A–6

See footnotes at end of table.

significant to engineering—Continued

Percentage less than 3 inches passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity[1]	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	85–95	50–60	0.63–2.0	0.20–0.22	[2] 5.1–6.5	Low	Low	Moderate.
100	85–95	55–65	0.63–2.0	0.17–0.19	4.5–6.0	Low.		
90–100	50–70	5–10	6.3–20.0	0.05–0.07	5.1–5.5	Very low.		
([6])	([6])	([6])	2.0–6.3	0.25–0.35	6.6–7.3	Very low	High	Low.
90–100	50–75	15–25	6.3–20.0	0.12–0.16	6.6–7.3	Very low.		
100	95–100	80–100	0.63–2.0	0.22–0.24	5.6–7.3	Moderate	Moderate	Moderate.
100	90–100	70–90	0.63–2.0	0.22–0.24	5.6–6.0	Low.		
100	60–70	50–65	2.0–6.3	0.20–0.22	5.1–6.0	Low	Moderate to high.	High.
100	60–70	30–50	2.0–6.3	0.12–0.14	5.1–5.5	Low.		
85–95	50–70	0–15	6.3–20.0	0.05–0.10	4.5–6.0	Very low.		
100	95–100	90–100	0.63–2.0	0.22–0.24	5.6–6.0	Moderate	High	Moderate.
100	95–100	90–100	0.63–2.0	0.20–0.22	5.1–5.5	Moderate.		
100	65–80	5–10	6.3–20.0	0.05–0.07	5.1–5.5	Very low.		
100	95–100	90–100	0.63–2.0	0.22–0.24	6.1–7.3	Low	Moderate	Moderate.
100	90–100	85–95	0.63–2.0	0.18–0.20	5.1–5.5	Moderate.		
100	85–95	30–55	0.63–2.0	0.14–0.19	5.1–6.5	Low.		
100	90–100	80–100	0.63–2.0	0.22–0.24	6.6–7.3	Moderate	High	Low.
100	90–100	70–90	0.63–2.0	0.20–0.22	6.6–7.3	Moderate.		
100	90–100	70–90	0.63–2.0	0.20–0.24	6.1–6.5	Moderate	Moderate	Low.
100	90–100	15–80	0.63–2.0	0.11–0.18	7.9–8.4	Low.		
100	85–100	50–95	0.63–2.0	0.14–0.24	5.1–6.5	Low	Low	Low to moderate.
100	85–95	40–55	0.63–2.0	0.20–0.22	[2] 6.6–7.3	Low	Low	Moderate.
100	85–95	45–60	0.63–2.0	0.17–0.19	5.1–7.3	Low.		
100	65–80	0–5	6.3–20.0	0.05–0.07	5.1–5.5	Very low.		
100	50–75	15–20	6.3–20.0	0.10–0.12	5.1–6.0	Very low	Low to moderate.	Moderate.
100	50–75	0–5	6.3–20.0	0.05–0.07	5.6–6.0	Very low.		
100	95–100	90–100	0.63–2.0	0.22–0.24	[2] 6.6–7.3	Moderate	High	Moderate.
100	95–100	90–100	0.63–2.0	0.18–0.20	5.1–6.5	High.		
100	90–100	85–95	0.2–0.63	0.20–0.22	5.6–6.0	Moderate.		

TABLE 5.—*Estimated soil properties*



significant to engineering—Continued

Percentage less than 2 inches passing sieve					Corrosivity[1]

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification	
	Bedrock	Seasonal high water table			Unified	AASHO
	Feet	*Feet*	*Inches*			
Trempealeau: TuA	>5	>5	0–11	Loam	SM or ML	A–4
			11–25	Loam	SM or ML	A–4
			25–60	Sand	SP–SM	A–3
Trempealeau, mottled subsoil variant: TvA	>5	1–3	0–12	Loam	ML	A–4
			12–32	Sandy loam	SM	A–4
			32–60	Sand	SP–SM	A–3
*Urne: UfB, UfC2, UfD2, UfE2, UfF, UnC2, UnD2, UnE2, UsD2, UsE, UsF	2–3	>5	0–12	Silt loam	ML	A–4
			12–30	Very fine sandy loam	SM	A–4

significant to engineering—Continued

Percentage less than 3 inches passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity [1]	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	85–95	45–55	0.63–2.0	0.20–0.22	[2] 6.1–7.3	Low	Moderate	Moderate.
100	85–95	45–55	0.63–2.0	0.17–0.19	5.1–5.5	Low.		
100	50–70	5–10	6.3–20.0	0.05–0.07	5.6–6.0	Very low.		
100	85–95	50–70	0.63–2.0	0.20–0.22	[2] 6.6–7.3	Low	Moderate	Moderate.
80–100	60–70	35–45	0.63–2.0	0.12–0.14	5.1–5.5	Low.		
80–100	50–70	5–10	6.3–20.0	0.05–0.07	5.6–6.0	Very low.		
100	90–100	60–80	0.63–2.0	0.20–0.22	5.6–7.3	Low	Low	Low.
100	85–95	50–60	0.63–2.0	0.17–0.19	6.1–6.5	Low.		
100	90–100	80–100	0.63–2.0	0.22–0.24	7.4–7.8	Low	High	Low.
([5])	([5])	([5])	2.0–6.3	0.25–0.35	7.4–7.8	Low.		
100	85–95	0–60	0.63–20.0	0.05–0.22	6.1–7.8	Low.		
100	95–100	90–100	0.63–2.0	0.22–0.24	[2] 6.6–7.3	Low	Moderate	Moderate to high.
90–100	80–95	70–90	0.63–2.0	0.18–0.20	4.5–6.0	Moderate.		
90–100	50–70	5–10	0.63–2.0	0.05–0.07	4.5–5.0	Very low.		
100	90–100	85–95	0.63–2.0	0.22–0.24	[2] 6.6–7.3	Low	Moderate	Low.
100	90–100	85–95	0.63–2.0	0.20–0.22	6.1–6.5	Low.		

[1] Seasonal perched water table.
[5] Not applicable to the soil.

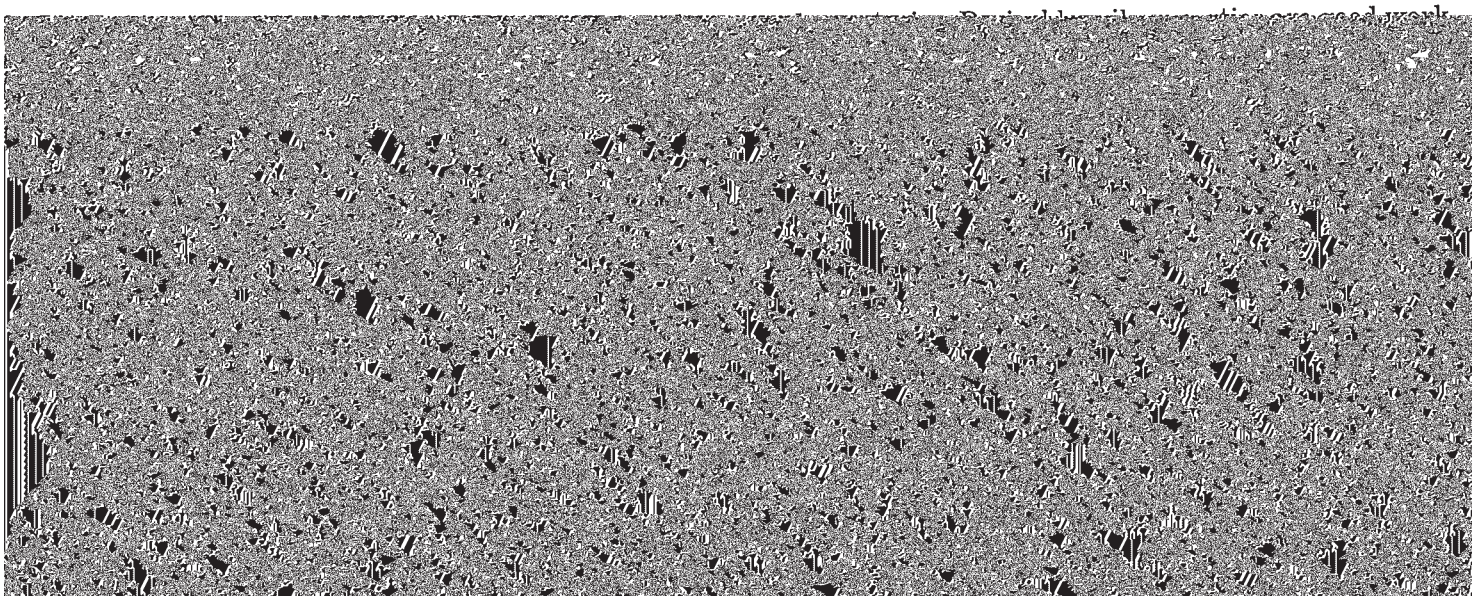


TABLE 6.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series that

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Billett:							
BlA, BlB	Slight [3]	Severe: rapid permeability in substratum.	Moderate: sidewall instability in substratum.	Slight	Severe: rapid permeability in sandy substratum.[3]	Slight	Good
BlC2	Moderate: [3] slope.	Severe: rapid permeability in substratum.	Moderate: sidewall instability in substratum.	Moderate: slope.	Severe: rapid permeability in sandy substratum.[3]	Moderate: slope.	Good
BlD2	Severe: [3] slope.	Severe: rapid permeability in substratum.	Moderate: sidewall instability in substratum.	Severe	Severe: rapid permeability in sandy substratum.[3]	Severe: slope.	Fair: slope.
Boaz: BmA	Severe: [3] seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: high frost-action potential.	Poor: high frost-action potential.
Boone: BnB, BnC2	Severe:	Severe:	Severe:	Severe:	Severe:	Moderate:	Poor: sand-

engineering properties of the soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the appear in the first column of this table]

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Good	Good	Rapid permeability.	Medium to high piping hazard; medium shear strength.	Well drained	Low available water capacity; moderately rapid water-intake rate.	[4]	Low fertility; low available water capacity.
Good	Good	Rapid perme-	Medium to	Well drained	Low available	Sand at a	Low fertility;

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Dickinson: DkA, DkB, DlA.	Slight [3]	Severe: rapid permeability in substratum.	Moderate: sidewall instability in substratum.	Slight	Severe: rapid permeability in substratum.[3]	Slight	Good
Downs:							
DoA, DoB	Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Slight	Slight	Severe: high frost-action potential.	Poor: high frost-action potential.
DoC2	Moderate: slope; moderate permeability.	Moderate: slope; moderate permeability.	Moderate: slope.	Moderate: slope.	Slight	Severe: high frost-action potential.	Poor: high frost-action potential.
DoD2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: high frost-action potential.	Poor: high frost-action potential.
Dunnville:							
DuA, DuB	Slight [3]	Severe: rapid permeability in substratum.	Moderate: sidewall instability.	Slight	Severe: rapid permeability in substratum.[3]	Slight	Good
DuC	Moderate: [3] slope.	Severe: rapid permeability in substratum.	Moderate: sidewall instability.	Moderate: slope.	Severe: rapid permeabil- in substratum.[3]	Moderate: slope.	Good
*Eleva:							
ElB2	Severe: sandstone at a depth of 4 to 5 feet.[5]	Severe: sandstone at a depth of 4 to 5 feet.	Moderate: sandstone at a depth of 4 to 5 feet.	Moderate: sandstone at a depth of 4 to 5 feet.	Severe: sandstone at a depth of 4 to 5 feet.	Slight	Fair: sandstone at a depth of 4 to 5 feet.
ElC2	Severe: sandstone at a depth of 3 to 5 feet.	Severe: sandstone at a depth of 3 to 5 feet.	Moderate: sandstone at a depth of 3 to 5 feet; slope.	Moderate: sandstone at a depth of 3 to 5 feet.	Severe: sandstone at a depth of 3 to 5 feet.	Moderate: slope.	Fair: sandstone at a depth of 3 to 5 feet.
ElD2, ElE2, EnF, EoE. For Boone part of EnF, see Boone series; for Gale part of EoE, see Gale series.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope.	Poor: sandstone at a depth of 2 to 4 feet; slope.

See footnotes at end of table.

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Good	Good	Rapid permeability.	Medium permeability; medium to high piping hazard.	Well drained	Low available water capacity; moderately rapid water-intake rate.	Sand at a depth of 2 to 4 feet; nearly level to gently sloping.	Low fertility; low available water capacity.
Unsuited: no sand.	Good	Moderate permeability.	Medium to high piping hazard; medium to low shear strength.	Well drained	High available water capacity; moderate water-intake rate.	Nearly level to gently sloping.	Nearly level to gently sloping.
Unsuited: no	Fair: slope;	Moderate	Medium to	Well drained	High avail-	Many short,	Moderate

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Ettrick: Er	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: high frost-action potential.	Poor: high frost-action potential.
Ettrick, clayey subsoil variant: Et.	Severe: moderately slow permeability in subsoil; seasonal perched water table.	Severe: rapid permeability in substratum.	Severe: seasonal perched water table; difficult to work.	Severe: seasonal perched water table; high shrink-swell potential.	Severe: seasonal perched water table;	Severe: high shrink-swell potential.	Poor: high shrink-swell potential.
Fayette: FaB	Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Slight	Slight	Severe: high frost-action potential.	Poor: high frost-action potential.
FaC, FaC2	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Slight	Severe: high	Poor: high

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Unsuited: no sand.	Poor: borrow area wet; revegetation difficult.	Moderately slow permeability; seasonal high water table.	Low permeability; medium to low shear strength.	Seasonal high water table; moderately slow permeability.	High available water capacity; seasonal high water table.	Seasonally wet; nearly level.	Seasonally wet; nearly level.
Poor: seasonal perched water table; clayey subsoil; sandy substratum.	Poor: borrow area wet and clayey; revegetation difficult.	Moderately slow permeability in subsoil; seasonal perched water table.	Low permeability; medium to low shear strength; high compressibility.	Seasonal perched water table; moderately slow permeability.	High available water capacity; moderately slow water-intake rate.	Seasonally wet; nearly level.	Seasonally wet; nearly level.
Unsuited: no sand.	Good	Moderate permeability.	Low permeability; medium to low shear strength.	Well drained	High available water capacity; moderate water-intake rate.	[4]	Silty; slight erosion hazard.
Unsuited: no sand.	Fair: slope	Moderate permeability.	Low permeability; medium to low shear strength.	Well drained	High available water capacity; moderate water-intake rate; slope.	Short, uneven slopes.	Silty; slope; moderate erosion hazard.
Unsuited: no sand.	Poor: slope	Moderate permeability.	Low permeability; medium to low shear strength.	Well drained	High available water capacity; moderate water-intake rate; slope.	Short, uneven slopes.	Silty; slope; severe to very severe erosion hazard.
Poor: sandstone at a depth of 3 to 5 feet.	Good	Sandstone at a depth of 3 to 5 feet.	Medium to low permeability; medium to low shear strength.	Well drained	Medium available water capacity; moderate water-intake rate.	Sandstone at a depth of 3 to 5 feet.	Silty; slight erosion hazard.
Poor: sandstone at a depth of 3 to 5 feet.	Fair: slope; erodible.	Sandstone at a depth of 3 to 5 feet.	Medium to low permeability; medium to low shear strength.	Well drained	Medium available water capacity; moderate water-intake rate; slope.	Short, uneven slopes; sandstone at a depth of 3 to 5 feet.	Silty; moderate erosion hazard.
Poor: sandstone at a depth of 3 to 5 feet.	Poor: slope; erodible.	Slope; sandstone at a depth of 3 to 5 feet.	Medium to low permeability; medium to low shear strength.	Well drained	Medium available water capacity; moderate water-intake rate; slope.	Short, uneven slopes; underlain by sandstone.	Silty; severe and very severe erosion hazard.

TABLE 6.—*Interpretations of engineering*

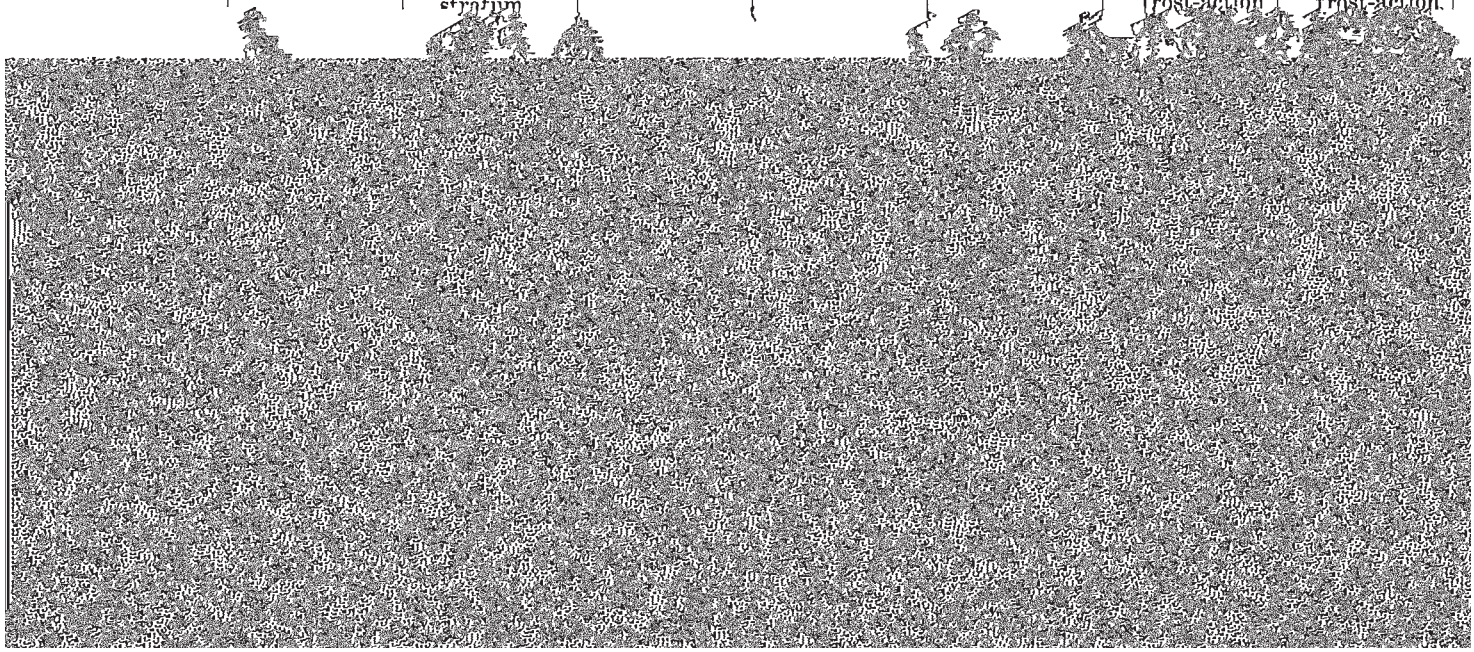
	Degree and kind of limitation for—								Suitability as source of—	

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [a]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Poor: sand-	Poor: sand-	Sandstone at	Sandstone at	Well drained_-	Sandstone at	Sandstone at	Slope;

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
HnD2, HnE2, HnF.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: slope; sandstone at a depth of 2 to 4 feet.	Severe: sandstone at a depth of 2 to 4 feet; slope of HnE2 and HnF.	Severe: slope; high frost-action potential.	Poor: high frost-action potential.
Houghton: Ho	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table; high compressibility.	Poor: high water table; high compressibility.
Huntsville: HuA	Severe: subject to occasional shallow flooding.	Moderate: medium low permeability when compacted.	Severe: subject to occasional shallow flooding.	Severe: subject to occasional shallow flooding	Severe: subject to occasional shallow flooding.	Severe: subject to occasional shallow flooding; high frost-action potential.	Poor: high frost-action potential.
Kato, sandy loam variant: Ka.	Severe: seasonal high water table.	Severe: rapid permeability in substratum.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Poor: seasonal high water table.
Kato: KcA	Severe: seasonal high water table.	Severe: rapid permeability in substratum	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost-action	Poor: seasonal high water table; high frost-action.



properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Poor: sandstone at a depth of 2 to 4 feet.	Poor: slope; erodible.	Slope; sandstone at a depth of 2 to 4 feet.	Medium to low permeability; high piping hazard.	Well drained	Moderate available water capacity; moderate water-intake rate; slope.	Sandstone at a depth of 2 to 4 feet.	Severe to very severe erosion hazard; moderate available water capacity.
Poor: sand below a depth of 50 inches in some areas; high water table.	Poor: high water table; muck.	High water table; moderately rapid permeability.	High compressibility; low shear strength.	Very poorly drained; moderately rapid permeability.	High water table.	Severe hazard of soil blowing; low shear strength.	High water table.
Poor: bands of sand in substratum in some areas.	Good	Subject to occasional shallow flooding; moderate permeability.	Medium to low permeability; high organic-matter content; good to fair compaction characteristics.	Well drained to moderately well drained.	Very high available water capacity.	Nearly level to gently sloping drainageways; subject to occasional flooding and siltation.	Nearly level to gently sloping; subject to occasional shallow flooding.
Fair: sandy substratum; seasonal high water table.	Poor: seasonal high water table.	Seasonal high water table; rapid permeability in substratum.	Medium to high permeability; medium to high piping hazard.	Poorly drained; some outlets filled or partly blocked.	Seasonal high water table.	Seasonal high water table; subject to occasional flooding and siltation.	Nearly level; subject to occasional shallow flooding.
Fair: sandy substratum; seasonal high water table.	Poor: seasonal high water table; borrow areas difficult to revegetate.	Seasonal high water table; moderate permeability in subsoil; rapid permeability in substratum.	Low permeability in compacted subsoil; high permeability in compacted substratum.	Poorly drained.	Seasonal high water table.	Seasonal high water table; subject to occasional flooding.	Nearly level to gently sloping; subject to occasional flooding.
Poor: soft, shaly sandstone at a depth of 4 to 5 feet.	Good	Moderate permeability and seepage in substratum; soft, shaly sandstone at a depth of 4 to 5 feet.	Medium to low permeability; fair to good compaction characteristics.	Well drained	Moderate available water capacity; moderate water-intake rate.	Gently sloping; soft, shaly sandstone at a depth of 4 to 5 feet.	Silty; slight erosion hazard.
Poor: soft, shaly sandstone at a depth of 2 to 4 feet.	Fair: slope; erodible.	Soft, shaly sandstone at a depth of 2 to 4 feet; slope.	Medium to low permeability; fair to good compaction characteristics.	Well drained	Moderate available water capacity; moderate water-intake rate.	Short, irregular slopes; soft, shaly sandstone at a depth of 2 to 4 feet.	Silty; severe to very severe erosion hazard.

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Poor: soft, shaly sandstone at a depth of 2 to	Poor: slope; erodible.	Slope; soft, shaly sandstone at a depth of 2	Medium to low permeability; fair to good	Well drained--	Moderate available water capacity;	Short, irregular slopes; shaly sandstone at a	Silty; moderate erosion hazard.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Morocco: MoA	Severe: seasonal high water table.[3]	Severe: rapid permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.[3]	Moderate: seasonal high water table; sandy.	Fair: seasonal high water table.
Muscatine: MuA	Severe: seasonal high water table.	Moderate: moderate permeability.	Severe: seasonal high water table.	Severe: seasonal high water table; high shrink-swell potential.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost-action potential.	Poor: high shrink-swell potential; high frost-action potential.
Norden: NoC2, NrB2, NrC2.	Severe: soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: high frost-action potential.	Fair in soft, shaly sandstone, poor in loamy part above sandstone; high frost-action potential.
NoD2, NrD2, NrE2.	Severe: slope; soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: soft, shaly sandstone at a depth of 2 to 4 feet.	Severe: slope; high frost-action potential.	Fair in soft, shaly sandstone; poor in loamy part above sandstone; high frost-action potential.
Palms: Pa	Severe: high water table.	Severe: high water table; moderately rapid permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table; high organic-matter content.	Unsuited: high organic-matter content.
Palsgrove: PgB, PgC2, PgD2.	Severe: moderately slow permeability in clay substratum.	Moderate for PgB; severe for PgC2 and PgD2: slope; 4 to 8 feet of clay over dolomitic limestone.	Severe: clay texture.	Severe: high shrink-swell potential.	Severe: clay over fissured dolomitic limestone.	Severe: high shrink-swell and frost-action potential; slope.	Poor: high shrink-swell and frost-action potential.

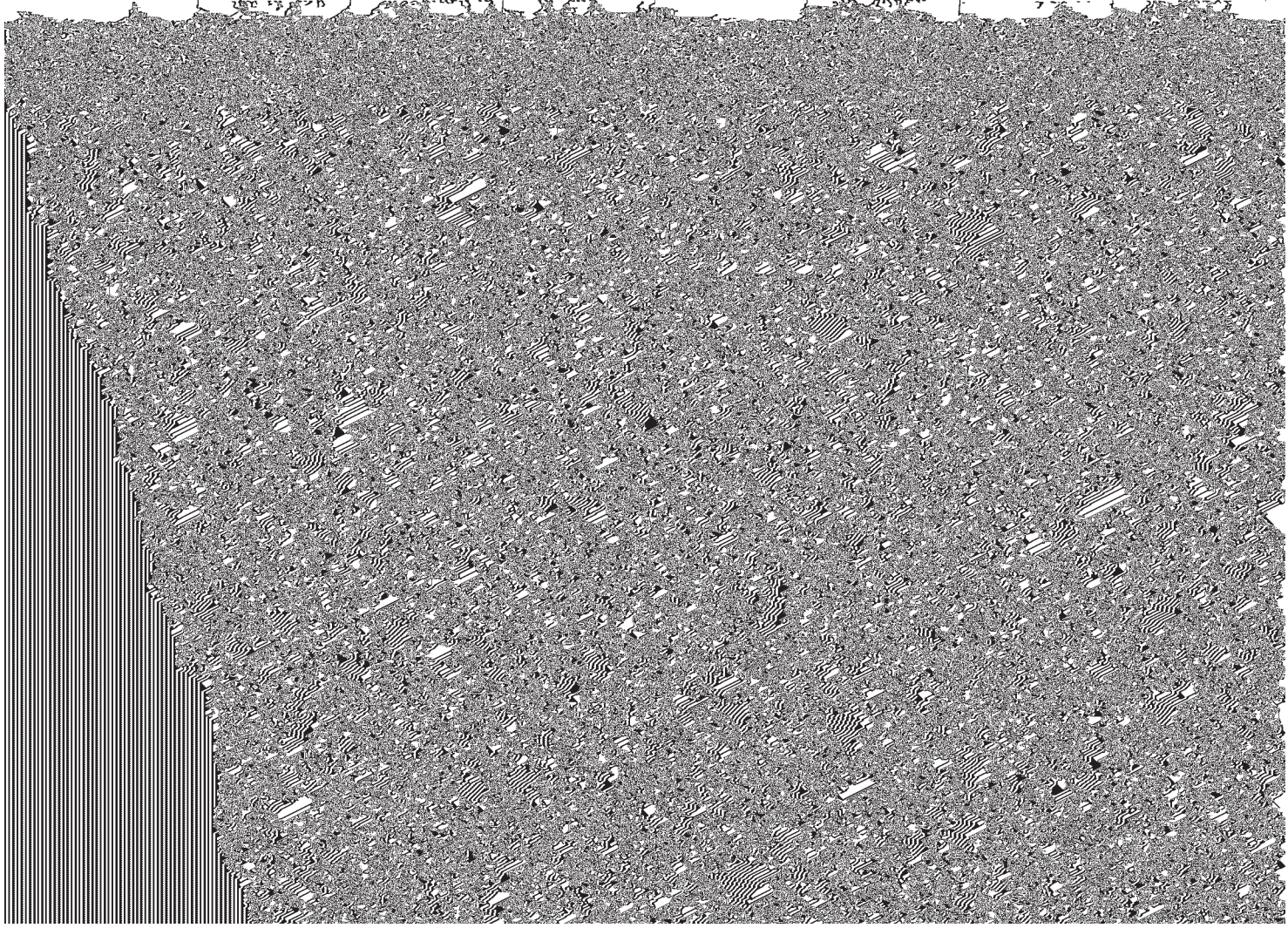
See footnotes at end of table.

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Fair: seasonal high water table.	Poor: sandy.	Rapid permeability; seasonal high water table.	High permeability; high piping hazard.	Somewhat poorly drained.	Low available water capacity; rapid water-intake rate; seasonal high water table.	Sandy; seasonal high water table.	Sandy; seasonal high water table.
Unsuited: no sand.	Fair: revegetation difficult in deep, wet borrow areas.	Moderate: permeability; seasonal high water table.	Low permeability; fair to good compaction characteristics; medium to low shear strength.	Somewhat poorly drained.	High available water capacity; moderate to moderately slow water-intake rate.	Nearly level to gently sloping; seasonal high water table.	Silty; seasonal high water table.
Poor: soft, shaly sandstone at a depth of 2 to 4 feet.	Good for NrB2, fair for NoC2 and NrC2: slope; erodible.	Soft, shaly sandstone at a depth of 2 to 4 feet.	Medium to low permeability; medium to low shear strength.	Well drained	Moderate available water capacity; moderate water-intake rate.	Soft, shaly sandstone at a depth of 2 to 4 feet.	Erosion hazard slight on NrB2 and moderate on NoC2 and NrC2.
Poor: soft, shaly sandstone at a depth of 2 to 4 feet.	Poor: slope; erodible.	Soft, shaly sandstone at a depth of 2 to 4 feet.	Medium to low permeability; medium to low shear strength.	Well drained	Moderate available water capacity; moderate water-intake rate.	Soft, shaly sandstone at a depth of 2 to 4 feet; short, irregular slopes.	Silty; severe erosion hazard.
Unsuited: high organic-matter content; high water table.	Poor: high organic-matter content; high water table.	Moderately rapid permeability; high water table.	High organic-matter content.	Poorly drained.	Very high available water capacity; moderately rapid water-intake rate; high water table.	Nearly level; high organic-matter content; high water table.	Nearly level; high water table.
Unsuited: no sand but source of limestone for crushing	Fair for PgB; severe for PgB, PgC2 and PgD2; silty clay	Moderately slow permeability; fissured dolomitic	Low permeability; medium to low shear strength.	Well drained	High available water capacity; moderate to moder-	Clay substratum at a depth of about 38 inches.	Erosion hazard slight on PgB; moderate on

TABLE 6.—*Interpretations of engineering*

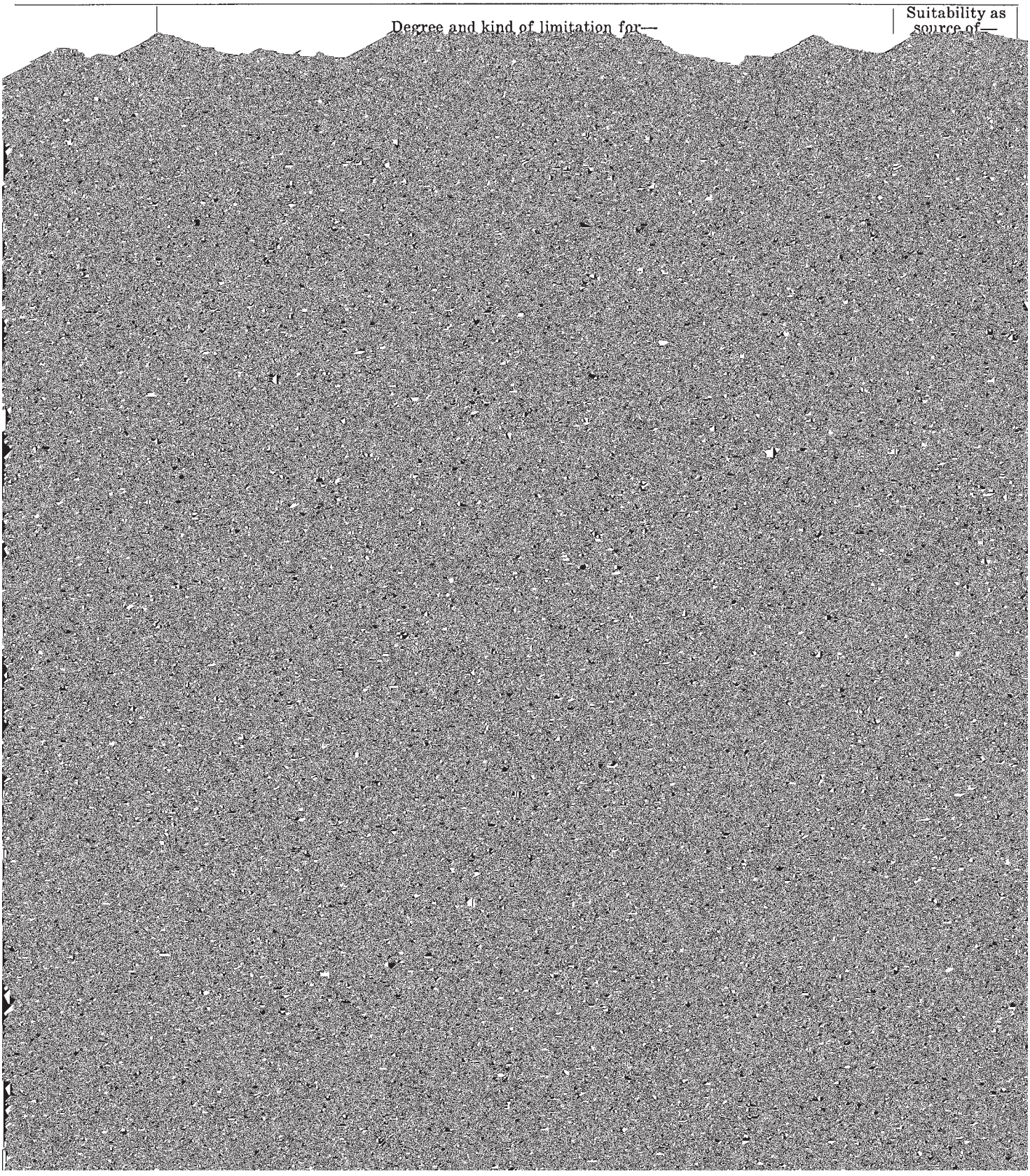
Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Palsgrove, clayey subsoil variant: PlB, PlC, PlD, PlD2, PlE, PnD3.	Severe: moderately slow permeability.	Moderate for PlB; severe for PlC, PlD, PlD2, PnD3, and PnE: slope; 4 to 8 feet of clay over dolomitic limestone.	Severe: clay texture.	Severe: high shrink-swell potential.	Severe: clay over fissured dolomitic limestone.	Severe: high shrink-swell and frost-action potential.	Poor: high shrink-swell and frost-action potential.
Pillot: PoA, PoB	Slight: rapid permeability in substratum.[3]	Severe: rapid permeability in substratum.	Moderate: sidewall instability in substratum.	Slight	Severe: rapid permeability in sandy substratum.[3]	Severe: high frost-action potential.	Good in sandy substratum; poor in upper silty part; high frost-action potential.
PoC2	Moderate: slope; rapid permeabil-	Severe: slope; rapid per-	Moderate: sidewall instability	Moderate: slope.	Severe: rapid permeability	Severe: high frost-action potential.	Good in sandy substratum; poor



properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Unsuited: no sand but source of limestone for crushing.	Poor: clayey.	Moderately slow permeability; fissured dolomitic limestone at a depth of 4 to 8 feet.	Low permeability; high compressibility; low shear strength.	Well drained.	Moderate available water capacity; moderately slow water-intake rate.	Clay subsoil at a depth of about 15 inches.	Erosion hazard slight on PIB; moderate on PIC; and severe on others.
Good: sandy substratum.	Good	Rapid permeability in substratum.	Medium to low permeability but ranges to high in sandy substratum.	Well drained.	Moderate available water capacity; moderate water-intake rate.	Nearly level to gently sloping; sand at a depth of 2 to 3 feet.	Silty; slight erosion hazard.
Good: sandy substratum.	Fair: slope.	Rapid permeability in substratum.	Medium to low permeability but ranges to high in sandy substratum.	Well drained.	Moderate available water capacity; moderate water-intake rate.	Sloping; sand at a depth of 2 to 3 feet.	Silty; moderate erosion hazard.
Unsuited: no sand.	Good	Moderate permeability.	Medium to low permeability; medium to high piping hazard.	Well drained.	Very high available water capacity; moderate water-intake rate.	Gently sloping; deep silt.	Silty; slight erosion hazard.
Unsuited: no sand.	Fair: slope; erodible.	Moderate permeability.	Medium to low permeability; medium to high piping hazard.	Well drained.	Very high available water capacity; moderate water-intake rate.	Sloping; deep silt.	Silty; moderate erosion hazard.
Unsuited: no sand.	Severe: slope; erodible.	Moderate permeability.	Slope: medium to low permeability; medium to high piping hazard.	Well drained.	Slope; very high available water capacity; moderate water-intake rate.	Moderately steep to steep; deep silt.	Silty; severe to very severe erosion hazard.
Fair: stratified sand; seasonal high water table.	Poor: sandy.	Rapid permeability; seasonal high water table.	High permeability; medium to high piping hazard.	Well drained to moderately well drained.	Low available water capacity; rapid water-intake rate.	Nearly level; sandy.	Sandy; hazard of streambank erosion.
Good in most places; fair or poor in a few places: variable.	Poor: sandy; moderately steep to very steep; erodible.	Rapid permeability; moderately steep to very steep.	High permeability; medium to high piping hazard.	Excessively drained.	Moderately steep to very steep; low available water capacity; rapid water-intake rate.	Moderately steep to very steep; sandy; hazard of gully erosion.	Sandy; severe to very severe hazard of soil blowing; hazard of gully erosion.

TABLE 6.—*Interpretations of engineering*



properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Unsuited: no sand.	Good	Moderate permeability.	Medium to low permeability; medium to high piping hazard.	Well drained	Very high available water capacity; moderate water-intake rate.	Gently sloping; deep silt.	Silty; slight erosion hazard.
Unsuited: no sand.	Fair: slope; erodible.	Moderate permeability.	Medium to low permeability; medium to high piping hazard.	Well drained	Very high available water capacity; moderate water-intake rate.	Sloping; deep silt.	Silty; moderate erosion hazard.
Unsuited: no sand.	Poor: slope; erodible.	Slope: moderate permeability.	Medium to low permeability; medium to high piping hazard.	Well drained	Very high available water capacity; moderate water-intake rate.	Moderately steep to steep; deep silt.	Silty; severe to very severe erosion hazard.
Fair: sandy substratum; seasonal high water table.	Good	Rapid permeability in substratum; seasonal high water table.	Medium to low permeability but ranges to high in sandy substratum.	Somewhat poorly drained.	Moderate available water capacity; moderate water-intake rate; seasonal high water table.	Nearly level to gently sloping; sand at a depth of 2 to 3 feet.	Loamy; slight erosion hazard; seasonal high water table.
Good	Poor: sandy	Rapid permeability.	High permeability; medium to high piping hazard.	Excessively drained.	Low available water capacity; very rapid water-intake rate.	[4]	Low available water capacity; low natural fertility.
Good	Poor: sandy; slope; erodible.	Rapid permeability.	High permeability; medium to high piping hazard.	Excessively drained.	Low available water capacity; slope; rapid water-intake rate.	[4]	Low available water capacity; low natural fertility.
Fair: seasonal high water table.	Poor: sandy	Rapid permeability; seasonal high water table.	High permeability; medium to high piping hazard.	Moderately well drained to somewhat poorly drained.	Low available water capacity; seasonal high water table.	Sandy; seasonal high water table.	Low available water capacity; low natural fertility; seasonal high water table.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Trempe: TrA, TrB	Slight [3]	Severe: rapid permeability.[3]	Severe: sidewall instability.	Slight	Severe: sandy; rapid permeability.[3]	Slight	Good
Trempealeau: TuA.	Slight [3]	Severe: rapid permeability in substratum.[3]	Moderate: sidewall instability in substratum.	Slight	Severe: rapid permeability in sandy substratum.[3]	Severe: high frost-action potential.	Good in sandy substratum; poor in loamy part above sandy substratum; high frost-action potential.
Trempealeau, mottled subsoil variant: TvA.	Severe: seasonal high water table.[3]	Severe: rapid permeability in substratum; seasonal high water table.[3]	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; rapid permeability in sandy substratum.[3]	Severe: high frost-action potential.	Fair in sandy substratum: seasonal high water table. Poor in loamy part above substratum: high frost-action potential.
*Urne: UfB, UfC2, UnC2.	Severe: soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: soft; shaly sandstone at a depth of 2 to 3 feet.	Severe: soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: high frost-action potential.	Fair in soft, shaly sandstone; poor in part above sandstone; high frost-action potential.
UfD2, UfE2, UfF, UnD2, UnE2, UrD2, UrE, UrF. For Norden part of UrD2, UrE, and UrF, see Norden series.	Severe: slope; soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: slope; soft, shaly sandstone at a depth of 2 to 3 feet.	Severe: slope; high frost-action potential.	Fair in soft, shaly sandstone; poor in upper loamy part; high frost-action potential.
Wallkill: WaA	Severe: seasonal high water table.	Severe: moderately rapid permeability in substratum; seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; high in organic-matter content in substratum.	Severe: seasonal high water table.	Severe: seasonal high water table; high frost-action potential; high organic-matter content in substratum.	Poor: silty in upper part; high frost-action potential; high organic-matter content in substratum.

See footnotes at end of table.

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [2]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Good	Poor: sandy	Rapid permeability.	High permeability; medium to high piping hazard.	Excessively drained.	Low available water capacity; very rapid water-intake rate.	[4]	Low available water capacity; low natural fertility.
Good: sandy substratum.	Good	Rapid permeability in substratum.	Medium to low permeability but ranges to high in sandy substratum.	Well drained	Moderate available water capacity; moderate water-intake rate.	Nearly level to gently sloping; sand at a depth of 2 to 3 feet.	Loamy; slight erosion hazard.
Fair: sandy substratum; seasonal high water table.	Fair: iron fragments in upper part of subsoil.	Rapid permeability in substratum.	Medium to low permeability but ranges to high in sandy substratum.	Somewhat poorly drained.	Moderate available water capacity; seasonal high water table.	Nearly level to gently sloping; sand at a depth of 2 to 3 feet.	Loamy; slight erosion hazard; seasonal high water table.
Poor: soft, shaly sandstone at a depth of 2 to 3 feet.	Poor: borrow area shallow to sandstone; revegetation difficult.	Soft, shaly sandstone at a depth of 2 to 3 feet; moderate permeability.	Medium to low permeability but soft, shaly sandstone at a depth of 2 to 3 feet.	Well drained	Low available water capacity; gently sloping to sloping.	Gently sloping to sloping; soft, shaly sandstone at a depth of 2 to 3 feet.	Loamy; slight to moderate erosion hazard.
Poor: soft, shaly sandstone at a depth of 2 to 3 feet.	Poor: borrow area shallow to sandstone; revegetation difficult; slope; erodible.	Slope; soft, shaly bedrock at a depth of 2 to 3 feet; moderate permeability.	Medium to low permeability but soft, shaly sandstone at a depth of 2 to 3 feet.	Well drained	Low available water capacity; moderately steep to very steep.	Short, uneven slopes; soft, shaly sandstone at a depth of 2 to 3 feet.	Loamy; severe to very severe erosion hazard.
Unsuited: no sand.	Poor: seasonal high water table.	Moderately rapid permeability in substratum; seasonal high water table.	High organic-matter content in substratum at a depth of 20 to 40 inches.	Well drained	Very high available capacity; moderate water-intake rate; seasonal high water table.	Nearly level to gently sloping; high organic-matter content in substratum at a depth of 20 to 40 inches.	Silty; slight erosion hazard.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Trench-type sanitary landfill [1]	Local roads and streets	Road fill
Wet alluvial land: We. No interpretations; limitations severe for most uses.							
Whitehall: WhA	Slight: rapid permeability in substratum.[3]	Severe: rapid permeability in substratum.[3]	Moderate: sidewall instability in substratum.	Slight	Severe: rapid permeability in sandy substratum.[3]	Severe: high frost-action potential.	Good in sandy substratum; poor in upper silt part; high frost-action potential.
Worthen: WoA	Moderate if gently sloping; severe	Moderate: moderate permeabil	Moderate if gently sloping; severe	Moderate if gently sloping; severe	Slight if gently sloping; severe	Severe: high frost-action potential	Poor: silty; high frost-action

properties of the soils—Continued

Suitability as source of—continued		Soil features affecting—					
Sand	Topsoil	Pond reservoir areas	Embankments, dikes, and levees [3]	Drainage for crops and pasture	Irrigation	Terraces and diversions	Grassed waterways
Good: sandy substratum.	Good	Rapid permeability in substratum.	Medium to low permeability but ranges to high for sandy substratum.	Well drained to moderately well drained.	Medium available water capacity; moderate water-intake rate.	Nearly level to gently sloping; sand at a depth of 2 to 3 feet.	Silty; slight erosion hazard.
Unsuited: no sand.	Good	Moderate permeability.	Medium to low permeability; medium to low shear strength.	Well drained to moderately well drained.	Very high available water capacity; moderate water-intake rate.	Nearly level to gently sloping; deep silt.	Silty; slight erosion hazard; subject to occasional shallow flooding.

[4] Practice not applicable or not needed on this soil.
[5] Wisconsin Administrative Code, Chapter H65—Subdivisions not served by Public Sewers, requires at least 5 feet of soil cover over bedrock.

is damage that will result at the area from which topsoil is taken.

Pond reservoir areas hold water behind a dam or

Terraces and diversions are embankments or ridges constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared

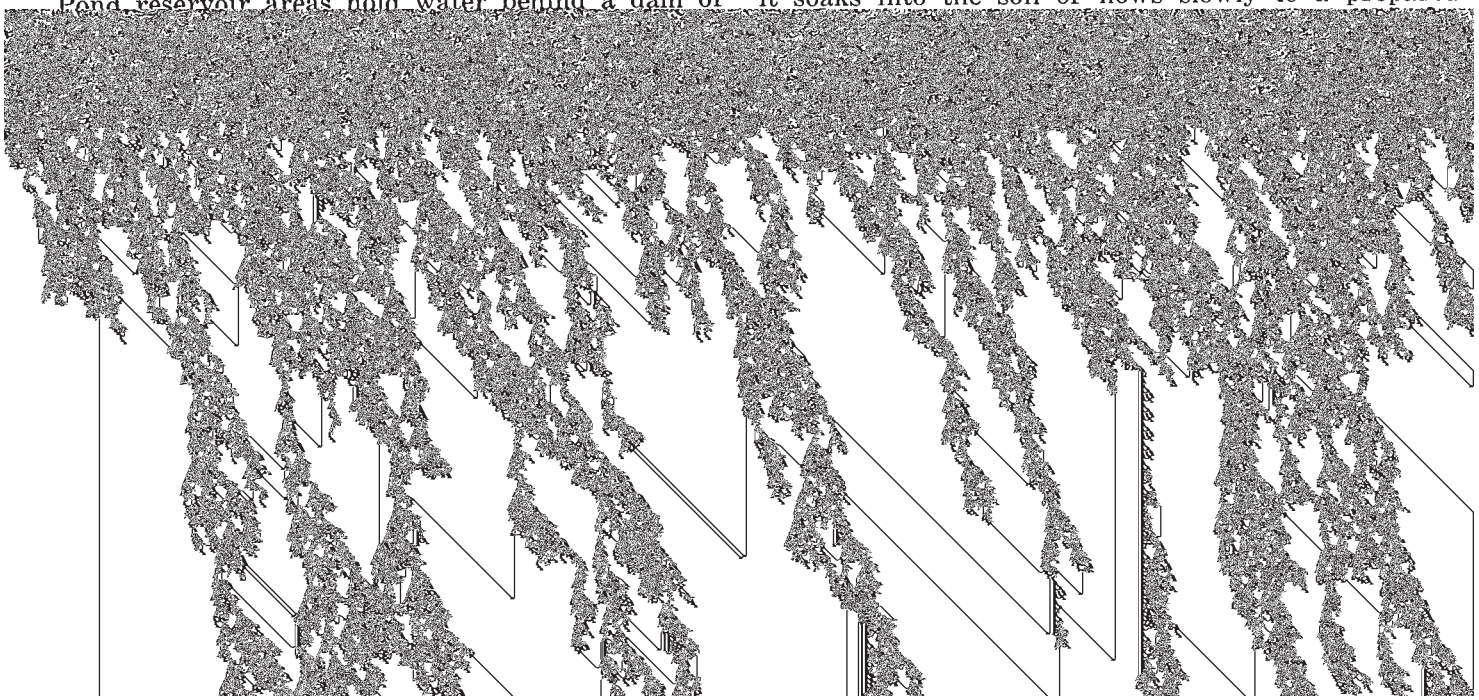


TABLE 7.—*Engineering*

[Absence of an entry indicates

Soil name and location	Parent material	Depth	Moisture-density [1]		Mechanical analysis [2]	
			Maximum dry density	Optimum moisture	Percentage passing sieve—	
					No. 4 (4.7 mm)	No. 10 (2.0 mm)
		Inches	*Pounds per cubic foot*	*Percent*		
Billett fine sandy loam:[4] NE¼SW¼ sec. 2, T. 21 N., R. 9 W. (Modal).	Loamy sediment over sand.	0–8	-----	-----	100	100
		8–11	-----	-----	100	100
		11–19	-----	-----	100	100
		19–28	-----	-----	100	100
		28–34	-----	-----	100	100
Dickinson fine sandy loam:[5] SE¼NE¼ sec. 2, T. 18 N., R. 8 W. (Modal).	Loamy sediment over sand.	0–14	-----	-----	100	
		14–22	-----	-----	100	100
						100
Meridian loam:[6] NW¼SW¼ sec. 22, T. 24 N., R. 7 N. (Modal).	Loamy sediment over sand.	13–18	-----	-----	100	
		32–40	117	10	100	100
						100
Seaton silt loam:[6] SW¼SW¼ sec. 4, T. 2 N., R. 9 W. (Modal).	Silty loess.	15–25	-----	-----	100	
		34–45	111.9	14.3	100	100
						100

[1] Based on AASHO Designation: T 99–57, Method A (*1*).

[2] Mechanical analyses for the Meridian and Seaton soils were made according to AASHO Designation: T 88–57 (*1*). Mechanical analysis for the Billett and Dickinson soils were made by pipette analysis (*5*). Results by the AASHO procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

portant in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from

have affected the development of soils in Trempealeau County. It also explains the system of soil classification currently used and places each soil series represented in the county in some of the categories of that system.

Factors of Soil Formation

Soil is the product of the action of climate and living organisms upon parent materials, as conditioned by local factors of relief. The degree of the combined influence of these four factors is a function of time.

Climate and living organisms are regarded as the active agents of soil formation. They supply the energy

test data

that no determination was made]

Mechanical analysis [2]—Continued						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—continued		Percentage smaller than—						AASHO [1]	Unified [3]
No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm				
						Percent			
----	----	28.9	17.4	--	6.1	----	----	------	-------
----	----	39.4	23.8	--	8.4	----	----	------	-------
----	----	43.4	28.6	--	11.3	----	----	------	-------
----	----	30.6	19.5	--	9.3	----	----	------	-------
----	----	7.3	4.8	--	3.7	----	----	------	-------
96.5	25.8	18.2	----	--	11.8	----	----	------	-------
96.8	21.2	13.4	----	--	9.3	----	----	------	-------
91	48	47	36	19	16	22	6	A-4(3)	SC-SM
66	5	3	3	3	2	----	[7] NP	A-3(0)	SP
100	98	96	49	25	21	31.4	9.1	A-4(8)	ML-CL
100	88	83	40	18	16	25.2	5.0	A-4(8)	ML-CL

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are SM-SC and ML-CL.

[4] Tests made by SCS Soil Survey Laboratory, Beltsville, Md. (*10*).

[5] Tests made by Soil Survey Division, Geological and Natural History Survey, University of Wisconsin.

[6] Tests made by the State Highway Commission of Wisconsin in cooperation with the U.S. Department of Commerce, Bureau of Public Roads.

[7] Nonplastic.

residuum, loess (windblown silt), outwash sediment, alluvial silt, lacustrine clay, and decomposed peat.

Bedrock was originally laid down as sediment in ancient seas. It has a wide range in mineral composition. Dolomite, commonly called limestone, caps the highest ridgetops in the southern and western parts of the county. A very firm, reddish clay is weathered from this limestone to form part of the subsoil of Palsgrove soils, clayey subsoil variant. The Franconia member is a fine-grained glauconite sandstone that contains shale and siltstone; it produced a finer textured soil than is expected from sandstone. Urne and Norden soils developed in material weathered from Franconia sandstone. Desbach sandstone, which is on low valley slopes, and Trempealeau sandstone, which is on high sandstone ridges, are medium-grained; upon weathering they form loamy sands, sandy loams, and loams. Examples are soils in the Boone, Eleva, and Hixton series.

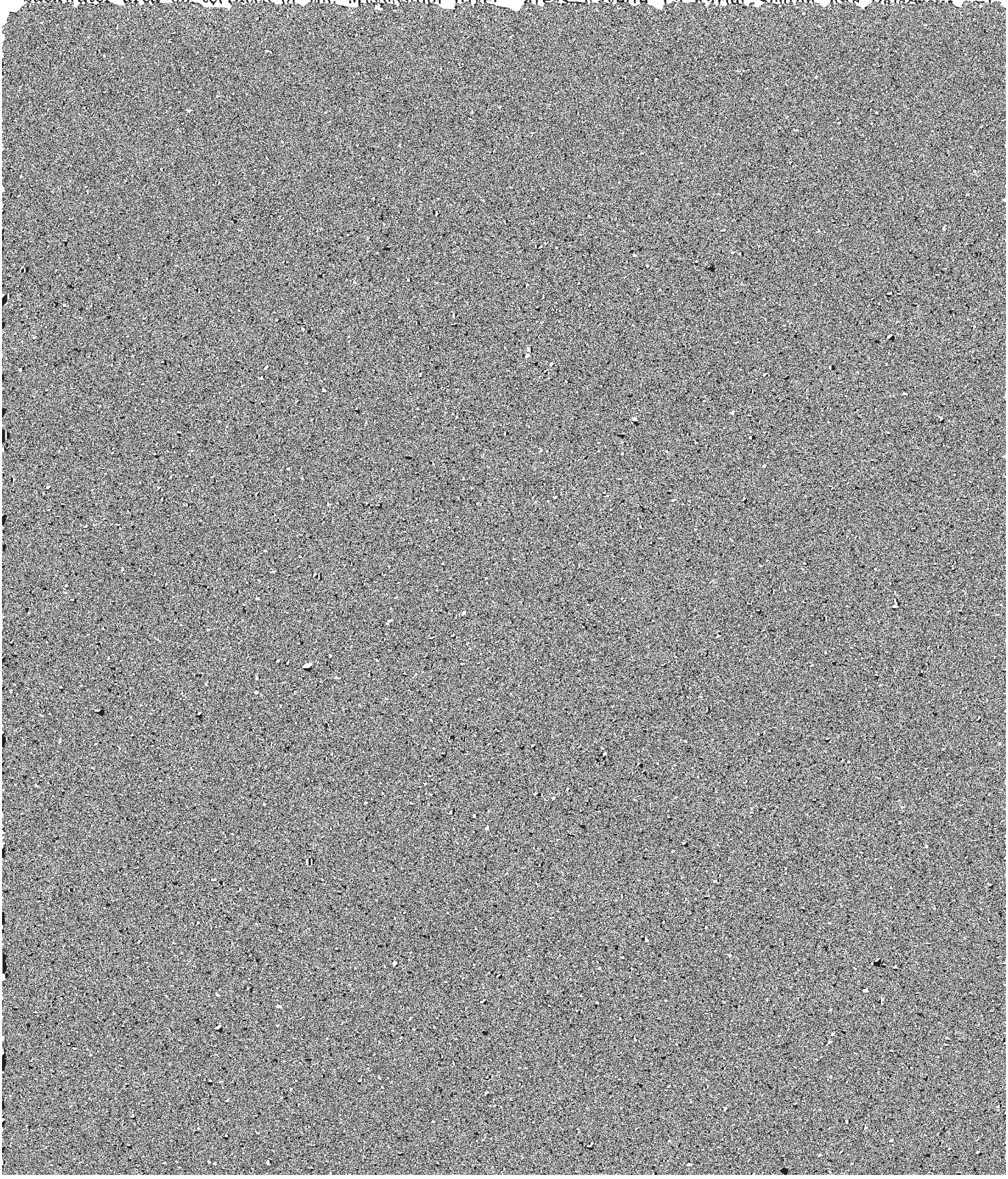
Soils formed in loess are the most extensive. They have a wide range of characteristics because the depth of loess and the material beneath the loess vary. Where loess has been thickly deposited, deep, silty soils, such as Fayette, Seaton, Port Byron, Downs and Muscatine soils, form. Peripheral to soils formed in deep loess are soils of the Gale, La Farge, Palsgrove, Pillot, and Whitehall series. These soils formed in moderately thick silt. Gale soils formed in loess that overlies in loess that overlies fine-grained, soft, shaly sandstone; Palsgrove soils in loess that overlies firm, reddish clay weathered from limestone; Pillot soils in loess or silty material that overlies loose, water-laid sand; and Whitehall soils in reddish-colored loess or silty material that overlies loose, water-laid sand.

Outwash sediment on stream terraces was laid down in streams that flowed at a higher level than they do today. The outwash in Trempealeau County has a mixed lithology. The glacial outwash contains granitic material, whereas the local outwash came from eroded sandstone residuum. Soils formed in outwash sediment are excessively drained and well drained loamy sands, sandy loams, and loams of the Sparta, Trempe, Gotham, Dickinson, Dunnville, Billett, Meridian, and Trempealeau series; the moderately well drained and somewhat poorly drained soils of the Sparta series, mottled subsoil variant, Trempealeau series, mottled subsoil variant, Kato series, sandy loam variant, and Morocco and Shiffer series.

Silty alluvium consists of deep sediment deposited on valley bottoms by stream overflow or in drainageways by runoff from upland areas. Soils formed in silty alluvium are well drained and moderately well drained Huntsville and Worthen soils, somewhat poorly drained Lawson and Boaz soils, and poorly drained Kato, Wallkill, and Ettrick soils.

Lacustrine clay is reddish-brown and grayish-brown

backwater area on terraces of the Mississippi River areas Fayette La Farge Sexton and Palsgrove soil



Morphology of the Soils

This subsection provides a brief description of the horizon nomenclature of soils. In addition, the processes involved in horizon development are discussed.

The results of the factors of soil formation can be distinguished by the different layers, or horizons, in a soil profile. The profile extends from the surface down to material that has been little altered by the soil-forming process.

Most soils contain three major horizons, called A, B, and C. These major horizons may be further subdivided by the use of subscripts and letters to indicate differences within one horizon.

The A horizon is the surface layer. If it has been disturbed or cultivated, it may be designated an Ap horizon. It is the layer that has the largest accumulation of organic matter. The A2 horizon generally develops below an A1 horizon or Ap horizon, where considerable leaching has taken place. It is a layer of maximum leaching, or eluviation, of clay and iron. [illegible] channels. In some soils an A2 horizon has formed by considerable eluviation of clay minerals to the B horizon. The A2 horizon is grayish brown in color and has platy structure. La Farge soils are an example of a soil that has clay mineral translocation.

The reduction and transfer of iron is associated mainly with the wetter, more poorly drained soils. This process is called gleying. Moderately well drained to somewhat poorly drained soils have yellowish-brown and reddish-brown mottles, indicating the segregation of iron. Poorly drained to very poorly drained soils have a subsoil and underlying material that are grayish colored, indicating reduction and transfer of iron. Boaz, Ettrick, and Kato soils are some of the soils that have indications of the reduction and transfer of iron.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils to

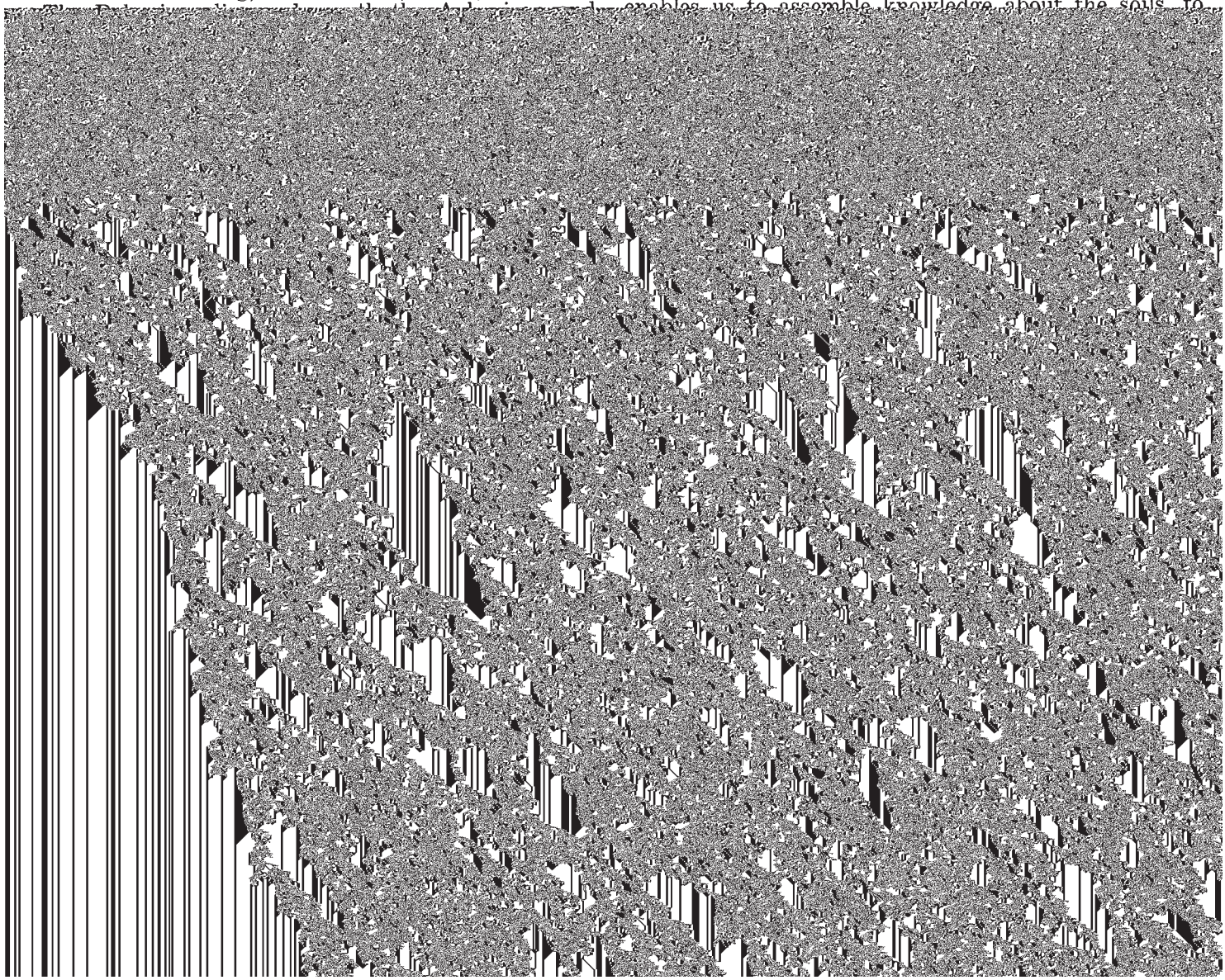


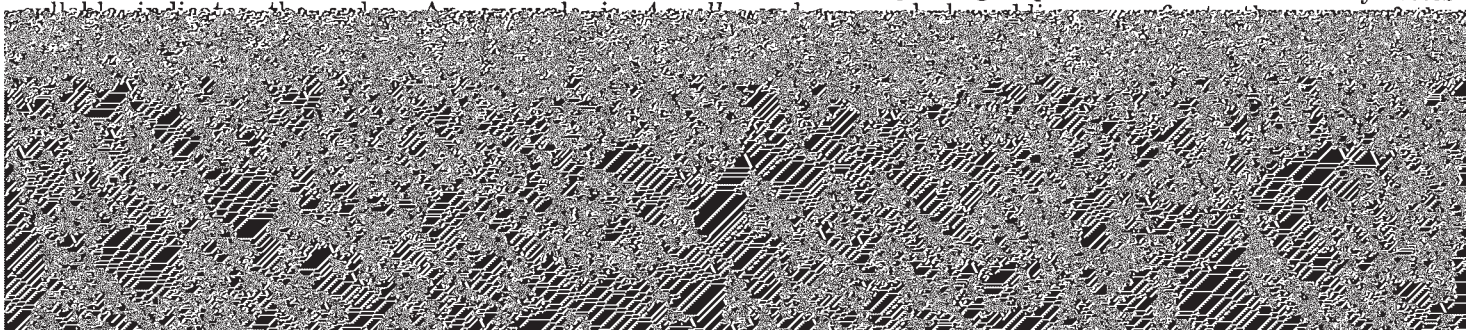
TABLE 8.—*Classification of soil series of Trempealeau County*

Series	Family	Subgroup	Order
Billett	Coarse-loamy, mixed, mesic	Mollic Hapludalfs	Alfisols.
Boaz	Fine-silty, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Boone	Mesic, uncoated	Typic Quartzipsamments	Entisols.
Denrock	Fine, mixed, mesic	Aquic Argiudolls	Mollisols.
Denrock, wet variant	Fine, mixed, mesic	Typic Argiaquolls	Mollisols.
Dickinson	Coarse-loamy, mixed, mesic	Typic Hapludolls	Mollisols.
Downs	Fine-silty, mixed, mesic	Mollic Hapludalfs	Alfisols.
Dunnville [1]	Coarse-loamy, mixed, frigid	Typic Haploborolls	Mollisols.
Eleva [1]	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Ettrick [1]	Fine-silty, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols.
Ettrick, clayey subsoil variant	Fine, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols.
Fayette	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Gale	Fine-silty over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Gotham	Sandy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Hixton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Houghton [1]	Euic, mesic	Typic Medisaprists	Histosols.
Huntsville	Fine-silty, mixed, mesic	Cumulic Hapludolls	Mollisols.
Kato	Fine-silty over sandy or sandy-skeletal, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols.
Kato, sandy loam variant	Coarse-loamy, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
La Farge	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Lawson [1]	Fine-silty, mixed, mesic	Cumulic Hapludolls	Mollisols.
Meridian	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Mollic Hapludalfs	Alfisols.
Morocco	Sandy, mixed, mesic	Aquic Udipsamments	Entisols.
Muscatine	Fine-silty, mixed, mesic	Aquic Argiudolls	Mollisols.
Norden	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Palms	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Palsgrove	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Palsgrove, clayey subsoil variant.	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Pillot	Fine-silty over sandy or sandy-skeletal, mixed, mesic	Typic Argiudolls	Mollisols.
Port Byron [1]	Fine-silty, mixed, mesic	Typic Hapludolls	Mollisols.
Seaton	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Shiffer [1]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Sparta	Sandy, mixed, mesic	Entic Hapludolls	Mollisols.
Sparta, mottled subsoil variant	Sandy, mixed, mesic	Aquic Hapludolls	Mollisols.
Trempe	Sandy, mixed, mesic	Entic Hapludolls	Mollisols.
Trempealeau	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Argiudolls	Mollisols.
Trempealeau, mottled subsoil variant.	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Aquic Argiudolls	Mollisols.
Urne	Coarse-loamy, mixed, mesic	Dystric Eutrochrepts	Inceptisols.
Wallkill [1]	Fine-loamy, mixed, nonacid, mesic	Thapto-Histic Fluvaquents	Entisols.
Whitehall	Fine-silty over sandy or sandy-skeletal, mixed, mesic	Typic Argiudolls	Mollisols.
Worthen	Fine-silty, mixed, mesic	Cumulic Hapludolls	Mollisols.

[1] Most of the soils in these series are taxadjunct to the series for which they are named. They differ from the series as follows:
Dunnville—A few degrees warmer.
Eleva—Some of these soils have an argillic horizon that is loamy sand or sand.
Ettrick—Lack stratification in the lower part of the control section.
Houghton—Some of these soils have a hemic or terric layer in the profile.
Lawson silt loam, 0 to 3 percent slopes—Mottles in the lower part of the mollic epipedon are higher in chroma.
Port Byron—Weakly expressed argillic horizons. Clay content is too low and coarse-silt-fine silt ratio is too high to be correlated as Tama soils.
Shiffer—Less well developed argillic horizons.
Wallkill—Higher content of silt and lower content of sand.

either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last

dium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables



groups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquolls (a typical Haplaquoll).

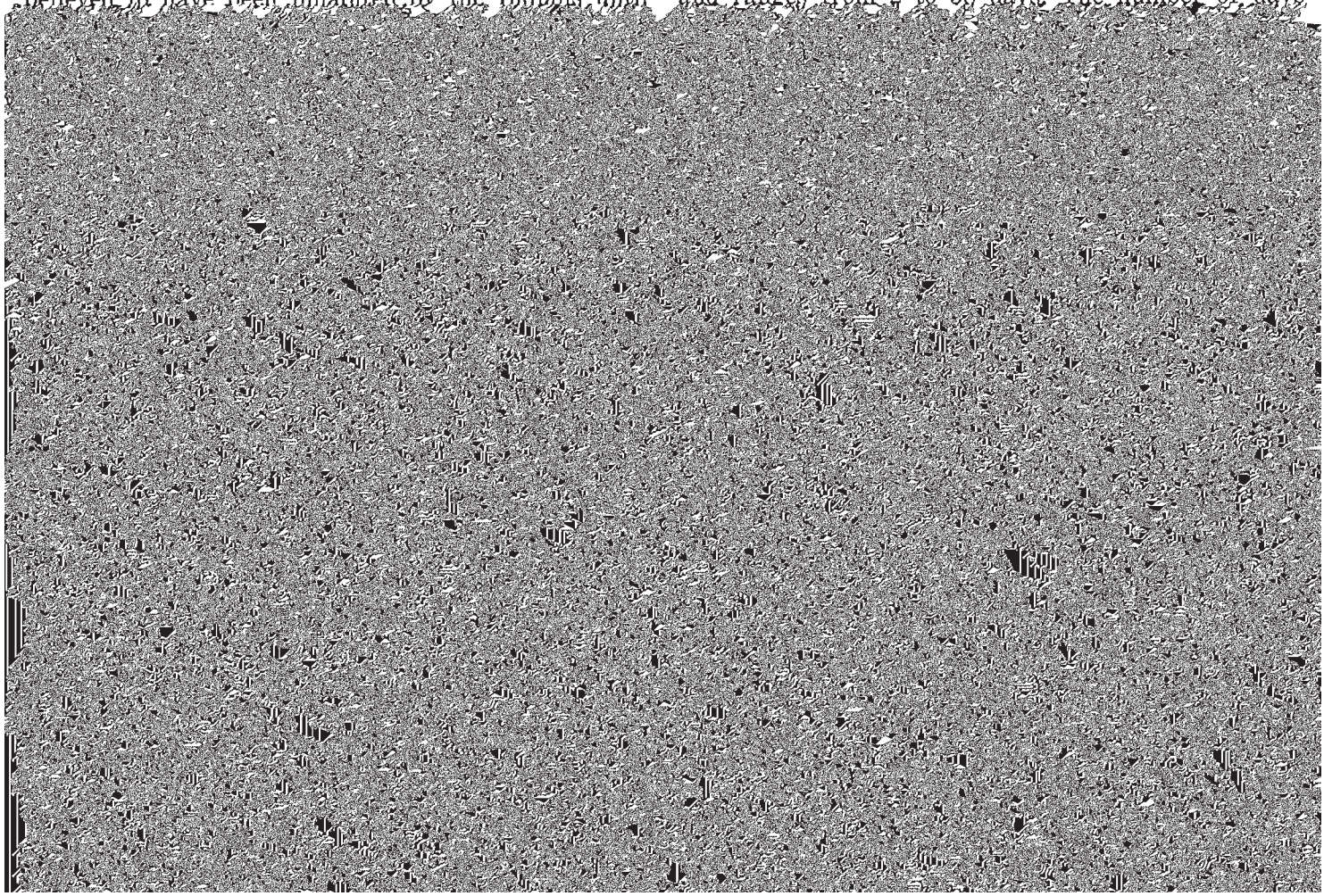
FAMILY: Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or to the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae. An example is the fine-silty over sandy or sandy-skeletal, mixed, noncalcareous, mesic family of Typic Haplaquolls.

General Nature of the County

In this section the settlement and development of Trempealeau County are discussed. Also, information is provided concerning the climate, relief and drainage, and farming.

Settlement and Development

The area now known as Trempealeau County is believed to have been inhabited by the Indians until



with Winona, Minnesota; U.S. Highway No. 53 crosses the county from north to south, joining La Crosse and Eau Claire; and U.S. Highway No. 10 and Interstate Highway No. 94 are the major east-west roads into the Twin Cities.

Climate [5]

The climate of Trempealeau County is continental, characterized by marked changes in weather common to locations in the interior of large land masses in the middle latitudes. Day length ranges from approximately 15 1/2 hours in June to 9 hours late in December.

Winters are cold and snowy. Summers are warm and have periods that are hot and humid. Spring and fall are sometimes short and are often a mixture of summer and winter. Weather changes can be expected every few days in winter and in spring. The climatological information and data are based on observations taken at Blair and should be fairly representative of Trempealeau County. Data on average temperatures are given in table 9. Data concerning the probabilities of the last freezing temperatures in spring and the first in fall are provided in table 10.

Since 1925 the highest temperature has been 109° F., and the lowest −45°. The number of days with temperatures of 90° and above averages 20 per year, and ranges from 2 to 38 days. The number of days

TABLE 9.—*Temperature and precipitation data*

[All data from Blair]

Month	Temperature				Precipitation				
	Average daily high	Average daily low	Average monthly highest	Average monthly lowest	Average	One year in 10 will have— Less than—	One year in 10 will have— More than—	Number of days with snow cover 1 inch or more	Average depth of snow on days with snow cover
	°F	°F	°F	°F	In	In	In		In
January	25	4	44	−24	1.2	0.3	2.6	27	6
February	29	6	47	−22	1.1	0.2	2.3	23	7
March	40	19	64	−4	1.9	0.5	3.5	15	5
April	57	33	78	18	2.6	1.2	3.9	2	3
May	71	45	87	27	3.7	1.3	6.6	(1)	2
June	80	55	93	37	4.6	2.5	7.5	0	0
July	85	59	97	44	3.8	1.5	7.8	0	0
August	83	57	95	40	3.8	1.4	7.5	0	0
September	74	48	89	28	3.6	1.2	7.3	0	0
October	62	37	79	20	2.0	0.2	5.0	(1)	1
November	43	23	66	3	1.9	0.5	3.3	5	2
December	29	11	47	−20	1.0	0.3	1.9	20	4
Year	56	33	[2] 99	[3] −28	31.2	25.5	40.5	92	5

[1] Less than one-half day.
[2] Average annual highest temperature.
[3] Average annual lowest temperature.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Blair]

Probability	Dates for given probability and temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	April 12	April 25	May 11	May 22	June 3
2 years in 10 later than	April 6	April 19	May 5	May 17	May 29
5 years in 10 later than	March 27	April 8	April 24	May 7	May 19
Fall:					
1 year in 10 earlier than	October 20	October 11	September 27	September 17	September 8
2 years in 10 earlier than	October 26	October 16	October 3	September 23	September 13
5 years in 10 earlier than	November 6	October 27	October 14	October 4	September 24

than 1 percent. The highest speeds are generally from one of the westerly directions.

Possible sunshine has averaged between 60 and 70 percent for June through September, near 40 percent for November and December, and between 50 and 60 percent for the remaining months.

The average date of the last 32° freeze in spring is May 19 and of the first 32° freeze in fall is September 24. The growing season, defined as the number of days between the last 32° freeze in spring and the first in fall, averages 128 days.

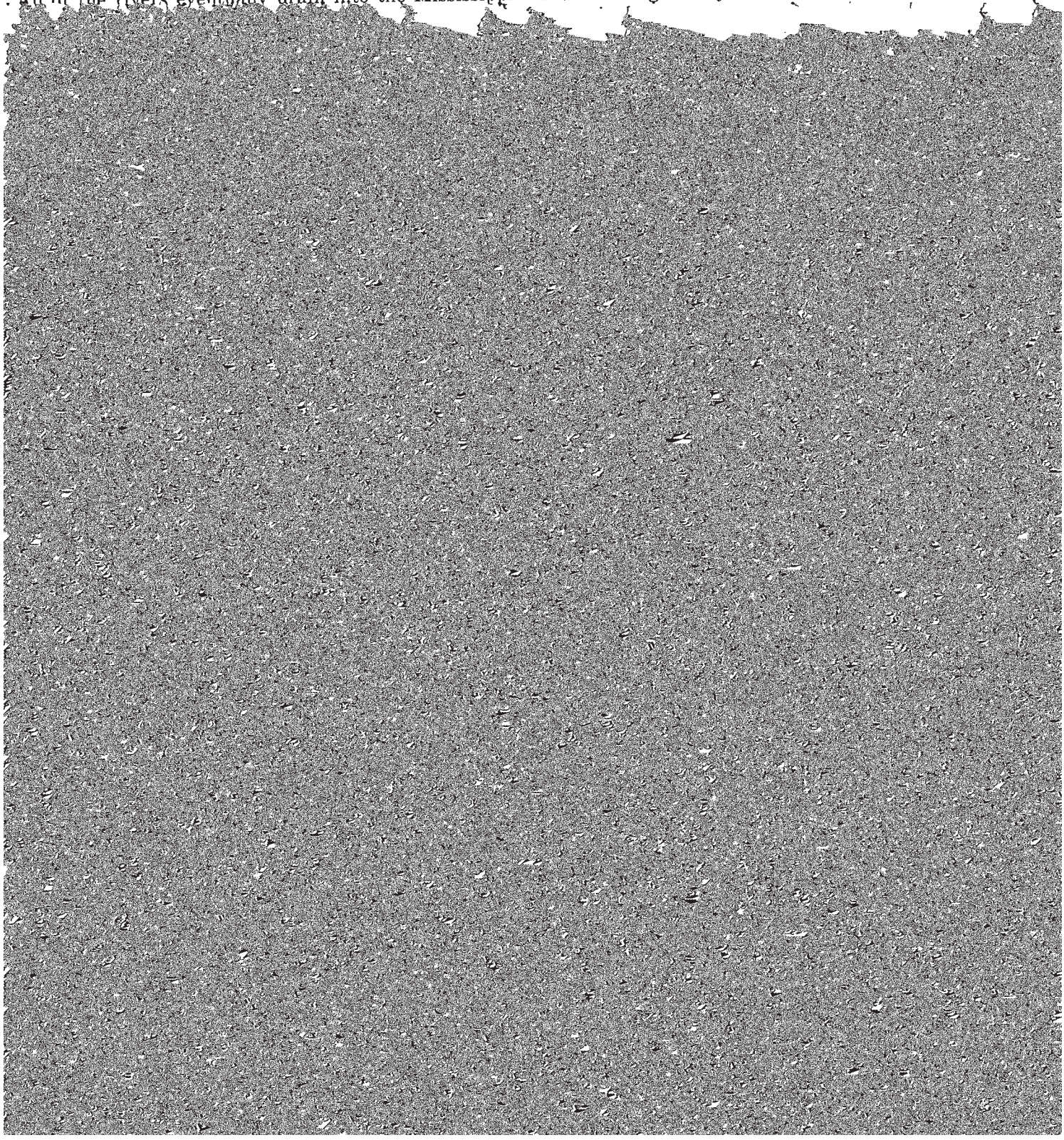
Relief and Drainage

There are two main ridges in the county. They are separated by the Trempealeau River. One ridge is in the northern part of the county and lies east and west. The bedrock in this area is mainly medium-grained and fine-grained sandstone that dips gently to the southwest.

The other ridge is in the southern part of the county. It lies east and west on the eastern side of the county and then makes approximately a right angle turn and lies north and south in the central and western parts of the county. The bedrock in this area is mainly medium-grained and fine-grained sandstone that is capped by dolomitic limestone in some areas. The bedrock in this area also dips gently to the southwest. The limestone ridges have the highest elevation and the steepest relief in the county. The elevation of the limestone ridges is about 1,200 feet, or about 500 feet above the adjacent valleys. Most of the rolling sandstone uplands are about 250 feet above the adjacent valleys.

Trempealeau County has three major watersheds. The Buffalo River drains the northern part of the county, and the Black River drains the southeastern part. The Trempealeau River drains the rest of the county. It is also the largest watershed in the county. All of the rivers eventually drain into the Mississippi

such as Dickinson, Gotham, and Billett soils. Large acreages are grown on a large sandy terrace along the Mississippi River. Green peas and sweet corn were raised on 2,450 acres in 1967. Most of these crops are grown on nearly level, silty benches along Beaver Creek and on a large sandy terrace along the Mississippi and



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

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can

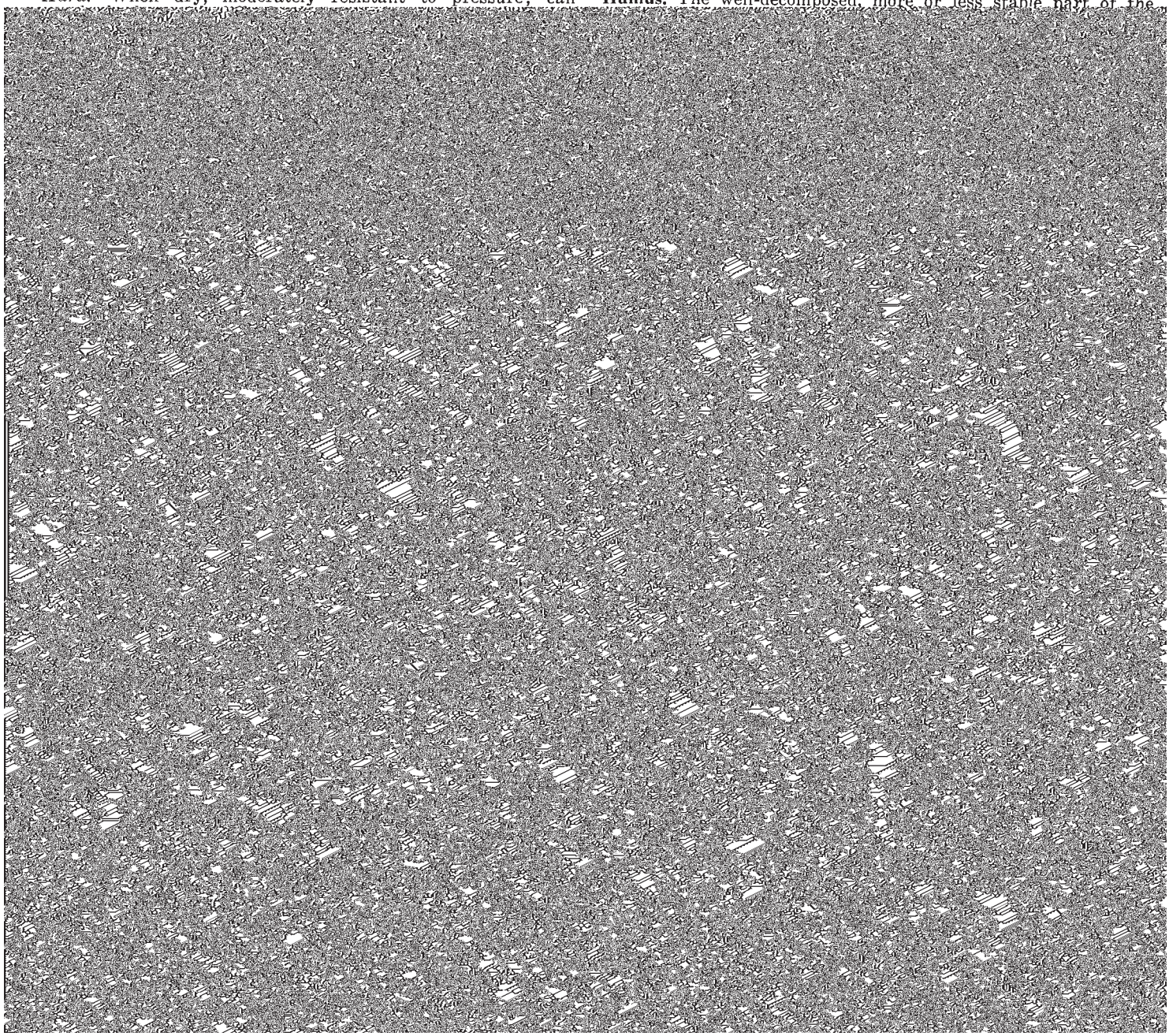
or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Humus. The well-decomposed, more or less stable part of the



is not soil but is frequently the material in which a soil has formed.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Savanna. An area of grassland usually flat and devoid of trees or containing only scattered trees.

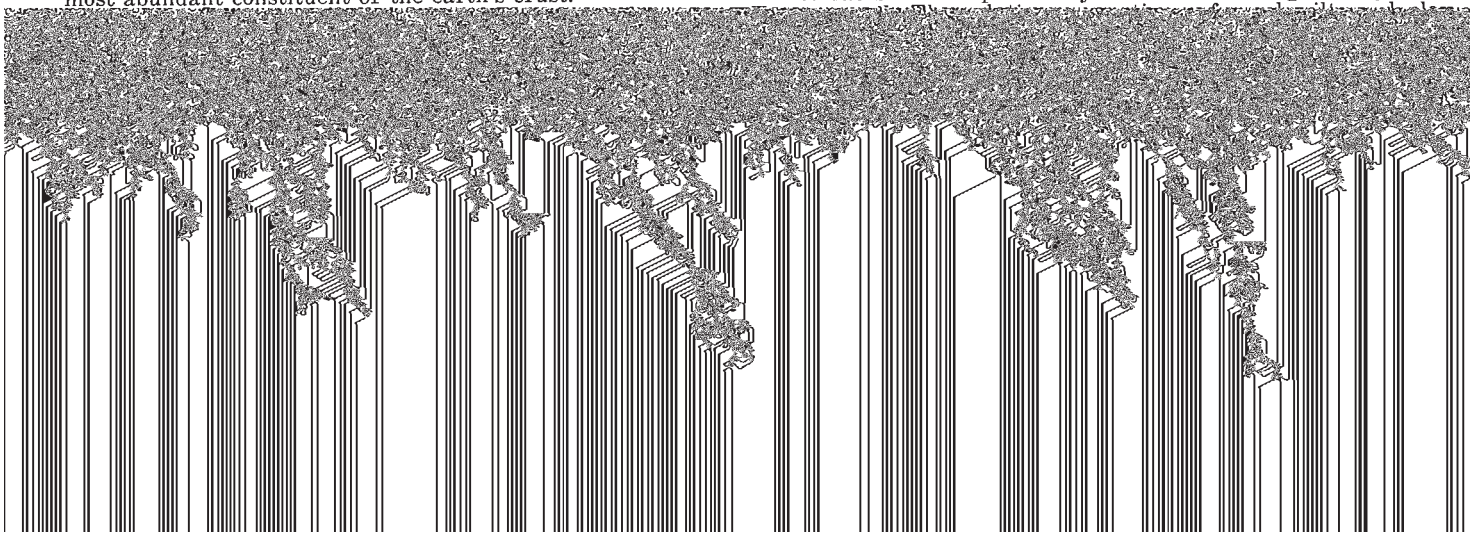
Siliceous. Adjective applied to rocks and soil material that contains silica. Silica is an oxide of silicon, SiO_2, and is the most abundant constituent of the earth's crust.

gular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

Substratum. Technically, the part of the soil below the solum.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.



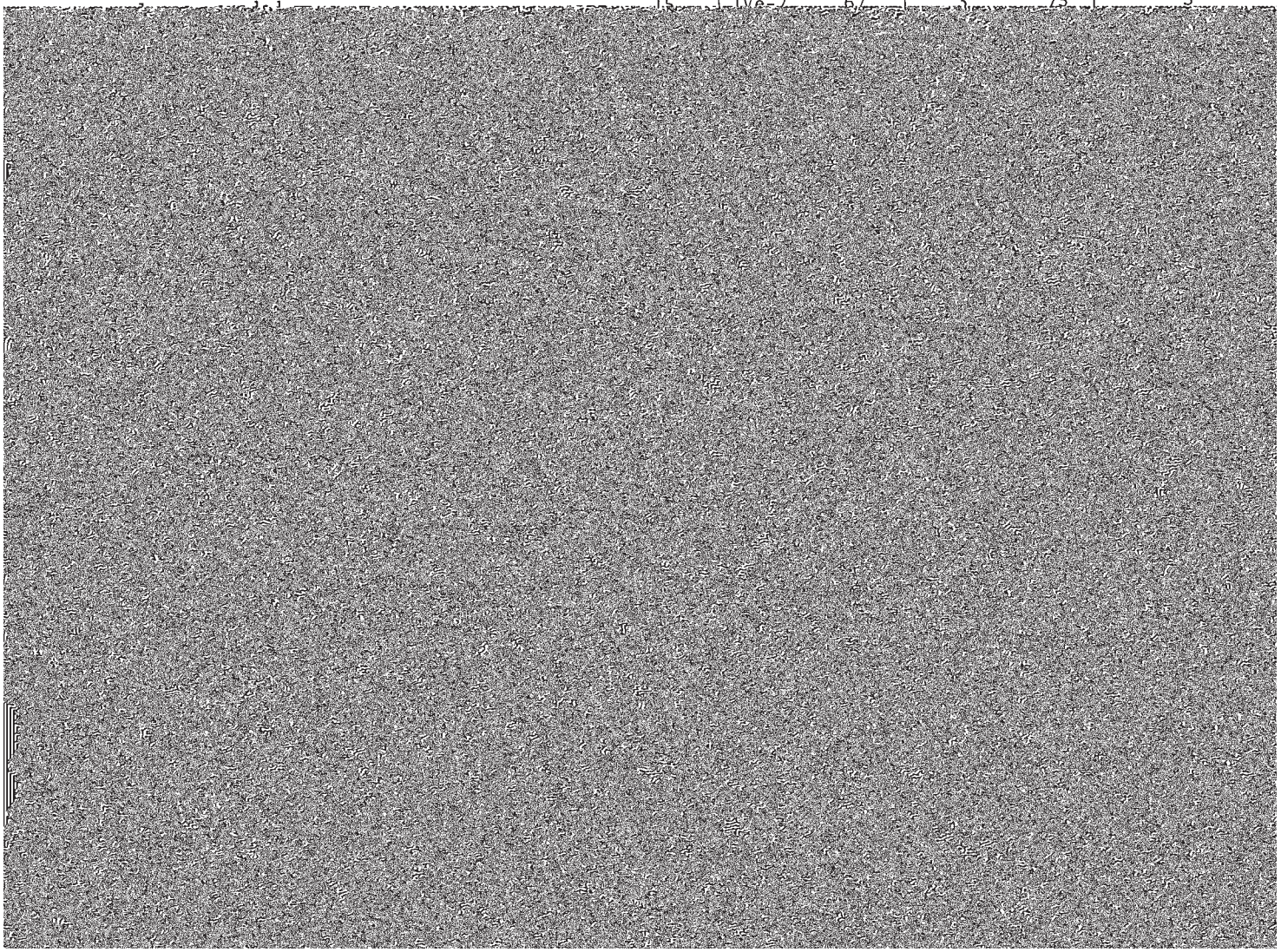
GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the soil series to which the mapping unit belongs. In referring to a capability unit, a woodland group, or a wildlife group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

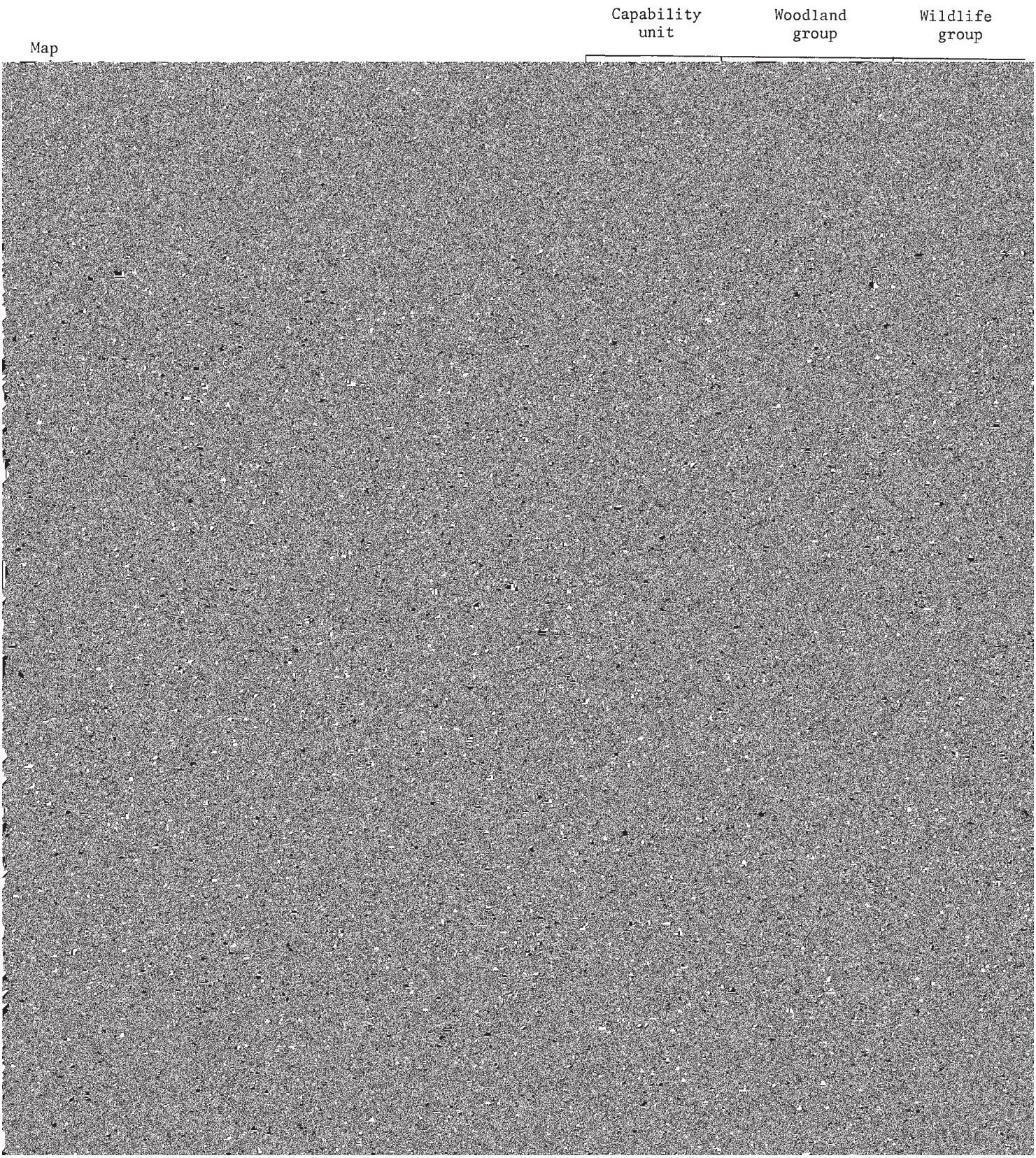
Acreage and extent, table 1, page 13.
Predicted yields, table 2, page 71.
Wildlife groups, table 3, page 78.

Engineering uses of the soils, tables 5, 6, and 7, pages 82 through 112.

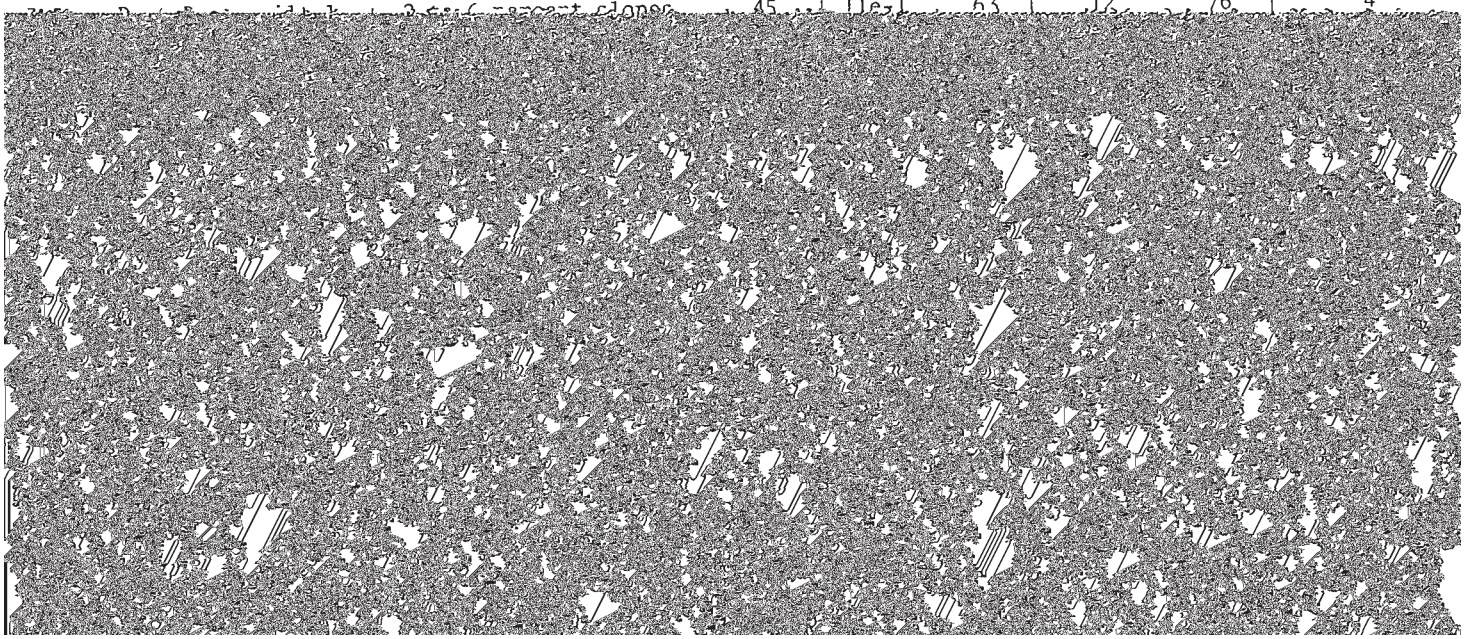
Map symbol	Mapping unit	Page	Capability unit		Woodland group		Wildlife group
			Symbol	Page	Number	Page	Number
B1A	Billett fine sandy loam, 0 to 2 percent slopes	14	IIIs-4	66	3	75	3
B1B	Billett fine sandy loam, 2 to 6 percent slopes	14	IIIs-4	66	3	75	3
B1C2	Billett fine sandy loam, 6 to 12 percent slopes, eroded	14	IIIe-7	66	3	75	3
B1D2	Billett fine sandy loam, 12 to 20 percent [illegible]	15	IVe-7	67	3	75	3



GUIDE TO MAPPING UNITS--Continued



Map symbol	Mapping unit	Page	Capability unit		Woodland group		Wildlife group
			Symbol	Page	Number	Page	Number
MoA	Morocco loamy sand, 0 to 3 percent slopes-----	38	IVw-5	67	8	76	5a
MuA	Muscatine silt loam, 0 to 3 percent slopes----	39	IIw-2	64	9	76	5a
NoC2	Norden loam, 4 to 12 percent slopes, eroded---	39	IIIe-2	65	1	75	1
NoD2	Norden loam, 12 to 20 percent slopes, eroded--	39	IVe-2	66	1	75	1
NrB2	Norden silt loam, 2 to 6 percent slopes, eroded----------	40	IIe-2	63	1	75	1
NrC2	Norden silt loam, 6 to 12 percent slopes, eroded----------	40	IIIe-2	65	1	75	1
NrD2	Norden silt loam, 12 to 20 percent slopes, eroded----------	40	IVe-2	66	1	75	1
NrE2	Norden silt loam, 20 to 30 percent slopes, eroded----------	40	VIe-2	67	1	75	1
Pa	Palms muck----------	41	IIw-8	64	10	76	6
PgB	Palsgrove silt loam, 2 to 6 percent slopes----	42	IIe-1	63	1	75	1
PgC2	Palsgrove silt loam, 6 to 12 percent slopes, eroded----------	42	IIIe-1	65	1	75	1
PgD2	Palsgrove silt loam, 12 to 20 percent slopes, eroded----------	42	IVe-1	66	1	75	1
P1B	Palsgrove silt loam, clayey subsoil variant, 2 to 6 percent slopes----------	43	IIe-1	63	1	75	1
P1C	Palsgrove silt loam, clayey subsoil variant, 6 to 12 percent slopes----------	43	IIIe-1	65	1	75	1
P1D	Palsgrove silt loam, clayey subsoil variant, 12 to 20 percent slopes----------	43	IVe-1	66	1	75	1
P1D2	Palsgrove silt loam, clayey subsoil variant, 12 to 20 percent slopes, eroded----------	43	IVe-1	66	1	75	1
P1E	Palsgrove silt loam, clayey subsoil variant, 20 to 30 percent slopes----------	43	VIe-1	67	1	75	1
PnD3	Palsgrove soils, clayey subsoil variant, 12 to 20 percent slopes, severely eroded----	43	VIe-1	67	1	75	1
PoA	Pillot silt loam, 0 to 2 percent slopes-------	44	IIs-1	65	12	76	4
PoB	Pillot silt loam, 2 to 6 percent slopes-------	44	IIe-2	63	12	76	4
PoC2	Pillot silt loam, 6 to 12 percent slopes, eroded----------	44	IIIe-2	65	12	76	4
[illegible]	[illegible]	45	IIe-1	63	12	76	4



Map symbol	Mapping unit	Page	Capability unit		Woodland group		Wildlife group
			Symbol	Page	Number	Page	Number
St	Stony and rocky land	50	VIIs-6	70	13	77	8
TrA	Trempe loamy sand, 0 to 2 percent slopes	51	IVs-3	67	4	75	3
TrB	Trempe loamy sand, 2 to 6 percent slopes	51	IVs-3	67	4	75	3
TuA	Trempealeau loam, 0 to 3 percent slopes	52	IIs-1	65	12	76	4
TvA	Trempealeau loam, mottled subsoil variant, 0 to 3 percent slopes	53	IIw-5	64	12	76	5a
UfB	Urne fine sandy loam, 2 to 6 percent slopes	53	IIe-2	63	3	75	3
UfC2	Urne fine sandy loam, 6 to 12 percent slopes, eroded	54	IIIe-2	65	3	75	3
UfD2	Urne fine sandy loam, 12 to 20 percent slopes, eroded	54	IVe-2	66	3	75	3
UfE2	Urne fine sandy loam, 20 to 30 percent slopes, eroded	54	VIe-2	67	3	75	3
UfF	Urne fine sandy loam, 30 to 45 percent slopes	54	VIIe-2	69	3	75	3
UnC2	Urne silt loam, 6 to 12 percent slopes, eroded	54	IIIe-2	65	3	75	3
UnD2	Urne silt loam, 12 to 20 percent slopes, eroded	55	IVe-2	66	3	75	3
UnE2	Urne silt loam, 20 to 30 percent slopes, eroded	55	VIe-2	67	3	75	3
UrD2	Urne-Norden complex, 12 to 20 percent slopes, eroded	55	IVe-2	66	1	75	1
UrE	Urne-Norden complex, 20 to 30 percent slopes	55	VIe-2	67	1	75	1
UrF	Urne-Norden complex, 30 to 45 percent slopes	56	VIIe-2	69	1	75	1

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