Soil Survey of

Union County, Illinois

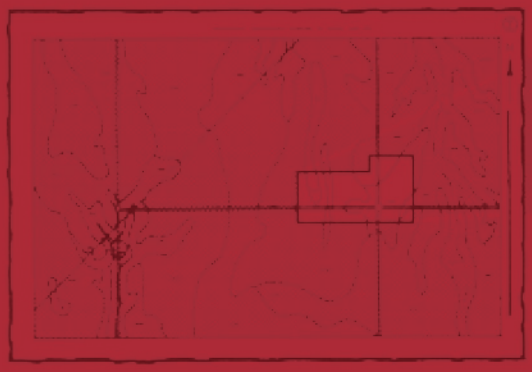
United States Department of Agriculture
Soil Conservation Service and Forest Service
in cooperation with
Illinois Agricultural Experiment Station

HOW TO USE

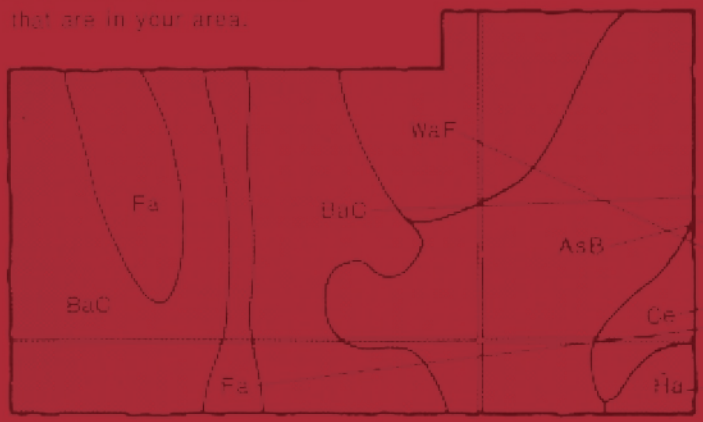
1. Locate your area of interest on the "Index to Map Sheets"

2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area.



Symbols

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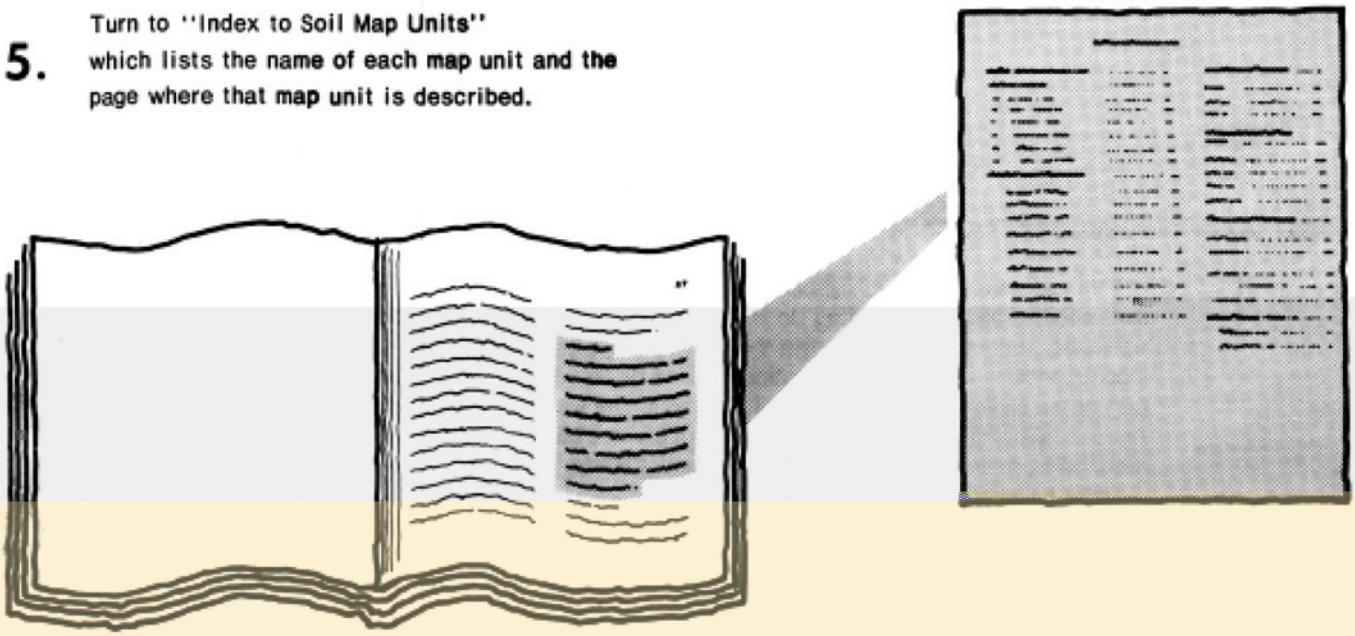
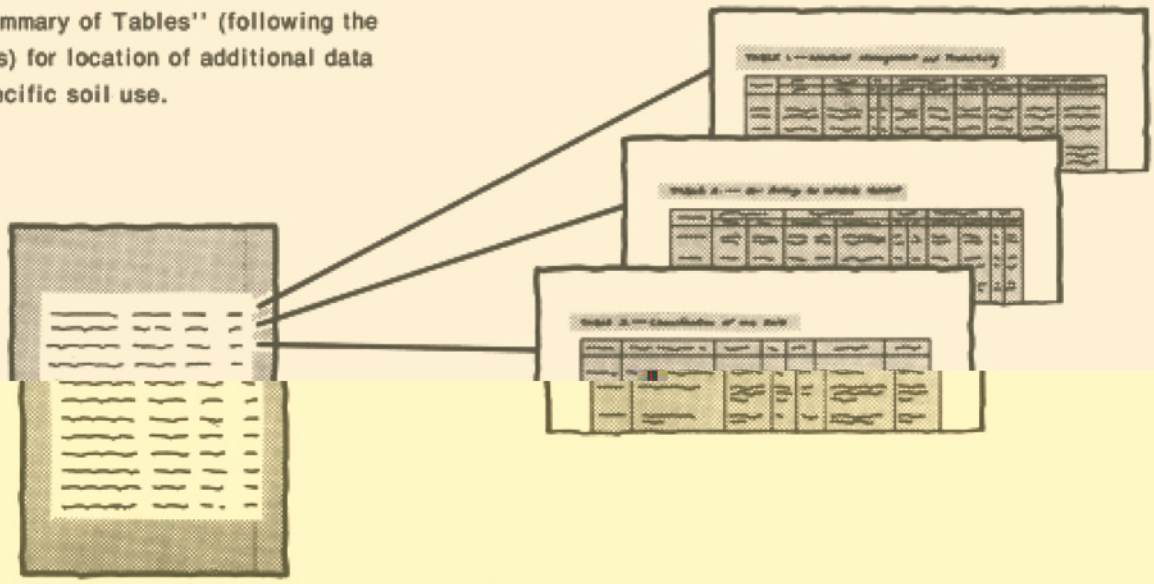
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



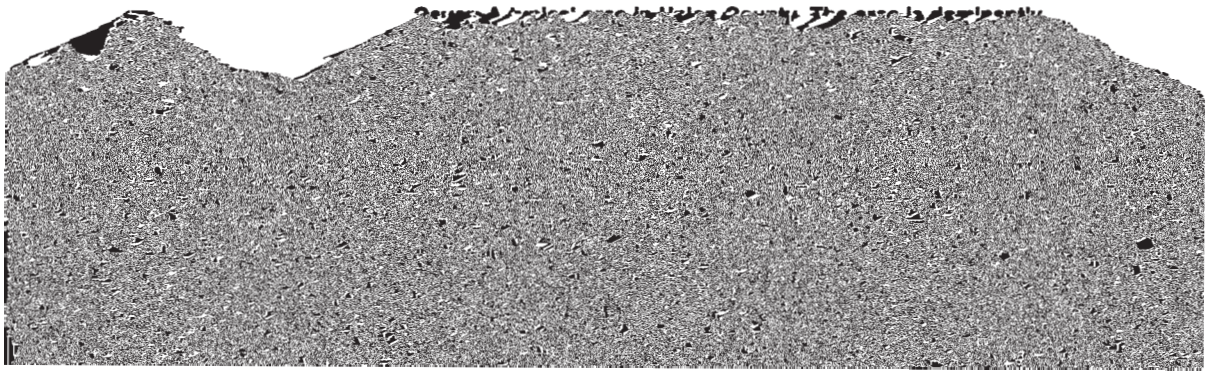
7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1971 to 1975. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Union County Soil and Water Conservation District. The cost was shared by the Union County Board of Commissioners.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can 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.

This soil survey is Illinois Agricultural Experiment Station Soil Report No. 110.



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Foreword

The Soil Survey of Union County, Illinois, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

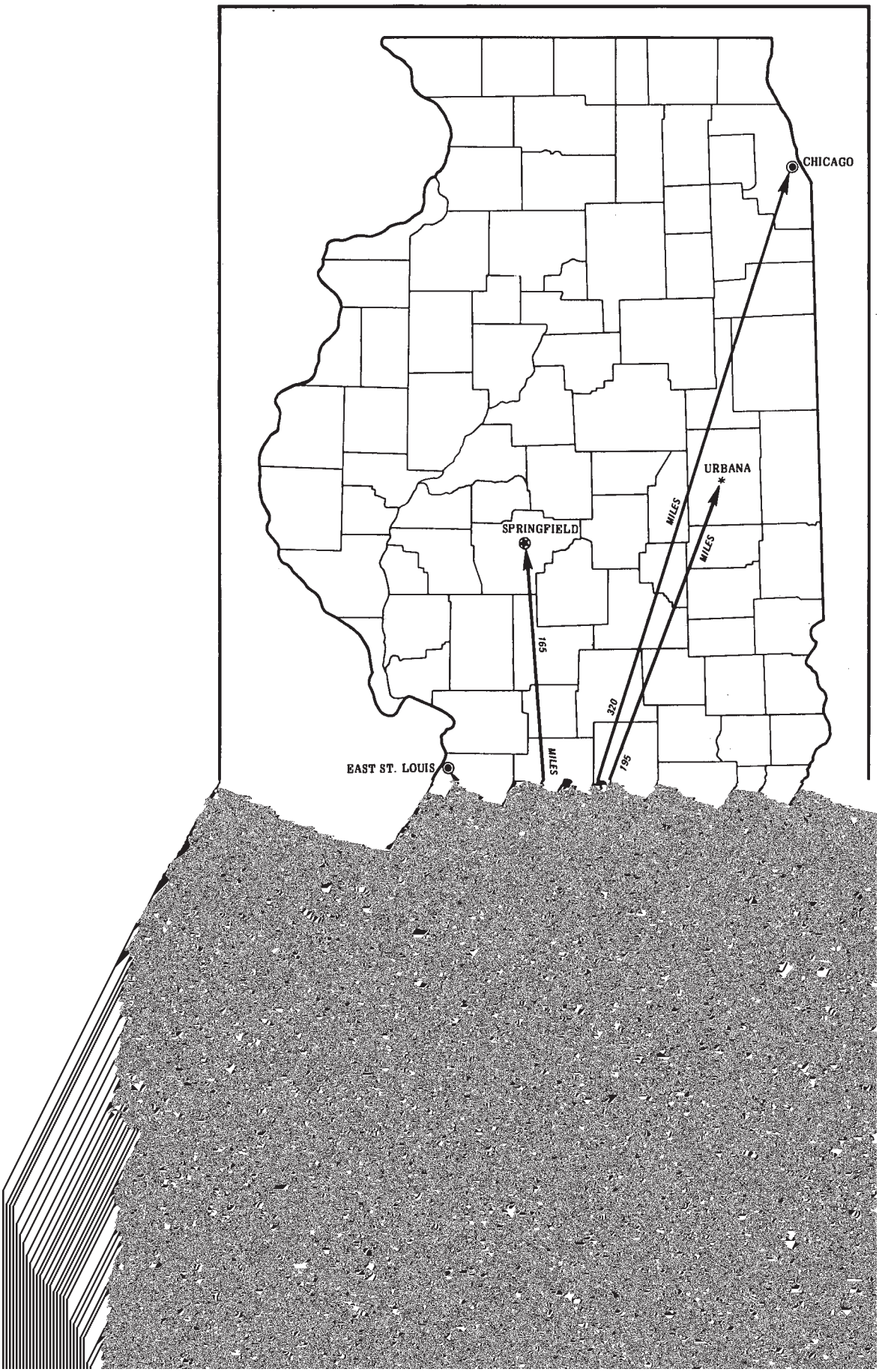
This soil survey has been prepared for many different users. Farmers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Daniel E. Holmes
State Conservationist
Soil Conservation Service


CHICAGO
URBANA
SPRINGFIELD
EAST ST. LOUIS
165
MILES
320
MILES
195
MILES

SOIL SURVEY OF UNION COUNTY, ILLINOIS

By C. C. Miles, assisted by J. W. Scott, B. E. Currie, and L. A. Dungan, Soil Conservation Service

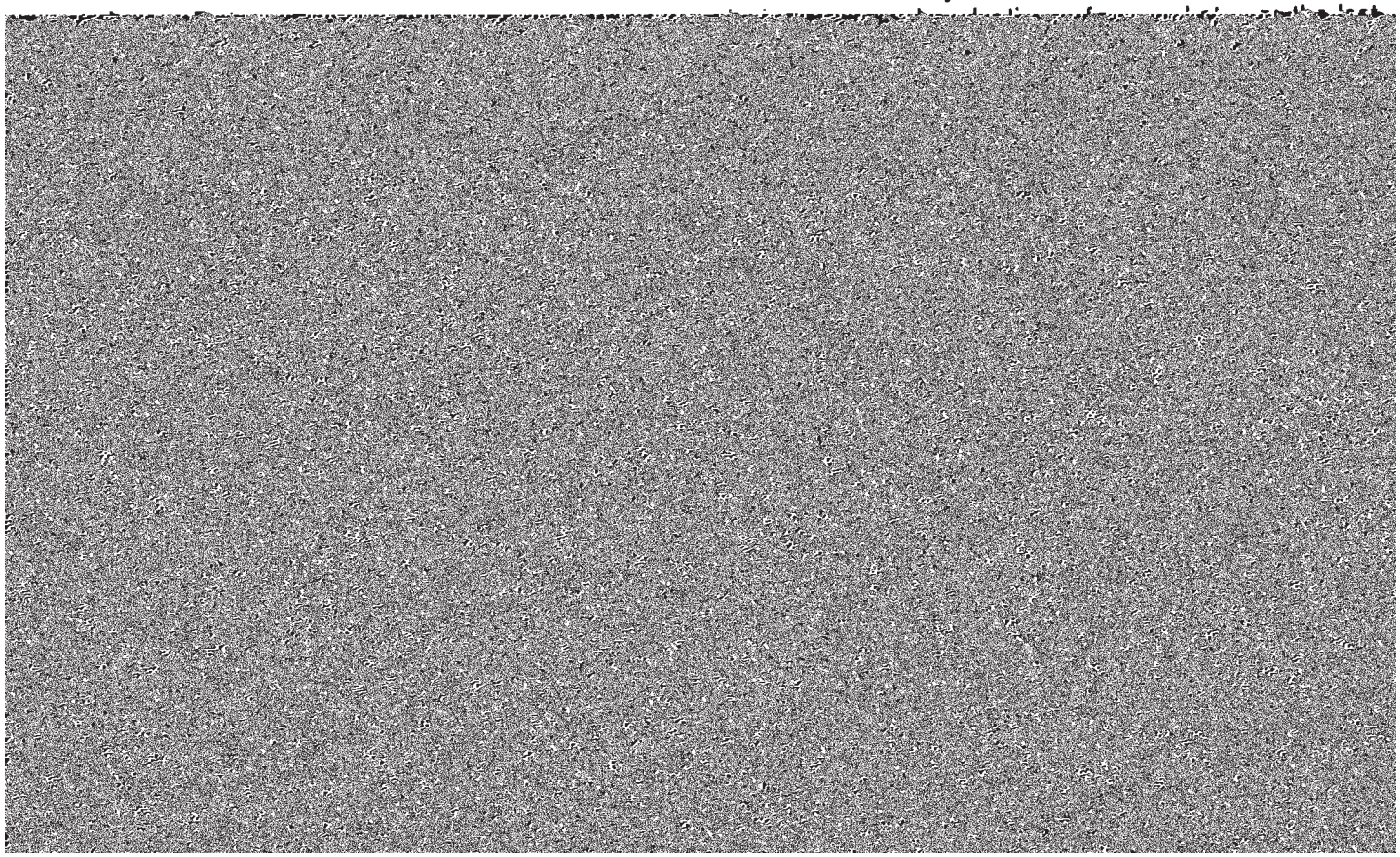
Fieldwork by B. E. Currie, L. A. Dungan, C. C. Miles, and J. W. Scott, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Forest Service
in cooperation with Illinois Agricultural Experiment Station

UNION COUNTY is in the southern part of Illinois (see map on facing page). It has an area of about 424 square miles, or 271,360 acres (*7*). The Mississippi River forms the western boundary. In 1970, the population of the county was 16,071. Jonesboro, the county seat, has a population of 1,700 and Anna, the largest city, one of 4,786. Other towns and villages are Cobden, Alto Pass, Dongola, Lick Creek, Mill Creek, Reynoldsville, Ware, and Wolf Lake.

summer the average temperature is 77 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 28, 1952, is 107 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule



Transportation facilities

Transportation facilities generally are good. The county is crossed from north to south by Interstate Highway 57 and U. S. Highway 51 and by State Routes 3 and 127 and from east to west by State Route 146. It has a good system of secondary roads, most of which are hard surfaced.

Railroads, although declining in use, provide valuable transportation service. All of the railroad lines run north and south and pass through most of the towns.

Natural resources

About 155,608 of the 271,360 acres in Union County is farmland. Of the 1,565 farms in the county, many of which are less than 100 acres in size, less than 8 percent are operated by tenants. Most owners or operators, however, supplement their income by working off the farm. A number of small industries provide employment. The average age of the farm operators is 52.3 years.

Union County has produced fruit, particularly apples and peaches, and vegetables. Although the extent has declined over the years, a fairly large acreage still produces fruit and vegetables. Erosion is only a minor problem in the orchards, most of which are kept in sod. It commonly is moderate to severe, however, in areas where vegetables are grown. In these areas, the crops generally are clean tilled and little crop residue is returned to the soil.

Two stone quarries operate in Union County. One, at the east edge of Anna, produces mostly road rock. The other, near Mill Creek, produces agricultural limestone.

The Shawnee National Forest occupies about 35,023 acres in the county and the State of Illinois 13,240 acres. The county has two water districts—the Shawnee Valley and the Lick Creek Water Districts.

Relief, physiography, and drainage

Rock formations belonging to the Pennsylvanian, Mississippian, and Devonian periods crop out in Union County. The youngest rocks, or the Pennsylvanian rocks, which are roughly north of a line from Alto Pass to Lick Creek, generally form the highest elevations in the county. The Mississippian rocks are in the eastern half of the county. Sandstone, limestone, or shale can crop out locally. For the most part, the sandstone is in the northeastern part of the county and the limestone in the southwestern part. The Devonian rocks are along the west side of the county, roughly west of a line from Alto Pass to Mill Creek. Most are cherty, but some are shale or limestone. The bedrock has a northeast-southwest strike and dips northeast 1 degree to 2 degrees.

In Union County, the Mississippi River is about 340 feet above sea level. The bottom land ranges in elevation from 340 to about 360 feet. Generally, the Devonian bedrock hills adjacent to bluffs along the Mississippi River rise to an elevation of 600 to 800 feet, the Mississippian bedrock hills to one of 500 to 650 feet, and the Pennsylvanian bedrock hills to one of 700 to 850 feet. Bald Knob, which is near Alto Pass in the northwest part of the county, has an elevation of 1,050 feet. It is the third highest point in Illinois.

Except for the bottom land along the Mississippi River and Cypress and Upper Cache Creeks and the narrow valleys along the smaller streams, Union County is mainly gently rolling to hilly. Vegetables are commonly grown on the narrow bottom land, whereas row crops commonly are intensively grown on the wider bottom land along the larger streams. The uplands, mostly windblown loess deposited over sandstone and limestone, commonly have been used for pasture, woodland, and orchards, but the trend is toward row crops.

The soils range mainly from well drained in the uplands to poorly drained on the wider bottom land. Many of the bottom land soils are suited to tile drainage, but the lack of outlets limits subsurface drainage. Most excavated ditches function only when the Mississippi River is low. The bottom land along Cypress and Upper Cache Creeks is flooded annually. Although leveed, much of the bottom land along the Mississippi River is inundated annually by seep water or backwater.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

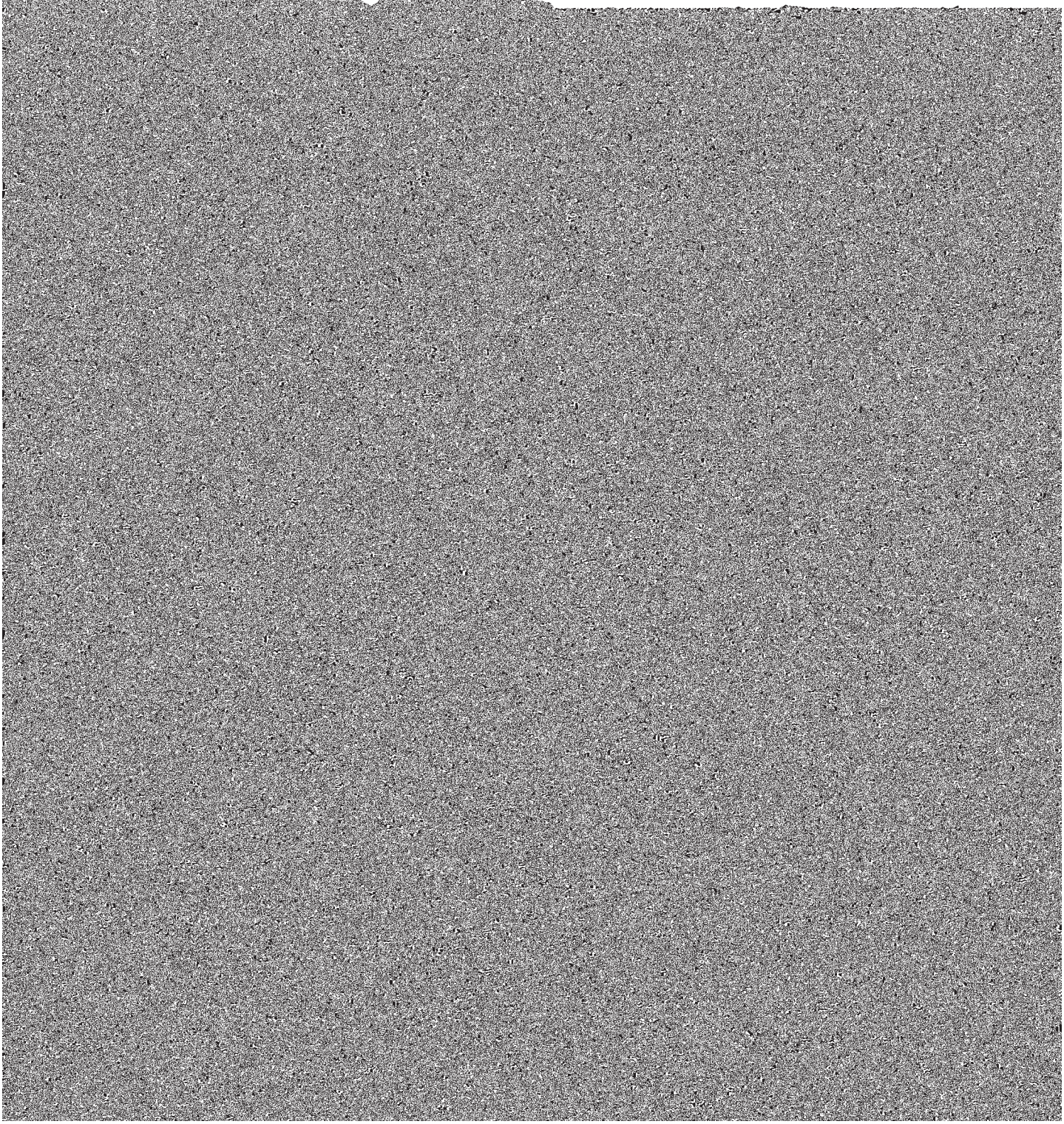
The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad

place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Descriptions of associations



Minor in this association are the poorly drained Cairo and the somewhat poorly drained Bowdre, Tice, and Dupo soils. These soils are slightly higher on the landscape than the major soils.

This association is used mainly for cultivated crops, but some areas remain in native hardwoods. Woodland is more common on the Jacob soils. Some ponded areas provide wetland wildlife habitat. Wetness and overflow are the main limitations.

This association has fair potential as cropland if it is adequately drained. It has poor potential for most urban or residential uses and for recreation uses because of the overflow and the high content of clay. Many areas have good potential as habitat for wetland wildlife.

3. Ware-Medway association

Nearly level and gently sloping, moderately well drained soils formed in silty, loamy, and sandy alluvial deposits

This association consists of soils on flood plains along the Mississippi River. It occupies about 7 percent of the county. It is about 30 percent Ware soils, 30 percent Medway soils, and 40 percent soils of minor extent (fig. 1).

The loamy Ware soils are on the slightly higher ridges. They contain somewhat more sand and less clay in the upper part than the silty Medway soils.

Minor in this association are mainly the excessively drained Sarpy, the poorly drained Gorham, and the somewhat poorly drained Bowdre soils. These soils are slightly lower on the landscape than the major soils. The sandy Sarpy soils are on ridges.

This association is used mainly for cultivated crops. It is well suited to row crops, but the soils outside the levee are subject to frequent flooding. Some of the more sandy areas are susceptible to soil blowing if the surface is bare.

This association has good potential for cultivated crops, fruits, and vegetables. The potential for residential uses is poor because flooding is a hazard. Also, the ground water supply can be contaminated by effluent from onsite waste disposal systems. The potential for openland wildlife habitat and most recreation uses is good.

4. Hosmer association

Gently sloping to moderately steep, moderately well drained soils that have a fragipan and that formed in loess

This association consists mainly of soils on hills, ridges, and side slopes. It occupies about 16 percent of the county. It is about 65 percent Hosmer soils and 35 percent soils of minor extent.

Hosmer soils have moderately permeable upper layers and slowly permeable lower layers. The surface layer is silt loam, and the subsoil is silty clay loam and silt loam. A compact, brittle fragipan is within a depth of 24 to 36 inches in most areas.

Minor in this association are Alford, Stoy, Zanesville, and Wakeland soils. Alford soils are higher on the landscape than the major soils. Stoy soils are at the head of drainageways. Zanesville soils are lower on the landscape than the major soils. Wakeland soils are on narrow bottom land.

This association is used mainly for cultivated crops, hay, and pasture. Some areas support native hardwoods. The erosion hazard and the slope are the main management problems.

The less steep areas have fair potential for cultivated crops and fair or poor potential for residential development. The potential for development of openland or woodland wildlife habitat is fair to good.

5. Hosmer-Zanesville association

Gently sloping to moderately steep, moderately well drained soils that have a fragipan and that formed in loess or in loess and material weathered from sandstone and siltstone

This association consists mainly of soils on ridges and hills. It occupies about 15 percent of the county. It is about 40 percent Hosmer soils, 15 percent Zanesville soils, and 45 percent soils of minor extent.

Hosmer soils are on the tops and sides of ridges and on hillsides. Zanesville soils are mainly on long hillsides. Bedrock escarpments are common on many of these hillsides. Both soils have a silt loam surface layer and a silt loam or silty clay loam subsoil. In both the lower part of the subsoil is a brittle, compact fragipan. Zanesville soils formed partly in material weathered from bedrock and contain sand grains and coarse fragments.

Minor in this association are Alford, Westmore, Wellston, and Burnside soils. Alford soils are higher on the landscape than the major soils, and Westmore and Wellston soils are lower. Alford soils do not have the fragipan characteristic of the major soils. Burnside soils are on narrow bottom land.

This association is used mainly for cultivated crops, pasture, or woodland. The erosion hazard, the slope, and the rooting depth are the main management problems. Also, rock crops out in places.

The less sloping areas have fair potential for cultivated crops and poor potential for residential development. Most of the acreage has good potential for woodland, for openland or woodland wildlife habitat, and for hiking trails or sightseeing areas.

6. Alford-Wellston association

Gently sloping to steep, well drained soils formed in loess or in loess and material weathered from sandstone and siltstone

This association consists mainly of soils on ridges and hills. It occupies about 11 percent of the county. It is about 60 percent Alford soils, 10 percent Wellston soils, and 30 percent soils of minor extent (fig. 2).

Alford soils are on the parts of ridgetops and hillsides where the layer of loess is thickest. They have a silt loam surface layer and a silty clay loam subsoil. Wellston soils are on the lower, generally steeper hillsides where material weathered partly from bedrock is within 40 inches of the surface. The surface layer is silt loam, and the subsoil is silt loam and very channery silty clay loam.

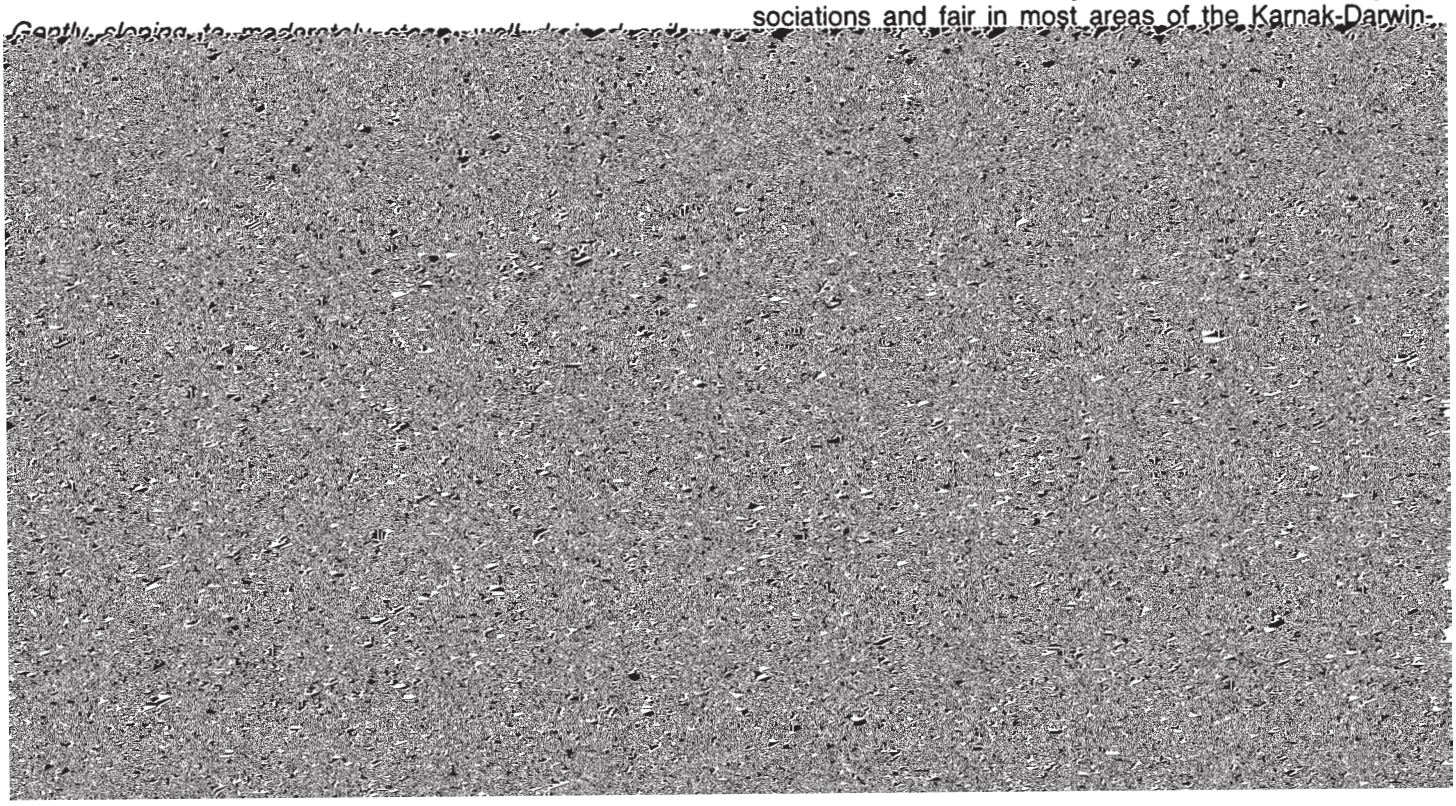
Minor in this association are Hosmer, Zanesville, Neotoma, Haymond, and Burnside soils. Hosmer and Zanesville soils are downslope from Alford soils and upslope from Wellston soils. Neotoma soils are on foot slopes. Haymond and Burnside soils are on narrow bottom land.

This association is used mainly for pasture and woodland, but some areas are used for cultivated crops, orchards, or vegetables. The erosion hazard and the slope are the main management problems. In some areas the soils are stony.

This association has fair to poor potential for cultivated crops and for residential or recreational development. Most areas have good potential for woodland, for woodland or openland wildlife habitat, and for orchards. Much of the acreage has good potential for hiking trails or sightseeing areas.

7. Alford association

Gently sloping to moderately steep, well drained soils



8. Goss-Alford association

Moderately steep to very steep, well drained soils formed in material weathered from cherty limestone or in loess

This association consists mainly of very hilly soils on bluffs along the flood plain of the Mississippi River. It occupies about 18 percent of the county. It is about 50 percent Goss soils, 30 percent Alford soils, and 20 percent soils of minor extent.

Goss soils are on the mid and lower parts of hillsides. They formed in cherty limestone and have a cherty, clayey subsoil. Alford soils are on the upper side slopes and narrow ridgetops. They formed in loess and are silty throughout.

Minor in this association are Elsah, Haymond, and Wakeland soils. These soils are on narrow bottom land.

This association is mainly native woodland, but a few areas are pastured. The slope, a severe erosion hazard, and the cherty, clayey subsoil limit the use of this association. Also, small areas on bottom land are subject to flash flooding.

Most areas have good potential as woodland, habitat for woodland wildlife, and hiking trails or sightseeing areas. The potential for most other uses is poor.

Broad land-use considerations

The potential for cultivated crops is good in most areas of the Wakeland-Haymond and Ware-Medway associations and fair in most areas of the Karnak-Darwin-

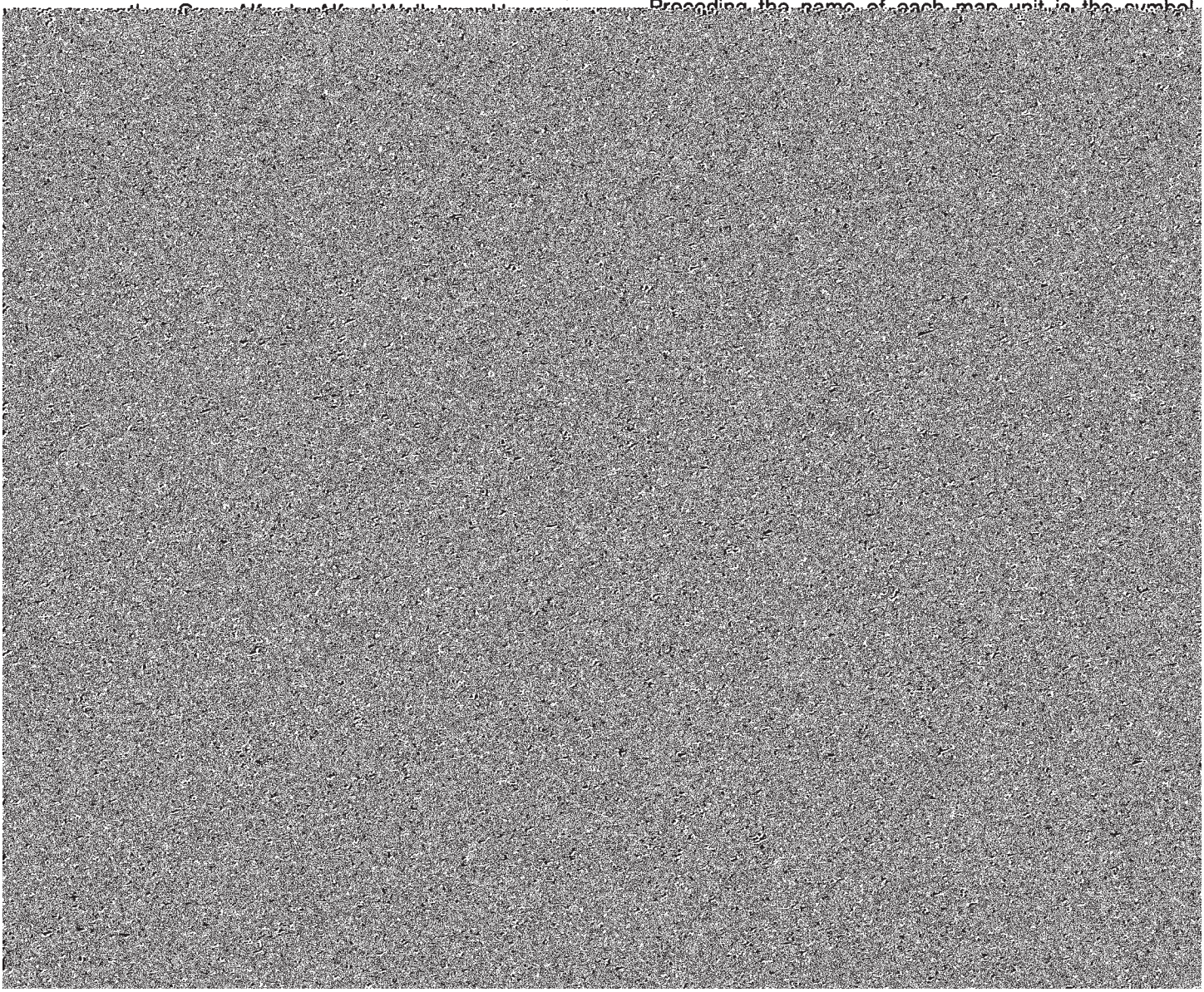
Because air drainage is good in most places and the supply of available water is adequate, all areas of the Hosmer, Hosmer-Zanesville, Alford, and Alford-Wellston associations except the areas of severely eroded Hosmer soils have good potential for apples and peaches. The gently sloping, less eroded soils in these associations have good potential for most vegetables and other specialty crops. These soils are moderately well drained or well drained, warm up early in spring, and are in good tilth. Erosion is the main problem. The silty, loamy, or sandy soils in the Wakeland-Haymond and Ware-Medway associations have good potential for most vegetables. These crops can be damaged by floodwater during some years.

Most soils in the county have good or fair potential for woodland. Commercially valuable trees are commonly [illegible] parts of the Hosmer-Zanesville and Alford-Wellston associations are examples.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

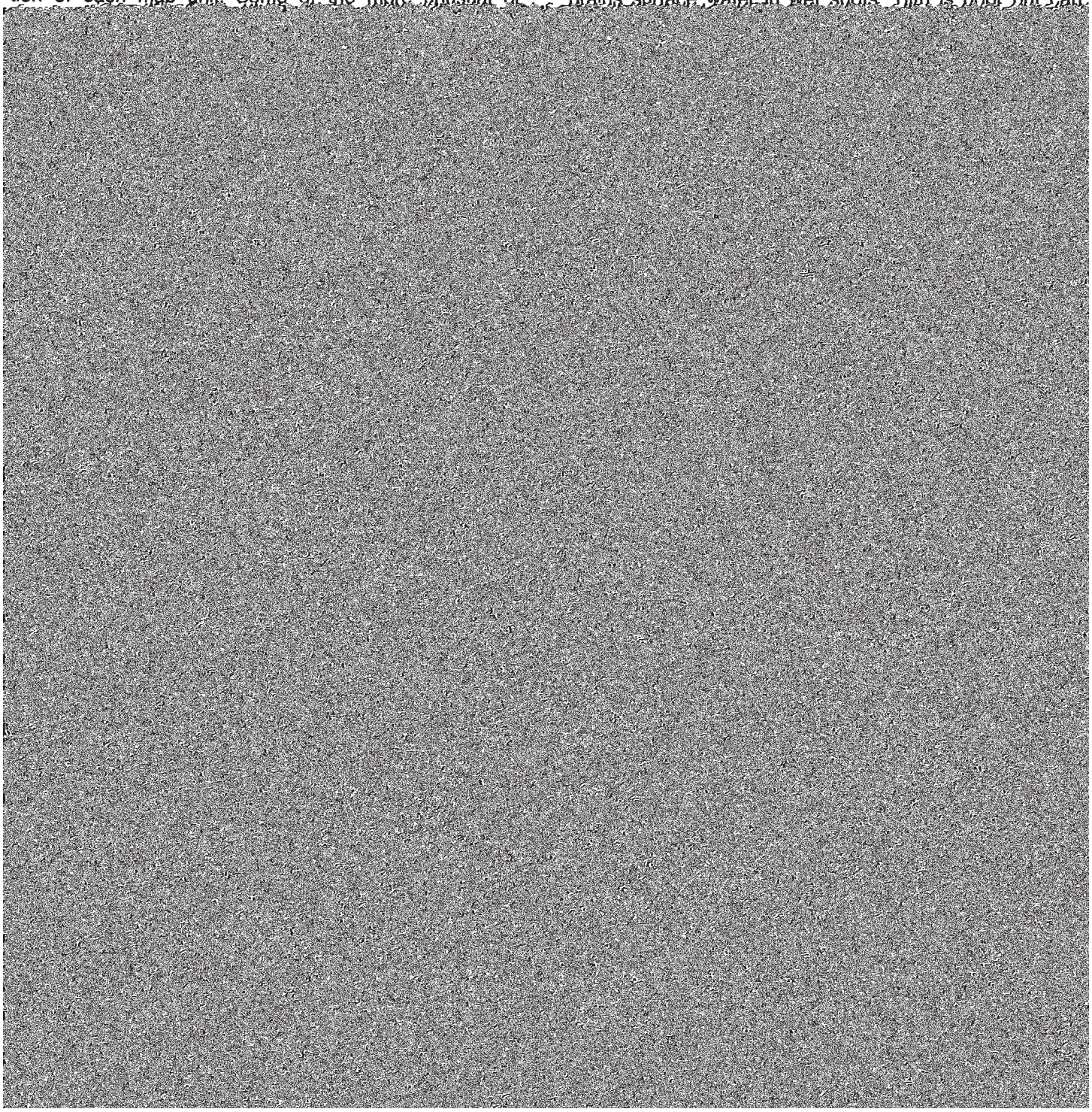
Preceding the name of each map unit is the symbol



Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or

habitat. The potential for building site development and septic tank absorption fields is poor.

This soil is suited to row crops. Shallow ditches at close intervals and land leveling commonly reduce wetness. Because of the very slow permeability, subsurface tile functions satisfactorily only as a surface inlet, which drains surface water in wet spots. Tilth is poor but can



Hay and pasture crops are well suited to this soil. They are effective in controlling erosion. Proper stocking rates, pasture rotation, and restricted use during wet periods keep the pasture and the soil in good condition.

This soil is well suited to woodland. Controlling plant competition helps to obtain maximum growth rates. Harvesting mature trees, cutting cull trees, weeding, and thinning reduce plant competition.

This soil has few limitations as a site for buildings, local roads, or waste disposal systems. The main concern is controlling erosion in exposed areas during construction. The effluent from onsite waste disposal systems can contaminate the ground water supply.

Capability subclass IIe.

85—Jacob silty clay. This nearly level, poorly drained or very poorly drained soil is on broad flats and in depressions or narrow channels on bottom land along the Mississippi River. It is subject to rare flooding. Individual areas are mainly long or round and range from about 20 to more than 400 acres in size.

Typically, the surface layer is grayish brown silty clay about 9 inches thick. The subsoil is grayish brown, olive gray, and gray, mottled clay about 47 inches thick. The substratum to a depth of about 60 inches is olive gray silty clay. In places the surface layer is thicker and reduce the wetness. Surface tilth can be improved by incorporating crop residue into the soil and by reducing compaction through conservation tillage.

Hay and pasture plants can be grown on this soil if adequate drainage and protection against overflow are provided. Grasses and legumes that are tolerant of wetness should be selected. Restricted use during wet periods keeps the pasture and the soil in good condition.

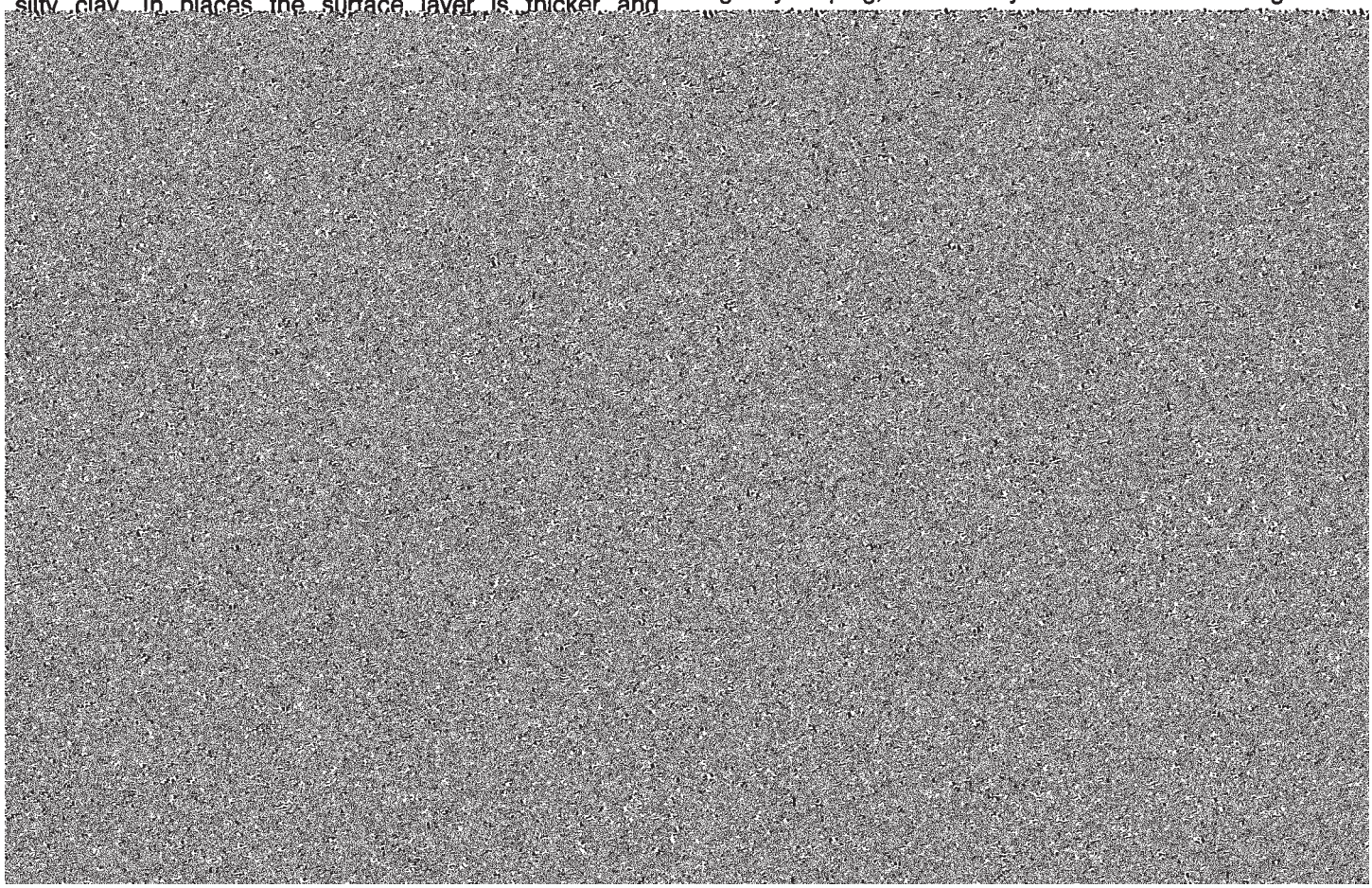
This soil is moderately suited to woodland. Many areas remain in native hardwoods. As a result of the clayey surface layer, seedling mortality is severe and the effective use of mechanical planters is restricted. Flooding and deposition can damage seedlings. Plant competition can be controlled by harvesting mature trees, cutting cull trees, weeding, and thinning.

The areas left in native hardwoods are well suited to woodland wildlife habitat. The cleared areas are well suited to the development of habitat for wetland wildlife.

Sewage lagoons can be installed on this soil only if they are properly designed and laid out and if adequately protected against overflow.

Capability subclass IVw.

92—Sarpy loamy fine sand. This nearly level and gently sloping, excessively drained soil is on ridges and



ling soil blowing and water erosion and in conserving soil moisture.

This soil is well suited to certain specialty crops, such as muskmelons or watermelons. It is suited to vegetable gardens only if the vegetables are grown early in the growing season; it is too droughty for vegetables during the summer. Several small applications of fertilizer, rather than one large application, are needed. Irrigation is beneficial.

Hay and pasture are well suited to this soil. They are effective in controlling erosion. During dry years yields can be reduced. If overgrazing is avoided and hay cutting limited, an adequate plant cover can be maintained during these years.

This soil is very poorly suited to woodland. The expected growth rate is low, and seedling mortality is severe. Competition from undesirable plants can be controlled by proper site preparation, by thinning, by cutting cull trees, and by weeding.

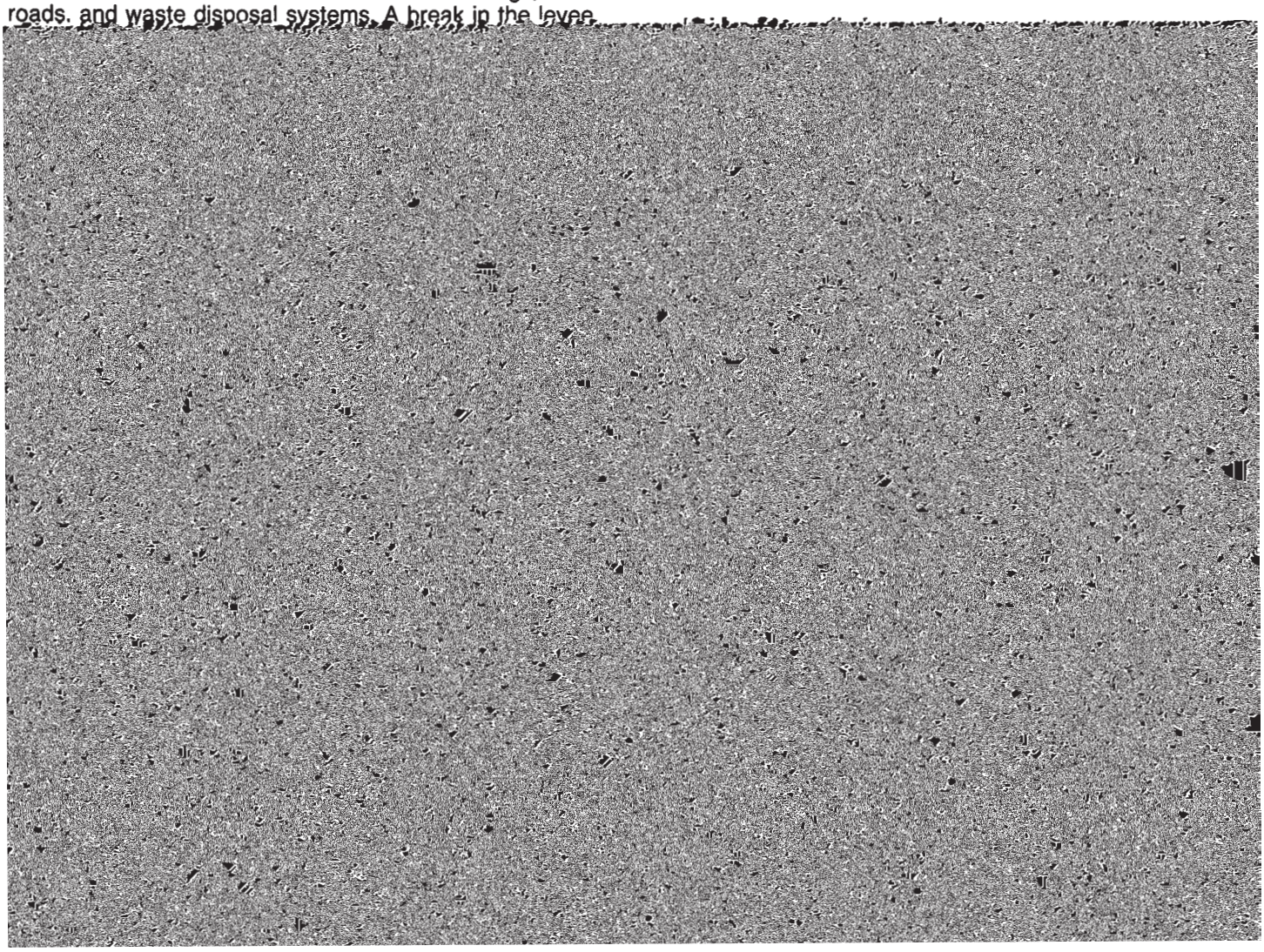
This soil is well suited as a site for buildings, local roads, and waste disposal systems. A break in the levee is medium, and natural fertility is high. Available water capacity also is high.

Most areas are used for cultivated crops. This soil has good potential for row crops, hay, pasture, and trees. It has fair potential as habitat for woodland and wetland wildlife. The potential for most recreation uses and for building site development and sanitary facilities is poor.

This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay or pasture. Seasonal wetness limits the choice of plants in some years. The wetness can be reduced by shallow ditches or by tiling. The return of crop residue to the surface layer and conservation tillage reduce compaction and soil loss.

The acreage of this soil used as pastureland or hayland is not extensive. The choice of plants is limited by wetness in some years. Restricted use during wet periods keeps the pasture and the soil in good condition.

Capability subclass IIw.



recreation uses is fair. The potential for building site development and septic tank absorption fields is poor.

This soil is suited to corn, soybeans, grain sorghum, wheat, and grasses and legumes if adequate drainage is provided. Shallow ditches can remove excess water. In low-lying areas diversion terraces can intercept runoff from higher ground. Erosion is a hazard in the more sloping areas. Conservation tillage, terraces, and contour farming reduce soil loss. Tilth can be improved by adding crop residue or other organic material to the surface layer.

Grasses and legumes grow well if properly fertilized, limed, and maintained. Frost heaving can damage the stand in winter. It can be minimized by removing excess surface water through shallow ditches. Grazing when the soil is wet causes surface compaction and poor tilth.

This soil is moderately well suited to woodland. Some areas remain in native hardwoods. Wetness can be a problem if logging is done during rainy periods.

Sewage lagoons can be installed on this soil.

Capability subclass IIw.

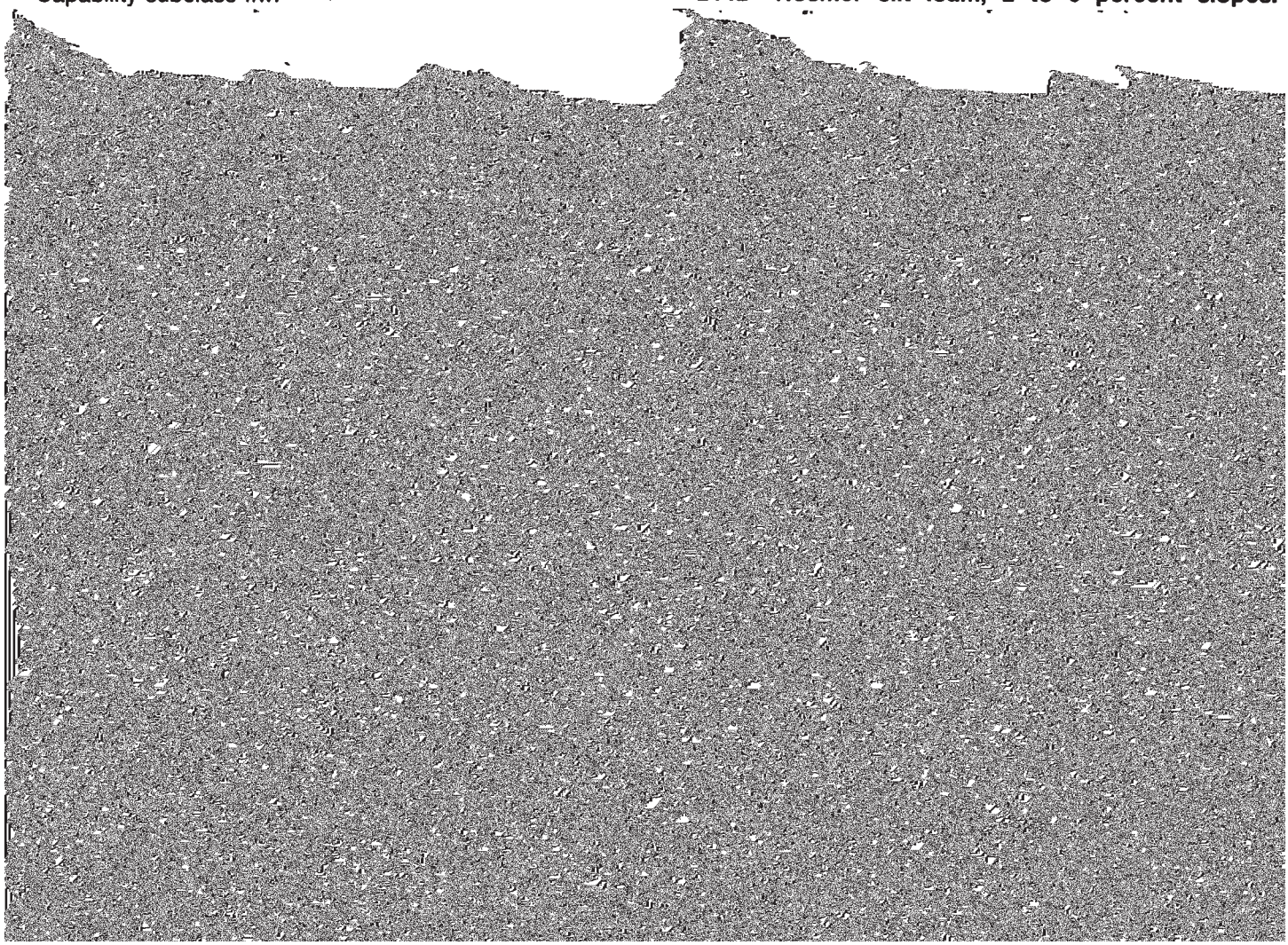
Most areas are farmed. This soil has good potential for row crops, hay, pasture, and trees and as habitat for openland and woodland wildlife. It has poor potential for most recreation uses and for building site development and sanitary facilities.

This soil is suited to corn, soybeans, grain sorghum, wheat, and grasses and legumes. Wetness is the main management concern. Excess water can be removed by shallow ditches. Subsurface tile drains connected to surface inlets can drain surface water in wet spots if outlets are available. Overflow water can be diverted by ditches or by dikes.

Pasture and hay crops grow well on this soil if excess water is removed. In undrained areas the water commonly damages the crops in winter and early in spring. Selecting plants that are tolerant of wetness limits the damage. Restricting both grazing and cutting during rainy periods keeps the soil and the crop in good condition.

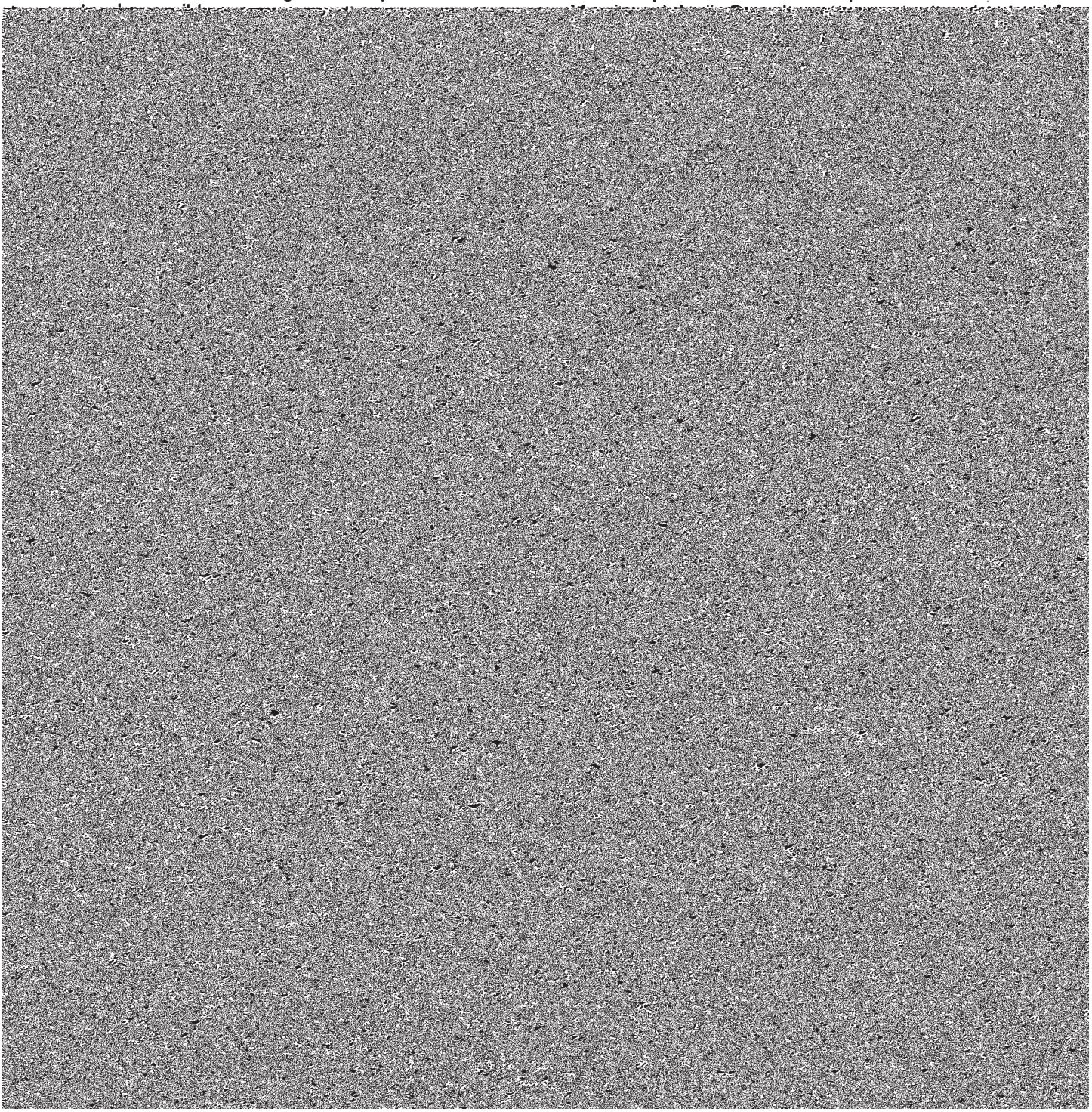
Capability subclass IIw.

214B—Hosmer silt loam, 2 to 6 percent slopes.



This soil is well suited to row crops, small grain, grain sorghum, and forage crops. It is also well suited to orchards, small fruit (fig. 3), and vegetables. Controlling erosion and maintaining and improving tilth and fertility are the main management concerns. Also of concern is the moderate available water capacity. Conservation tillage, terraces, contour farming, and crop residue man-

slow rate. Surface runoff is medium in cultivated areas. The subsoil ranges from extremely acid to strongly acid. The surface layer is friable and can be easily tilled, but it tends to crust or puddle after hard rains if the surface is bare. The penetration of roots and the downward movement of water are restricted by the fragipan. The water table is perched between depths of 3 and 6 feet in



Individual areas are mainly irregular in shape and range from about 5 to 30 acres in size.

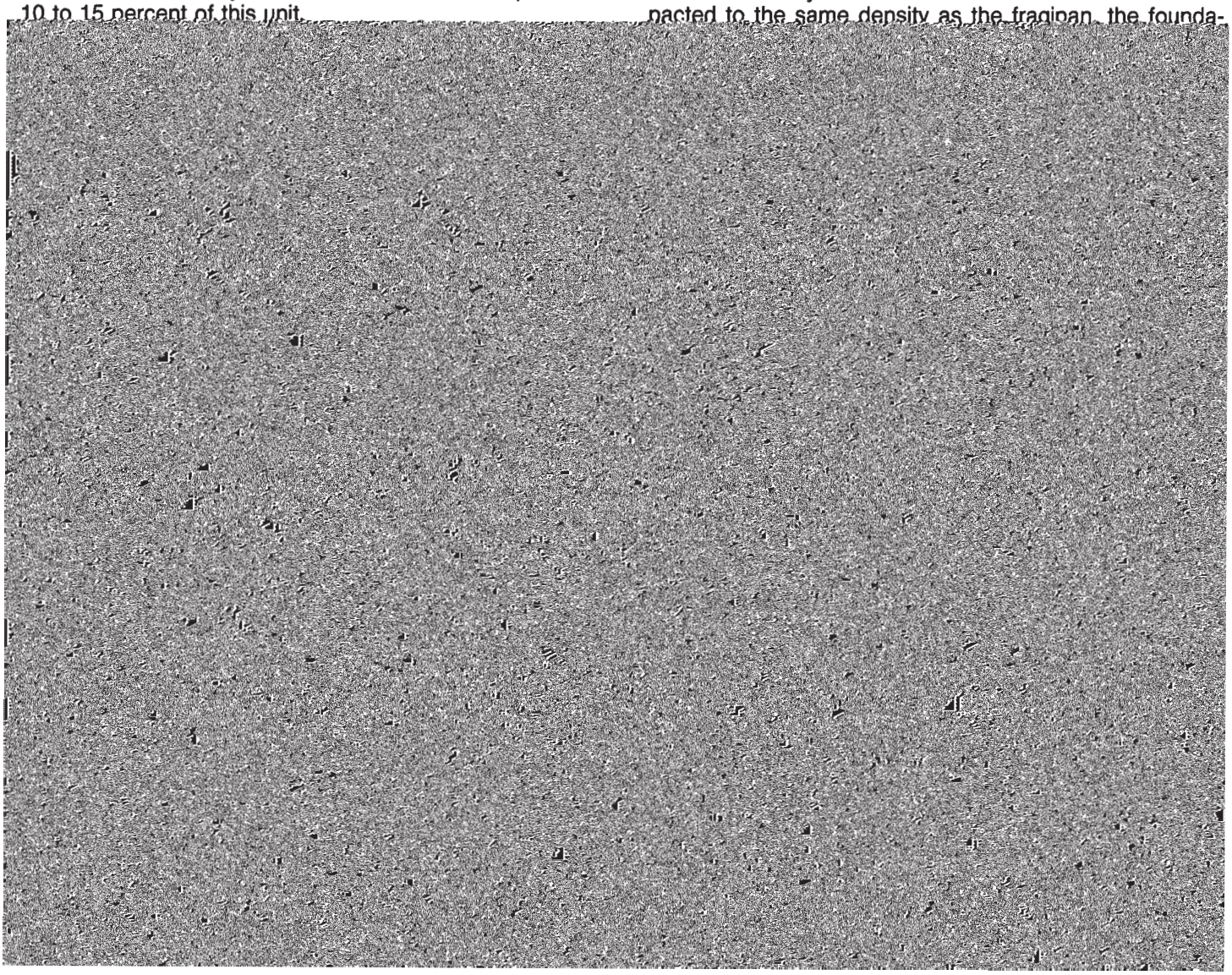
Typically, the present surface layer is mixed yellowish brown and dark yellowish brown silty clay loam about 5 inches thick. The upper 10 inches of the subsoil is brown silty clay loam. The lower part to a depth of about 60 inches is a fragipan. It is brown and strong brown, very firm and brittle silt loam that has grayish mottles and streaks. In some areas the fragipan is thinner and less compact.

Included with this soil in mapping are small areas of the somewhat poorly drained Stoy soil at the head of drainageways and the well drained Alford soil on crests between drainageways. Also included are some areas of a less sloping, less eroded soil between drainageways, a few areas where gullies have formed, and, along many drainageways, a somewhat poorly drained soil that has a thickened surface layer. Included areas make up about 10 to 15 percent of this unit.

Some areas are brushland, and some support planted pines. This soil is well suited to woodland. Seedlings can survive and grow well if competing vegetation is controlled by harvesting mature trees, thinning, cutting cull trees, and weeding. Restricting the use of equipment when the soil is wet helps to prevent compaction of the surface layer.

Some idle areas that formerly were cultivated have revegetated naturally. As a result, they are adequately protected against erosion. Many of these areas produce plants that are a source of food and cover for openland wildlife. Food plots of grain sorghum, sunflowers, lespedeza, or other plants increase wildlife populations. Applications of fertilizer are needed.

This soil is suited as a building site if proper precautions are taken to overcome the slope, the erosion hazard, and seepage. Cutting and filling or shaping is needed in many areas. Unless the fill material is compacted to the same density as the fragipan, the founda-



drainageways or at the break of slopes; and small areas of the well drained Alford soil on some side slopes and ridgetops. Included areas make up about 10 to 15 percent of this unit.

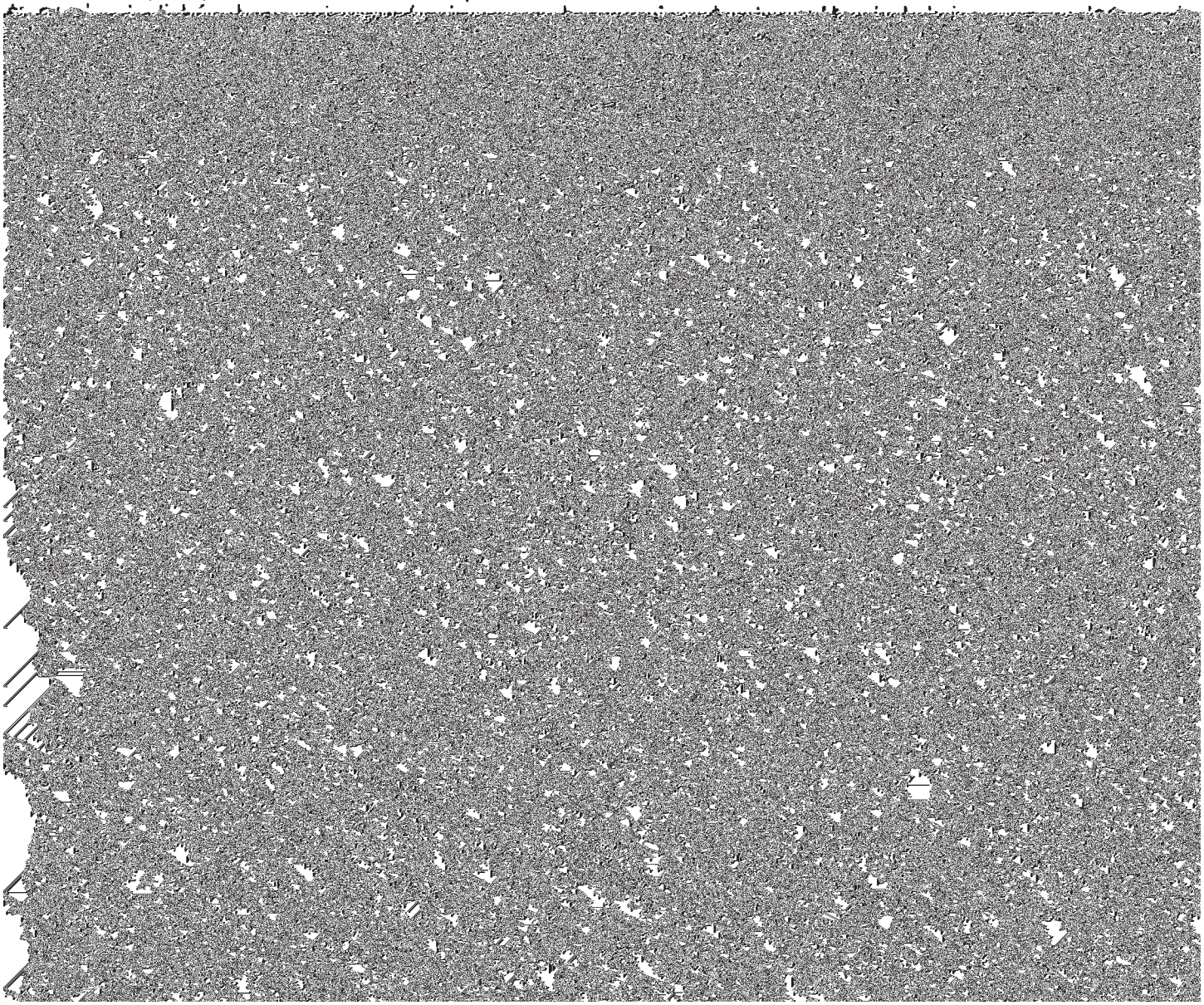
Water and air move through the surface layer and the upper part of the subsoil at a moderate rate and through the fragipan at a slow rate. Surface runoff is rapid. The subsoil ranges from strongly acid to extremely acid. The water table is perched between depths of 3 and 6 feet in March and April. The surface layer is friable and can be tilled easily. It tends to crust or puddle, however, after hard rains, especially in areas where the plow layer contains subsoil material. Organic-matter content and natural fertility are low. Available water capacity is moderate.

Most areas are pastured or support native hardwoods. This soil has poor potential for cultivated crops and fair

surface layer has been removed. Individual areas are irregularly shaped or long and range from about 5 to 100 acres in size.

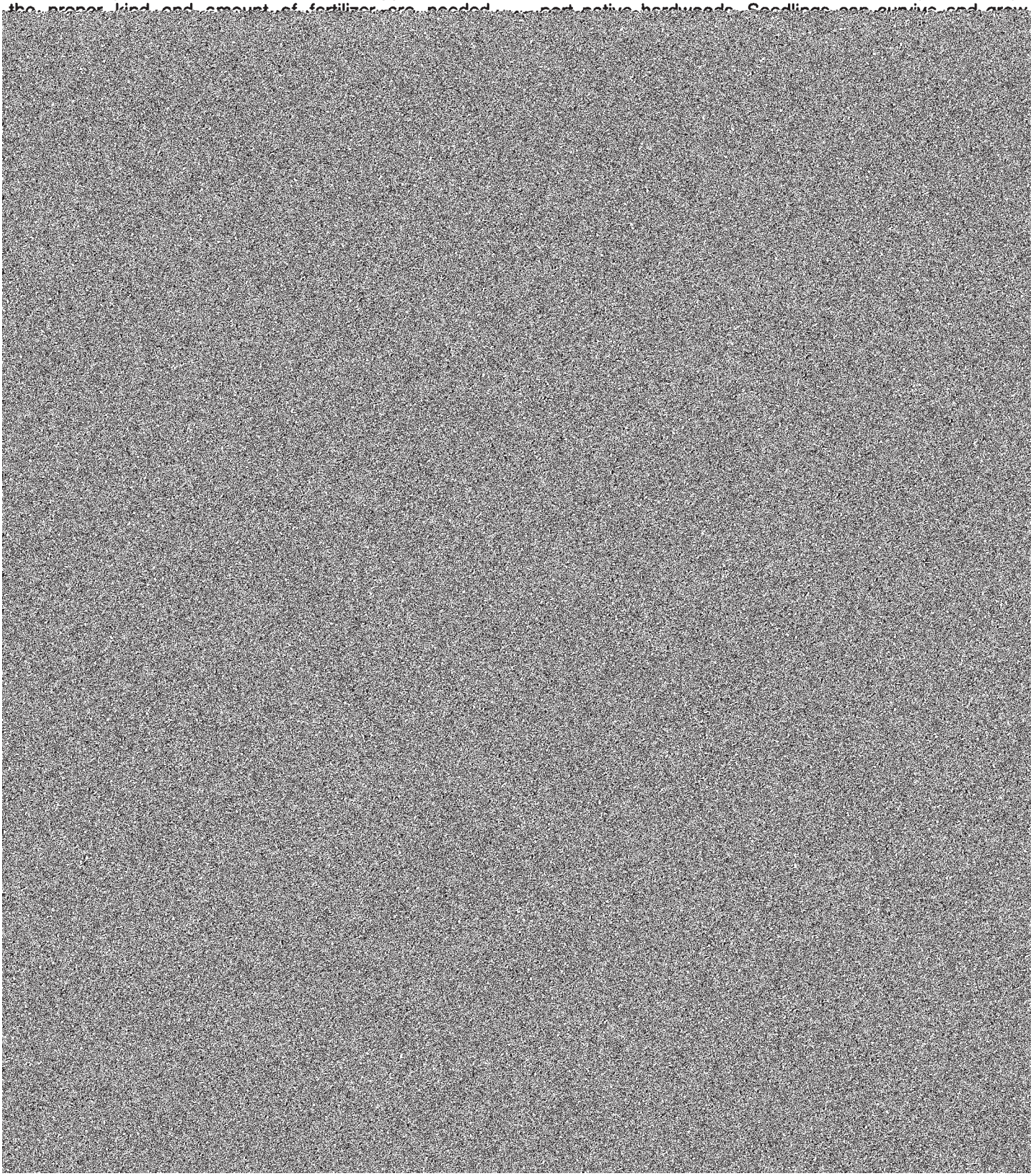
Typically, the present surface layer is yellowish brown silty clay loam about 5 inches thick. The upper 7 inches of the subsoil is yellowish brown silty clay loam. The lower 32 inches is a compact and brittle fragipan. It is yellowish brown and brown silt loam that has grayish streaks and mottles. The substratum to a depth of about 60 inches is brown silt loam. In places, the upper part of the subsoil is thicker and the fragipan is thinner and less compact.

Included with this soil in mapping are narrow strips of Zanesville soils along some of the lower slopes and drainageways. These soils formed partly in material weathered from bedrock. In some of these areas the



habitat for openland or woodland wildlife. Applications of the proper kind and amount of fertilizer are needed

This soil is well suited to woodland. Many areas support native hardwoods. Seedlings can survive and grow

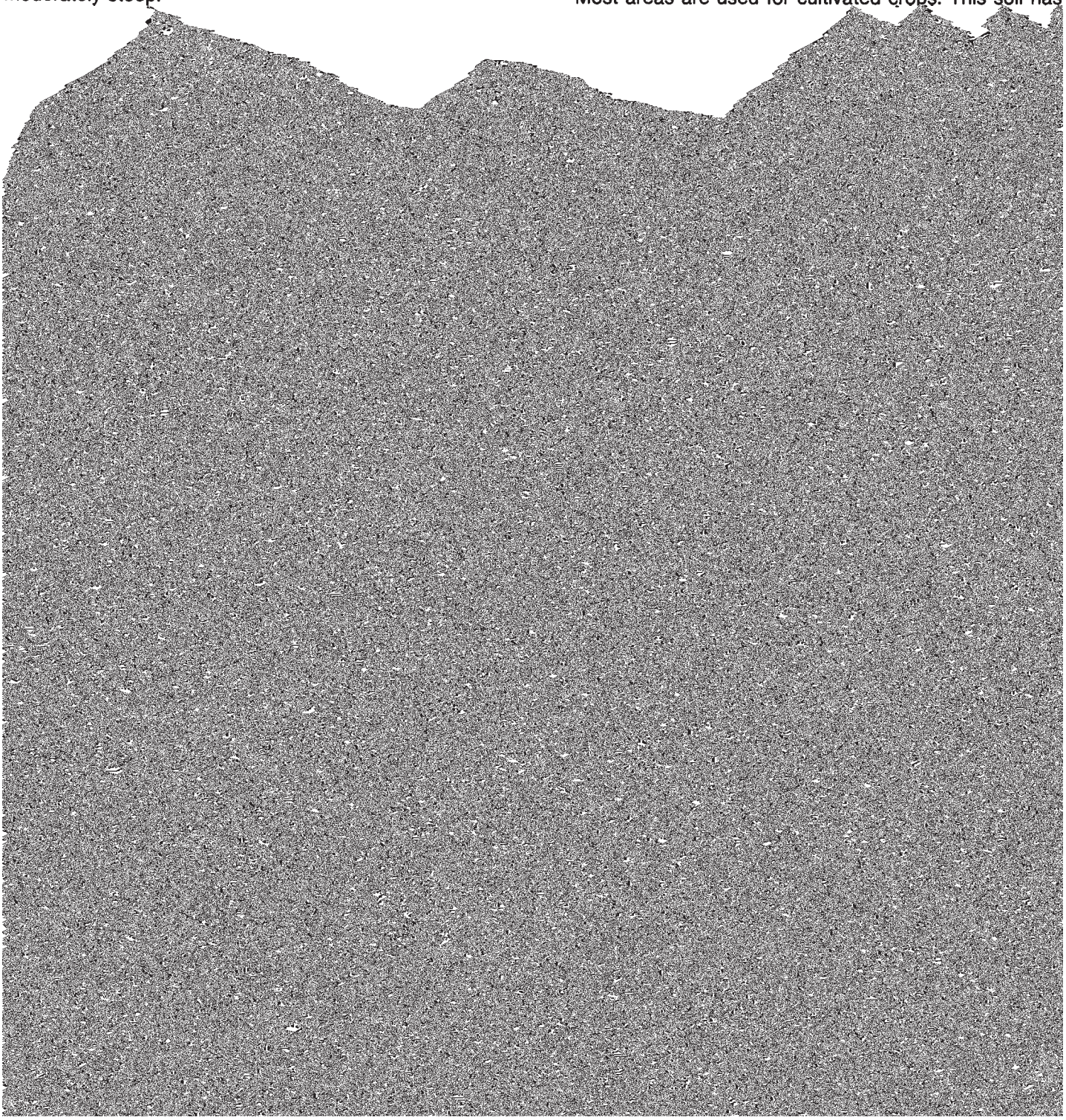


has poor potential for most recreation uses, building site development, and sanitary facilities.

This soil is suited to fruit trees if erosion is controlled by an adequate plant cover. Air drainage is good. Care is needed in the use of equipment because the soil is moderately steep.

table is 1 foot to 3 feet below the surface during most years. The subsoil ranges from slightly acid to mildly alkaline. The surface layer is somewhat clayey and firm. Organic-matter content is moderate, and natural fertility is high. Available water capacity also is high.

Most areas are used for cultivated crops. This soil has

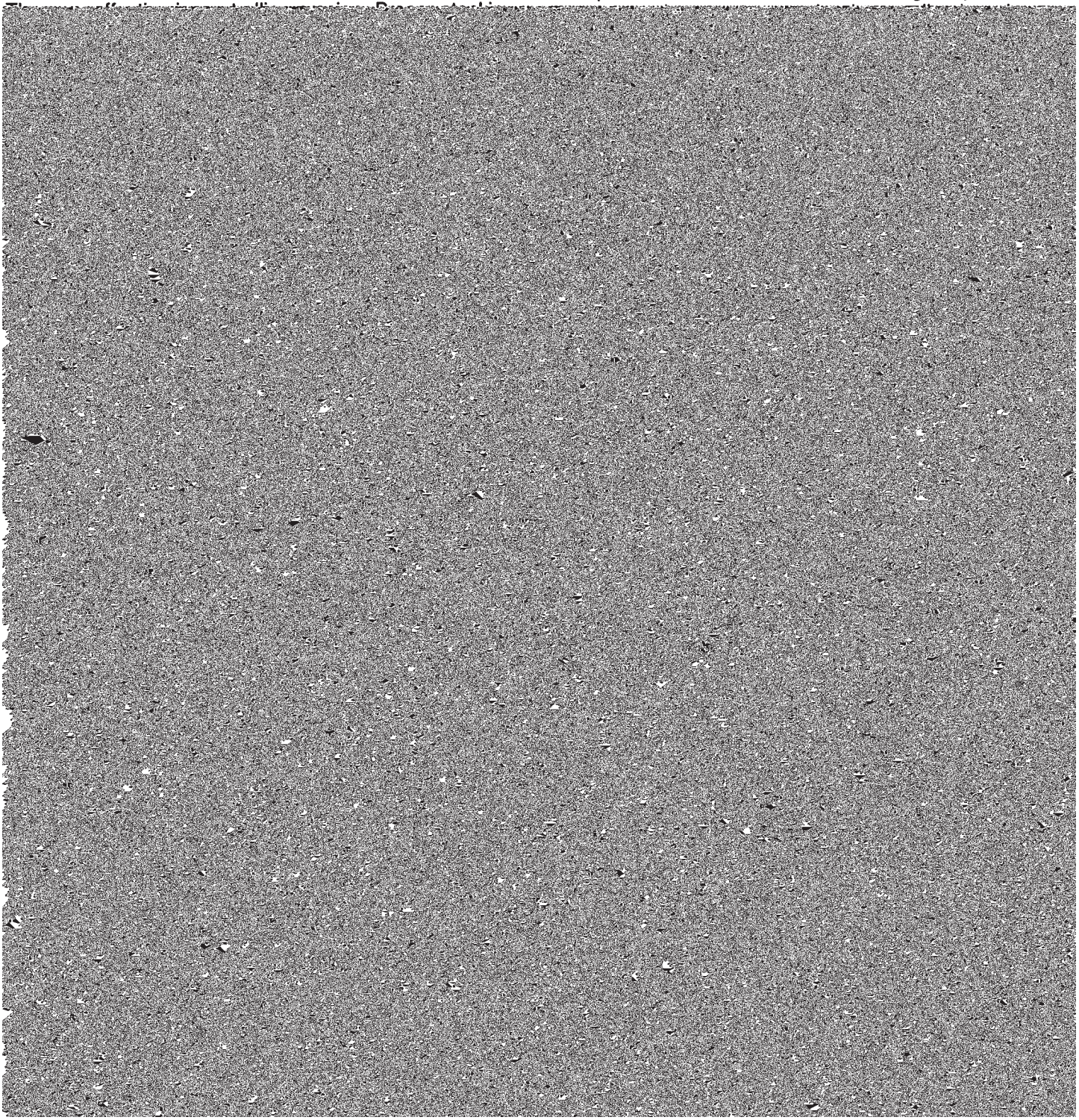


races, contour farming, a conservation cropping system, conservation tillage, and crop residue management help to reduce soil loss. Returning crop residue to the surface layer or adding other organic material reduces crusting and increases the rate of water intake.

Hay and pasture crops are well suited to this soil.

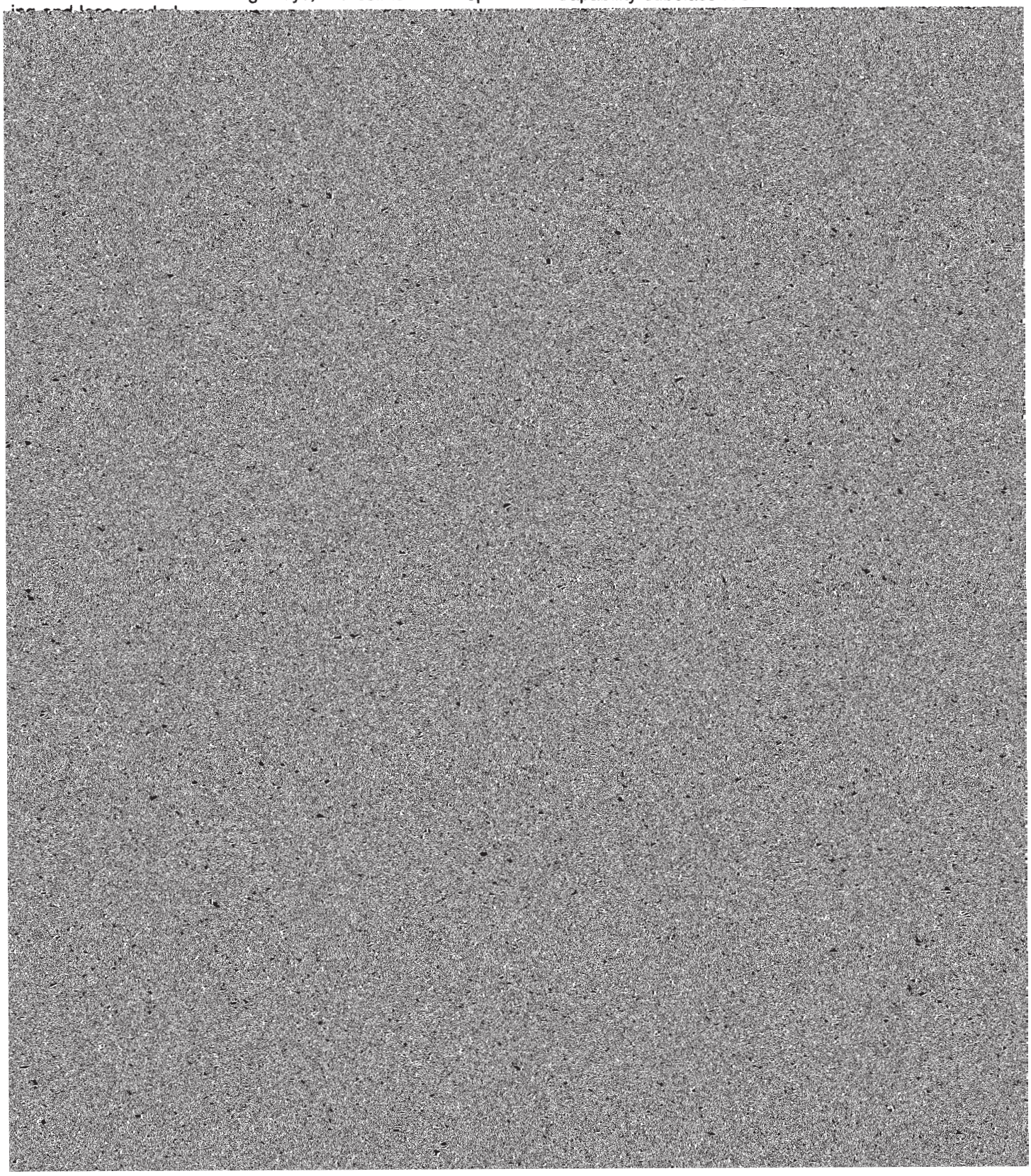
crust or puddle after a hard rain if the surface is bare. Organic-matter content is low in the surface layer, and natural fertility is medium. Available water capacity is high. Plant roots readily penetrate this soil.

Most of the broader areas are farmed, but many areas are pasture or woodland. This soil has good potential for



some areas between drainageways, the soil is less slop-

Capability subclass IVe.



needed. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is very well suited to woodland. Plant competition can be controlled by harvesting mature trees, thinning, cutting cull trees, and weeding. Seedlings should be planted on the contour and in a plant cover or mulch to prevent excessive soil loss before they are established. Restricting the use of equipment when the soil is wet helps to prevent compaction of the surface layer.

The slope and the erosion hazard limit the use of this soil as a site for buildings, local roads and streets, and waste disposal systems. Extensive cutting and filling or shaping generally is needed.

Capability subclass IVe.

308D3—Alford silty clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, severely eroded, well drained soil is mainly on hillsides above steeper soils or adjacent to drainageways or bottom land. Erosion has removed all or nearly all of the original silt loam surface layer. Individual areas are long or irregularly shaped and range from about 5 to 80 acres in size.

Typically, the surface layer is dark brown silty clay loam about 5 inches thick. The subsoil is strong brown silty clay loam about 45 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown silt loam. In places a thin, compact and brittle layer is in the lower part of the subsoil. It has grayish streaks and mottles. Some areas between drainageways are less sloping and less eroded.

Included with this soil in mapping are areas of the moderately well drained Hosmer soils, narrow strips of Wellston or Baxter soils along some of the lower slopes and drainageways, areas of the somewhat poorly drained Wakeland soils along many narrow drainageways, and areas where gullies have formed. The Wellston and Baxter soils formed partly in material weathered from bedrock. In many areas they have a stony surface. The Wakeland soils have a thickened surface layer. Also included are soils on conical slopes and in the accompanying depressions. These soils have a thick surface layer. Included areas make up about 10 to 15 percent of this unit.

Water and air move through this soil at a moderate rate. Surface runoff is rapid. The subsoil ranges from

most recreation uses and for building site development and sanitary facilities is poor.

This soil is not suited to cultivated crops. It is suited to fruit trees if an adequate plant cover is maintained to control further soil loss. Air drainage generally is good.

This soil is suitable as pastureland. Preparing a seedbed for pasture plants and establishing a stand are difficult because of surface crusting and runoff. Proper stocking rates, pasture rotation, weed control, and restricted use during wet periods help to maintain an adequate stand.

Some formerly cultivated areas are reverting to native hardwoods, and a few have been planted to pines. This soil is very well suited to woodland. Seedlings can survive and grow well if competing vegetation is controlled by thinning, cutting cull trees, and weeding. They should be planted on the contour and in a plant cover or mulch to prevent additional erosion before they are established. Restricting the use of equipment when the soil is wet helps to prevent compaction of the surface layer.

Some areas of idle cropland that has naturally revegetated provide food and cover for a variety of openland wildlife. If the proper kind and amount of fertilizer is applied, planting can greatly improve these areas as wildlife habitat. The wooded areas provide good habitat for woodland wildlife.

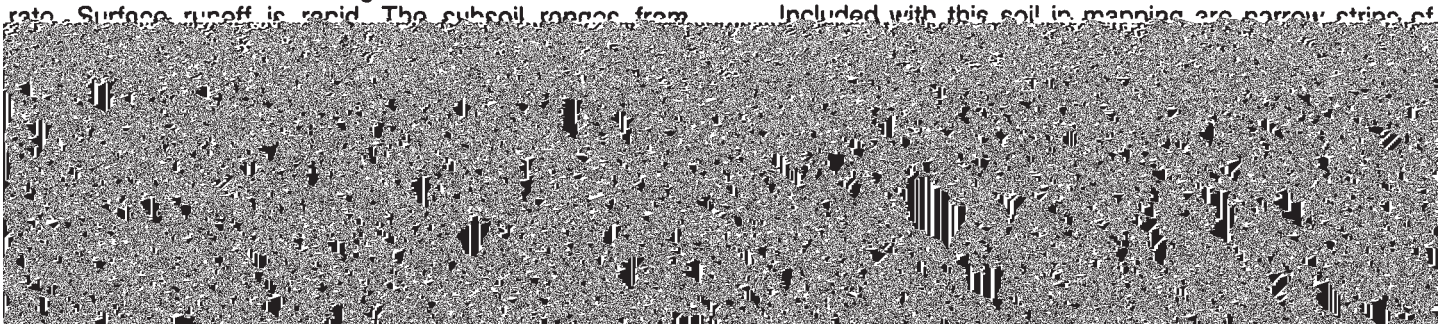
The slope and the erosion hazard severely limit the use of this soil as a site for buildings, local roads, and waste disposal systems. Extensive cutting and filling or shaping commonly is needed.

Capability subclass VIe.

308E—Alford silt loam, 18 to 30 percent slopes. This moderately steep, well drained soil is mainly on hillsides adjacent to drainageways or bottom land. Individual areas are long or irregularly shaped and range from about 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 6 inches thick. The subsoil is strong brown silty clay loam about 52 inches thick. The substratum to a depth of about 70 inches is brown silt loam. In places a thin, compact and brittle layer is in the lower part of the subsoil. It has grayish streaks and mottles.

Included with this soil in mapping are narrow strips of



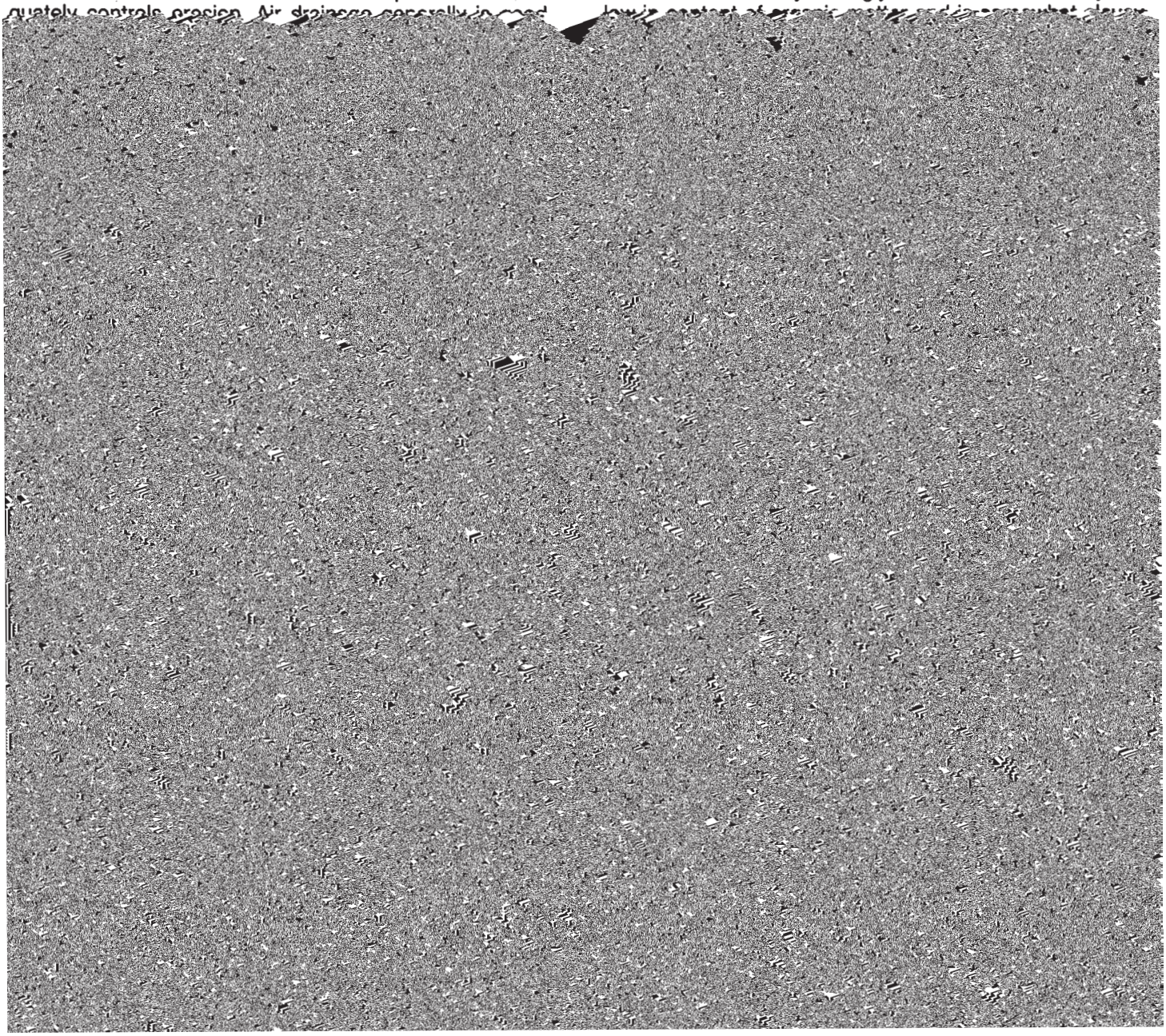
Water and air move through this soil at a moderate rate, and surface runoff is rapid. The subsoil ranges from medium acid to very strongly acid. The surface layer is friable and can be tilled easily. Organic-matter content is low, and natural fertility is medium. Available water capacity is high. Plant roots readily penetrate the soil.

Most areas support native hardwoods. This soil is generally unsuited to cultivated crops. It has fair potential for pasture and orchards and good potential for woodland and for woodland wildlife habitat. The potential for most recreation uses and for building site development and sanitary facilities is poor.

This soil is suited to fruit trees if the plant cover adequately controls erosion. Air drainage generally is good

Included with this soil in mapping are narrow strips of Wellston or Baxter soils along some of the lower slopes and along drainageways. These soils formed partly in material weathered from bedrock. In some areas they have a stony surface. Also included are a few areas of the moderately well drained Hosmer soils and, along many narrow drainageways, areas of the somewhat poorly drained Wakeland soils, which have a thickened surface layer. Included soils make up about 10 to 15 percent of this unit.

Water and air move through this soil at a moderate rate. Surface runoff is rapid. The subsoil ranges from medium acid to very strongly acid. The surface layer is low in content of organic matter and somewhat clayey

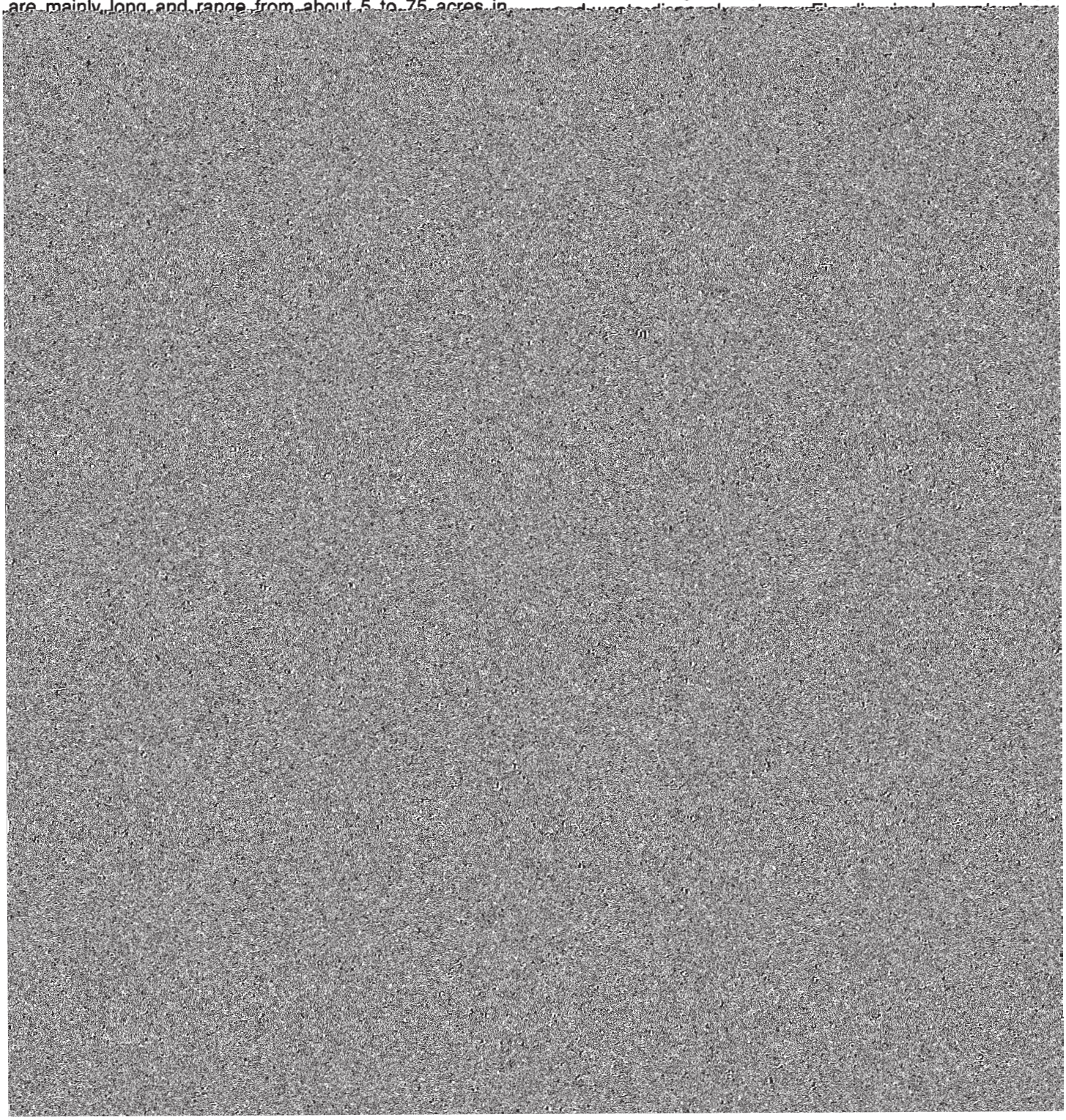


Capability subclass VIe.

331—Haymond silt loam. This nearly level, well drained soil is on flood plains and alluvial fans along streams. It is subject to rare flooding. Individual areas are mainly long and range from about 5 to 75 acres in

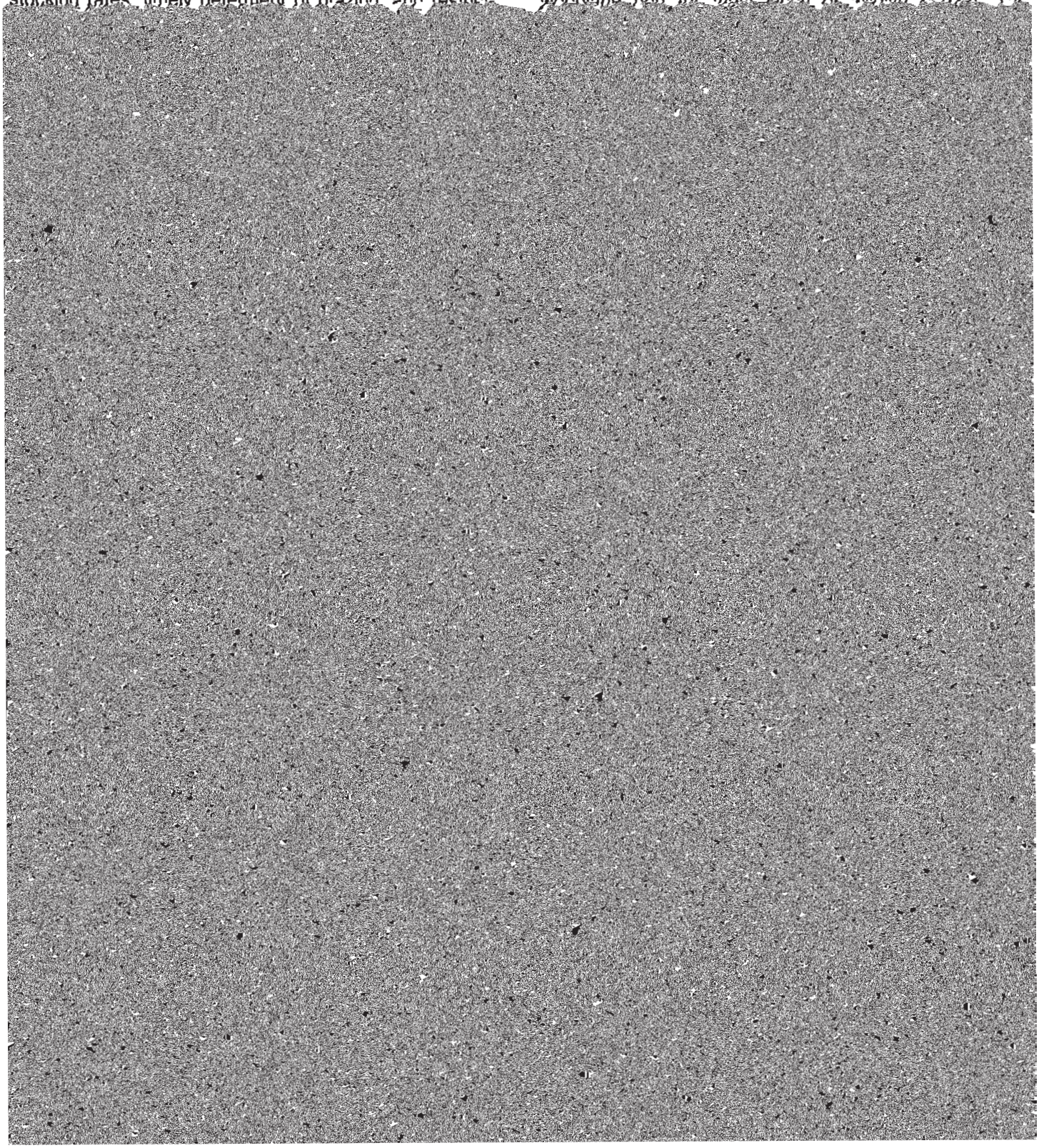
on wooded hillsides. This setting favors picnicking, hiking, and sightseeing. Flash flooding is a hazard if the soil is used as a site for overnight camping or similar activities.

This soil is generally unsuited as a site for buildings



Grasses and legumes are well suited to this soil. Clipping and spraying control weeds and brush. Proper stocking rates, timely deferment of grazing, and restrict-

if adequate drainage is provided. It also has good potential for hay or pasture. It has fair to good potential for woodland and for most kinds of wildlife habitat. The



Water and air move through this soil at a slow rate, and surface runoff is ponded. The seasonal high water table is less than 1 foot from the surface. The subsoil is strongly acid or very strongly acid. The surface layer is firm and somewhat clayey. It dries slowly in spring and clods if worked when wet. It is low in content of organic matter. Natural fertility is low. Available water capacity is high.

Most areas are cultivated or support native trees. This soil has fair potential for cultivated crops, hay, and pasture. It has good potential for woodland and for wetland wildlife habitat. The potential for recreation uses, building site development, and sanitary facilities is poor.

This soil is suited to corn, soybeans, and grain sorghum if it is protected from overflow and adequately drained. Shallow surface ditches are needed in many areas to remove standing water and control the seasonal wetness. Additions of crop residue or other organic material can improve the tilth of the surface layer. Crops are occasionally damaged by overflow during the growing season.

This soil is well suited to woodland. Growth is improved if competing vegetation is removed by harvesting mature trees, thinning, cutting cull trees, and weeding.

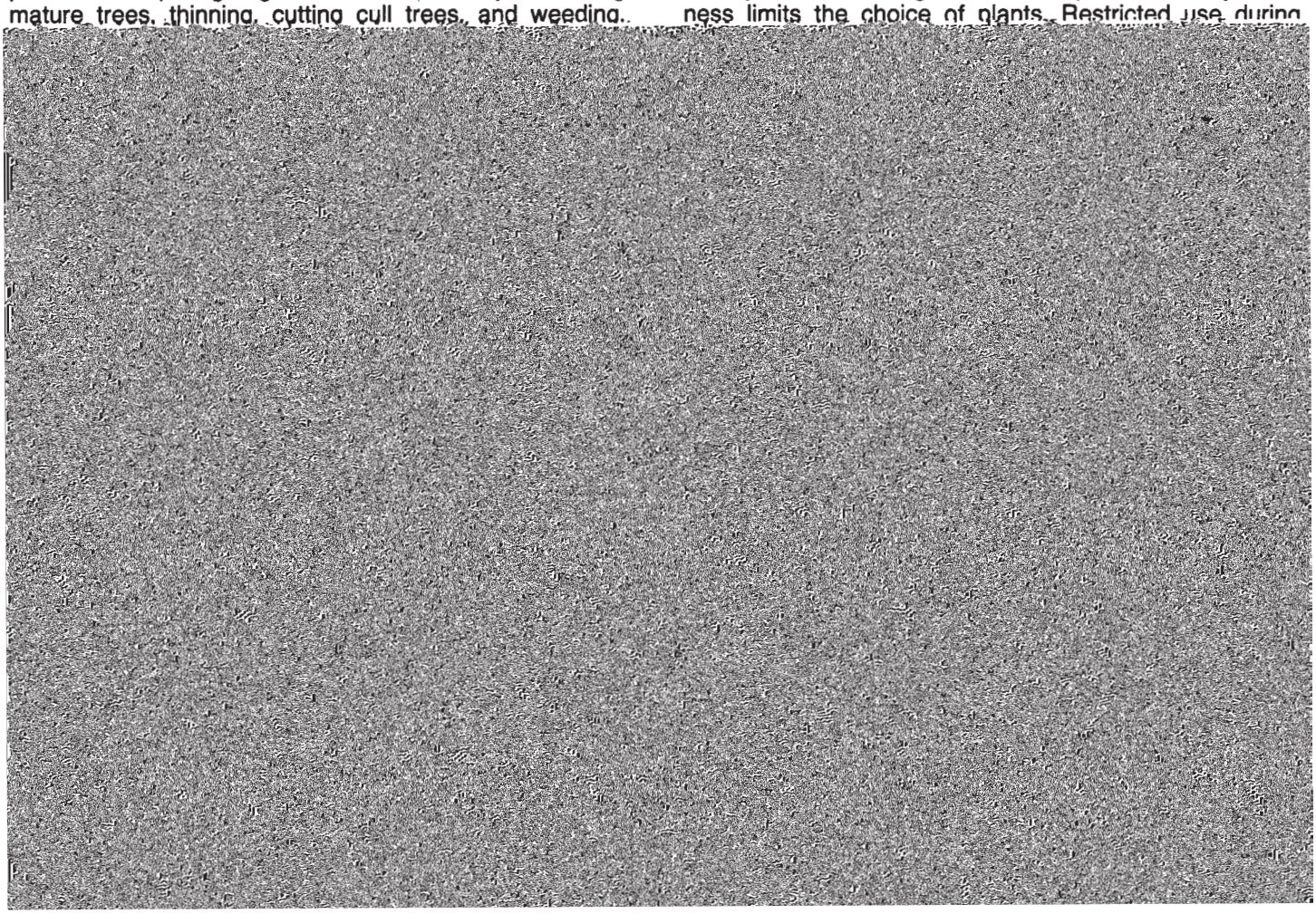
nels. Included areas make up about 10 to 15 percent of this unit.

Water and air move through this soil at a very slow or slow rate, and surface runoff is slow. The subsoil ranges from extremely acid to strongly acid. The water table is perched within 1 foot of the surface in spring. The surface layer is firm and is somewhat difficult to till. It dries slowly and clods if worked when wet. Organic-matter content and natural fertility are low. Available water capacity is moderate.

Most areas are used for cultivated crops. This soil has fair potential for cultivated crops, hay, and pasture and good potential for trees. It has poor potential for most recreation uses and fair potential for most kinds of wildlife habitat. The potential for building site development and septic tank absorption fields is poor.

This soil is suited to corn, soybeans, grain sorghum, small grain, and grasses and legumes. Seasonal wetness limits the choice of plants in some years. Shallow surface ditches can reduce the wetness. Tilth and workability can be improved by conservation tillage and by incorporation of crop residue into the surface layer.

Only a small acreage is used for pasture or hay. Wetness limits the choice of plants. Restricted use during



Water and air move through this soil at a very slow rate, and surface runoff is slow to ponded. The seasonal high water table is within 3 feet of the surface. The subsoil is medium acid or strongly acid. This very clayey soil shrinks during dry periods and swells during wet periods. The surface layer is very firm and difficult to till, and it dries out slowly. It clods if worked when wet. It is low in content of organic matter. Natural fertility is low or medium. Available water capacity is moderate. The seasonal wetness and the clayey subsoil prevent deep penetration of roots.

Most areas are cultivated or remain in native hardwoods. This soil has poor to fair potential for cultivated crops, hay, or pasture. It has fair potential for woodland wildlife habitat and good potential for wetland wildlife habitat. The potential for recreation uses, for building site development, and for sanitary facilities is poor.

This soil is suited to soybeans and grain sorghum if it is adequately drained and protected from overflow. It is somewhat less suited to corn because of the moderate available water capacity and the restricted penetration of roots. Wheat is often damaged by water in winter. Shallow ditches and land leveling can provide drainage in most areas. Surface tilth can be improved by a conservation tillage system, in which most of the crop residue is left on the surface.

This soil is well suited to woodland. Seedling mortality and plant competition are the main concerns of management. Flooding and deposition can damage seedlings. Plant competition can be controlled by harvesting mature trees, thinning, cutting cull trees, and weeding. Hand planting of species that can withstand wetness generally obtains the best results.

Many areas support native vegetation and provide food and cover for woodland or wetland wildlife. Some shallow water areas are evident, and many others could be developed.

This soil has serious limitations as a site for buildings, local roads and streets, and waste disposal systems. Providing adequate drainage is difficult because water moves very slowly through the soil.

Capability subclass IIIw.

427—Burnside loam. This nearly level and gently sloping, moderately well drained soil is on narrow bottom land. It is subject to occasional flooding for brief periods in spring. Individual areas are long and narrow and range from about 5 to 30 acres in size.

Typically, the surface layer is dark brown loam about 14 inches thick. The subsoil is about 8 inches of dark yellowish brown channery loam. The substratum to a

areas, along some overflow channels, where the surface layer is stony. Also included are some depressional areas of the somewhat poorly drained Wakeland soil. Included areas make up about 10 to 15 percent of this unit.

Water and air move through this soil at a moderate rate, and surface runoff is slow. The soil is strongly acid or very strongly acid between depths of 10 and 40 inches. The seasonal high water table is at a depth of 3 to 5 feet in winter and spring. The surface layer is very friable and dries quickly after rains. It is low in content of organic matter. Natural fertility is medium. Available water capacity is moderate. The penetration of roots is restricted by the coarse fragments.

Most areas are woodland or pasture. This soil has good potential for hay, pasture, and woodland and for openland or woodland wildlife habitat. It has fair potential for cultivated crops and for most recreation uses. The potential for building site development and sanitary facilities is poor.

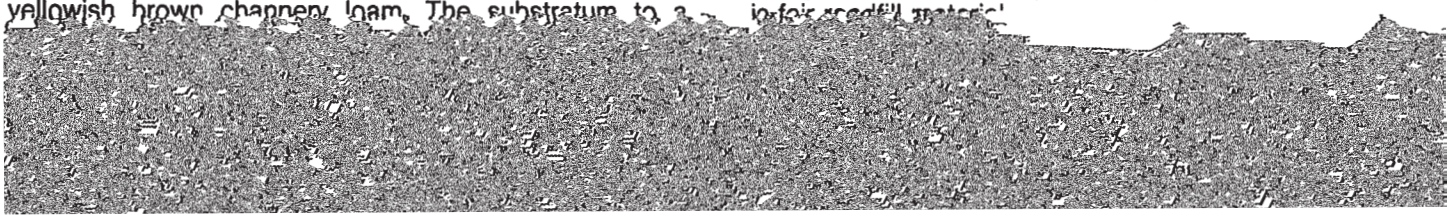
This soil is suited to soybeans and grain sorghum, but fields are long and narrow and access generally is limited. The soil is well suited to most vegetable crops. Conservation tillage and crop residue management reduce soil loss. Crops are damaged by floodwater during the growing season in some years.

This soil is suited to pasture and hay. Clipping and spraying are needed to control competing vegetation. Proper stocking rates and restricted use during wet periods keep the pasture and the soil in a good condition.

This soil is very well suited to woodland. Seedlings can survive and grow well if competing vegetation is controlled or removed by harvesting mature trees, thinning, cutting cull trees, and weeding. Restricting the use of equipment when the soil is wet helps to prevent compaction of the surface layer.

Stream channels are in most areas of this soil. These areas are generally enclosed by strongly sloping or moderately steep soils on wooded hillsides. This setting favors picnicking, hiking, and sightseeing. The possibility of flash floods prohibits the use of this soil as a site for overnight camping or similar activities.

This soil is generally unsuited as a site for buildings, local roads and streets, and waste disposal systems because of the flood hazard. Levees or upstream structures can provide protection from floodwater. Diversions are needed in some areas to intercept runoff from higher lying areas. Excessive seepage from lagoon reservoir areas or from septic tank filter fields is likely. As a result, the ground water supply can be contaminated. The soil is fair as sanitary



flooding. Individual areas are mainly long and range from about 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is about 12 inches thick. It is dark grayish brown loam over brown fine sandy loam. The substratum to a depth of about 60 inches is mainly brown, stratified loamy very fine sand, very fine sandy loam, loam, and fine sand. In places the surface layer is dark grayish brown.

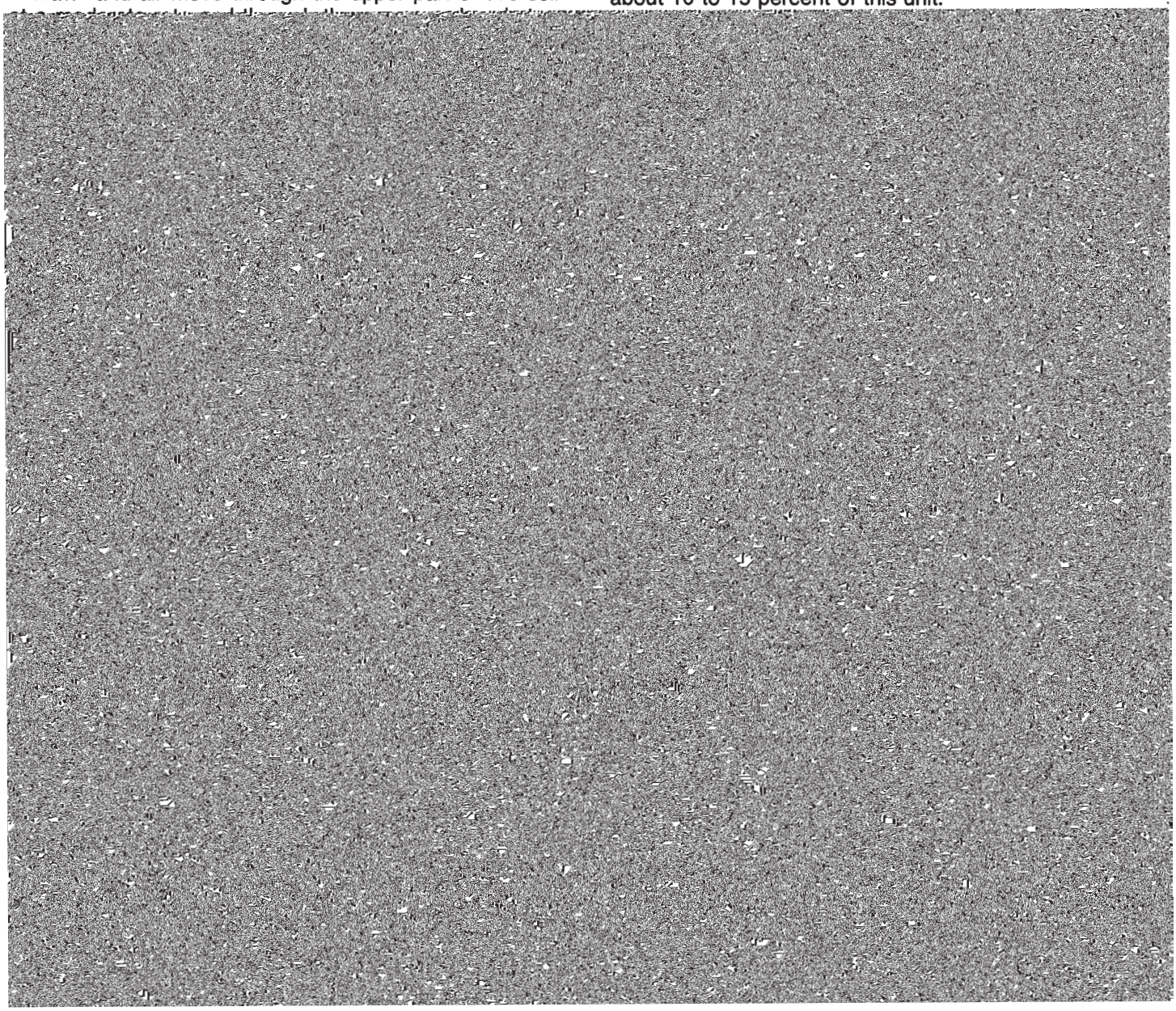
Included with this soil in mapping are small sandy areas and a few areas where slopes are short and steep. Also included are areas of the more clayey Medway soils in depressions. Included areas make up about 10 to 15 percent of this unit.

Water and air move through the upper part of this soil

ject to frequent flooding for brief periods from December through May. Individual areas are mainly long and narrow and range from about 10 to 75 acres in size.

Typically, the surface layer is dark brown silt loam about 15 inches thick. The substratum to a depth of about 60 inches is mainly strong brown, light yellowish brown, and brown very cherty and very cobbly loam. In places the surface layer is cherty. In some areas the substratum has strongly acid layers.

Included with this soil in mapping are areas where the silty surface layer is more than 25 inches thick and areas where bedrock is within 40 inches of the surface. Also included is the somewhat poorly drained Wakeland soil in some depressional areas. Included areas make up about 10 to 15 percent of this unit.



tivities should be avoided because flash flooding is a hazard.

This soil is generally unsuited as a site for buildings, local roads and streets, and waste disposal systems because of the flood hazard. Levees or upstream structures can provide protection from floodwater. The soil is fair roadfill material. Excessive seepage from reservoir areas of lagoons or from septic tank filter fields is likely. As a result, the ground water supply can be contaminated.

Capability subclass IIs.

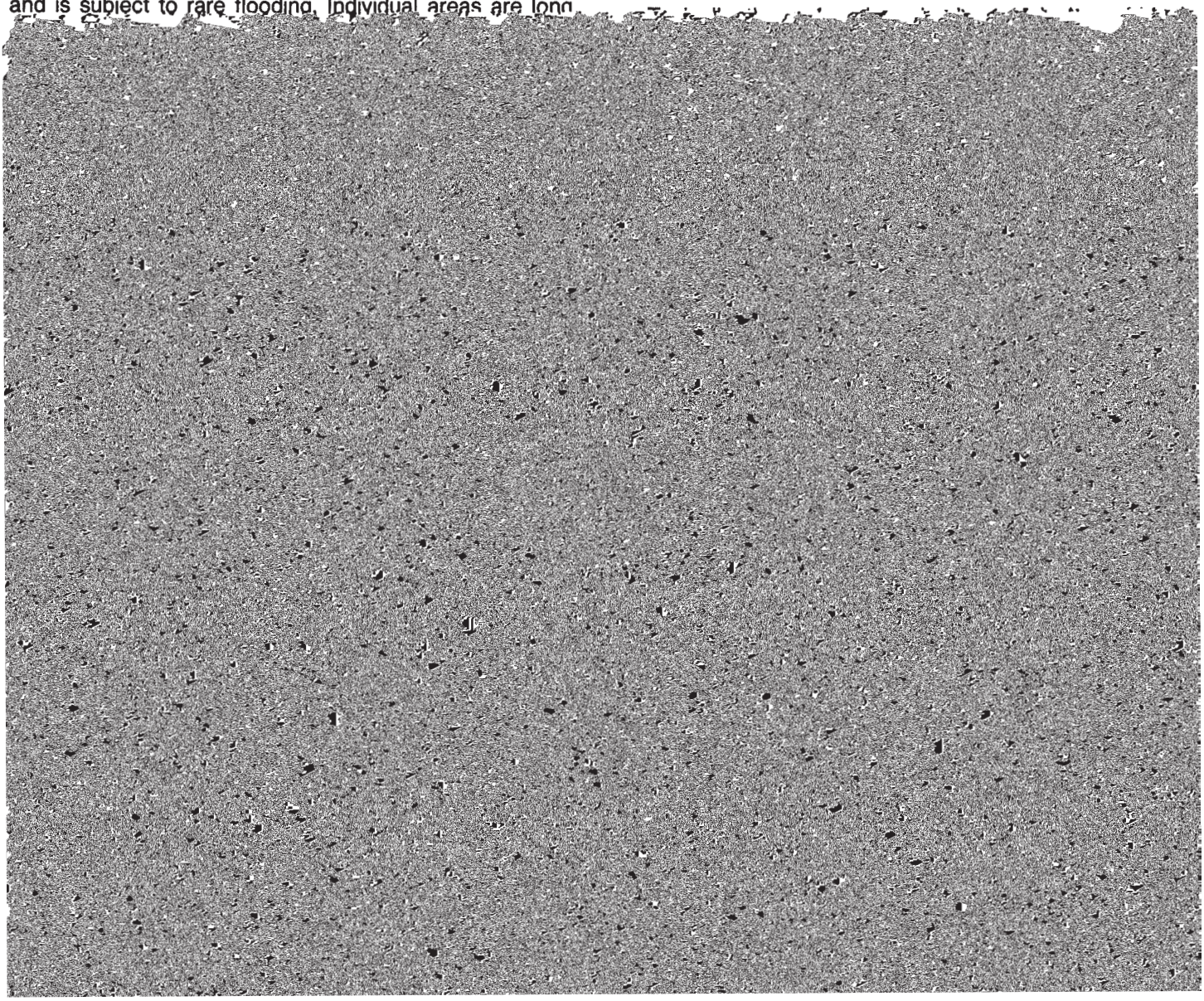
589—Bowdre silty clay. This nearly level and gently sloping, somewhat poorly drained soil is on low ridges in sloughs or overflow channels on bottom land along the Mississippi River. It is on the protected side of the levee and is subject to rare flooding. Individual areas are long

tivity and causes surface compaction, excessive runoff, and poor tilth.

This soil is generally not suited as a site for buildings, local roads and streets, and waste disposal systems. A break in the levee during high flood stages can result in flood damage.

Capability subclass IIw.

590—Cairo silty clay. This is a nearly level and gently sloping, poorly drained soil on broad flats and in slight depressions in the flood plain of the Mississippi River. It is on the protected side of the levee. It is subject to common flooding for brief periods in winter and spring because of runoff from adjacent soils. Individual areas are mainly long and range from about 5 to 75 acres in size.



restricted use during wet periods improve the condition of the pasture and the soil.

Because of the possibility of flooding after a break in the levee, this soil is generally unsuited as a site for buildings, local roads and streets, and waste disposal systems. Providing adequate drainage is difficult because water moves very slowly through the soil. Drainage is needed to control seasonal wetness and to carry runoff away from footings or slabs during and after construction. If protection from overflow is adequate, sewage lagoons that are properly designed and laid out can be installed. If the basin extends into the loamy substratum, however, seepage is likely to be excessive and the ground water supply contaminated unless the basin floor is adequately sealed.

Capability subclass IIIw.

682—Medway silty clay loam. This nearly level and gently sloping, moderately well drained soil is on narrow to broad, low ridges and natural levees along sloughs or overflow channels on the flood plain of the Mississippi River. It is on the protected side of the levee. It is subject to occasional flooding for very brief periods in winter and spring. Individual areas are mainly long and range from about 5 to 150 acres in size.

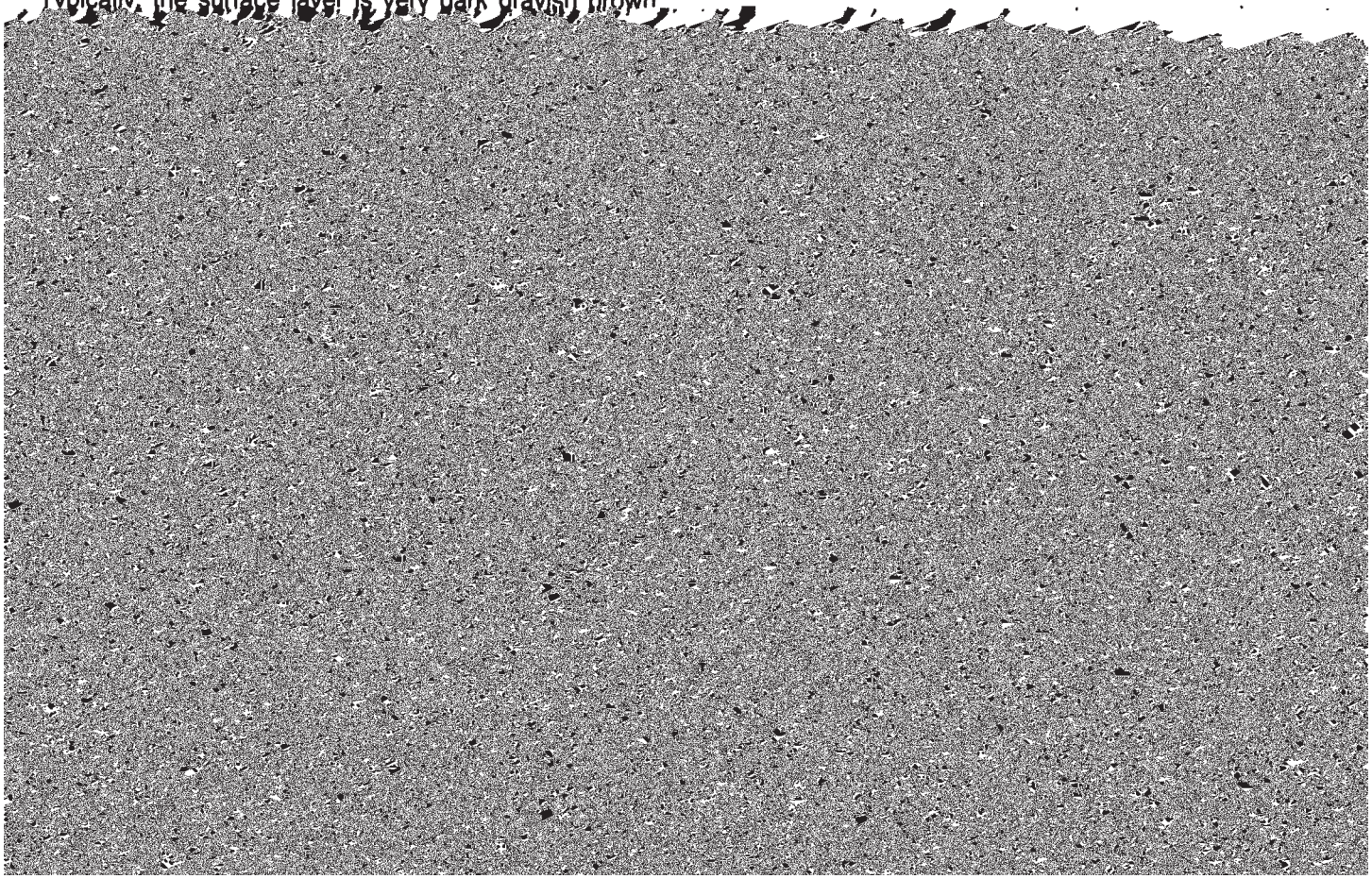
Typically, the surface layer is very dark gravish brown

This soil is well suited to corn, soybeans, grain sorghum, wheat, and most vegetables. Erosion is a hazard in the gently sloping areas. Conservation tillage, restricted use of equipment when the soil is wet, and the return of crop residue or other organic material to the surface layer keep the soil in good condition and reduce soil loss.

This soil is one of the better building sites on the flood plain of the Mississippi River, but it is generally unsuited as a building site. Flooding is a hazard because of the possibility of a break in the levee during high flood stages. During some periods when the water level is high, the site is inaccessible because of ponded water on surrounding low-lying soils. Runoff and other excess water should be removed during and after construction. Because of excessive seepage, the effluent from septic tank filter fields or basins of sewage lagoons can contaminate the ground water supply.

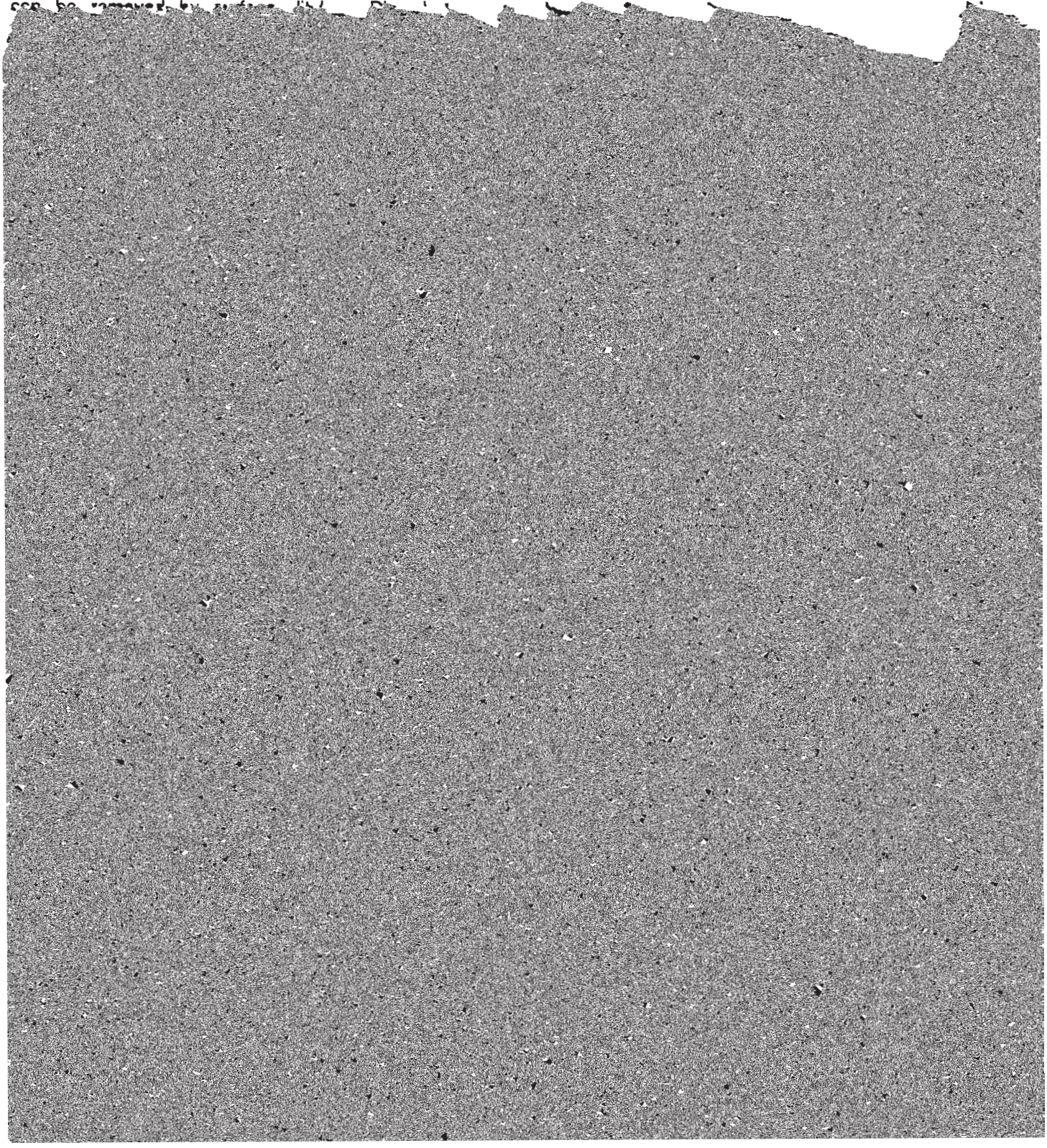
Capability class I.

787—Banlic silt loam. This nearly level, somewhat poorly drained soil is mainly on slight rises on flood plains. It is subject to rare flooding. Individual areas are mainly irregular in shape and range from about 5 to 25 acres in size.



This soil is suited to corn, soybeans, grain sorghum, and wheat. The main concerns of management are seasonal wetness and tilth. Excess surface water and runoff [illegible] ble later in the growing season, particularly during dry periods.

These soils generally are suited as sites for buildings, [illegible]



food for wildlife. Some shallow water areas are evident. Others could be developed, but controlling the depth of the water is difficult because of the flood hazard.

Not assigned to capability class or subclass.

852E—Alford-Wellston silt loams, 15 to 30 percent slopes. This map unit consists of strongly sloping and moderately steep, well drained soils on long hillsides adjacent to drainageways or bottom land. Individual areas are mainly long or irregularly shaped and range from about 20 to 200 acres in size. They are about 55 to 75 percent Alford soil and 25 to 45 percent Wellston soil. The Alford soil is on the upper and mid parts of side slopes and on convex spur ridges, and the Wellston soil is on the lower part of side slopes and along lateral drainageways that dissect the hillsides. These two soils occupy the same hillsides on a mostly wooded landscape and have not been separated in mapping.

Typically, the Alford soil has a dark brown and yellowish brown silt loam surface layer about 9 inches thick. The subsoil is mainly strong brown and dark brown silt loam about 40 inches thick. The substratum to a depth of about 66 inches is dark yellowish brown silt loam. In places a thin, compact and brittle layer is in the lower part of the subsoil. It has grayish streaks and mottles.

Typically, the Wellston soil has a very dark grayish brown and yellowish brown silt loam surface layer about 13 inches thick. The upper 26 inches of the subsoil is mainly yellowish brown silt loam. The lower part of the subsoil to a depth of about 62 inches is pale brown channery loam and dark yellowish brown and yellowish brown channery silty clay loam.

Included with these soils in mapping are areas of the moderately well drained Zanesville soils on the convex spur ridges and areas of a stony soil along drainageways and directly above and below bedrock escarpments. Also included are some areas where the subsoil is clayey and small areas of Burnside soils on bottom land. Included areas make up about 10 to 15 percent of this unit.

Water and air move through these soils at a moderate rate, and surface runoff is rapid. The subsoil ranges from extremely acid to medium acid. Organic-matter content is low in the surface layer. Natural fertility is medium. Available water capacity is high. Plant roots generally can readily penetrate these soils but are restricted in the Wellston soil by the coarse fragments in the lower part of the subsoil.

Most areas are woodland. These soils have poor potential for cultivated crops, fair potential for hay or pasture, and good potential for woodland and as habitat for woodland wildlife. The potential for recreation uses, building site development, and sanitary facilities is poor.

These soils are suited to pasture. Competing vegetation can be controlled by spraying or clipping. Pasture rotation, proper stocking rates, and restricted grazing during wet periods help to maintain the plant cover and prevent excessive erosion. The less sloping areas are suitable as hayland, but the steeper slopes limit the use of equipment.

These soils are suited to woodland. The competing vegetation, the erosion hazard, and the equipment limitation are the main problems. The competing vegetation can be controlled by harvesting mature trees, thinning, weeding, and cutting cull trees. The slope and the bedrock escarpments in the areas of Wellston soil hinder planting and harvesting. The soils are easily eroded if the plant cover is removed during logging operations. Diverting surface water from haul roads and skid trails helps to control erosion.

Many rolling to hilly areas are wooded. Carefully planned trails or paths can be constructed for hiking and sightseeing. Control of erosion is needed.

These soils are generally unsuited as sites for buildings, local roads and streets, and waste disposal systems. Extensive cutting and filling and extensive shaping generally are needed. Coarse fragments and bedrock interfere in some areas where cutting and shaping are needed. The hazard of erosion is severe. Special design, layout, and construction methods are needed. The cost may be prohibitive.

Capability subclass VIe.

864—Pits, quarry, limestone. This miscellaneous area consists mainly of nearly level and gently sloping basins and the accompanying nearly vertical sides of quarries. Individual areas are mainly rectangular and range from about 10 to 80 acres in size.

The basins and sidewalls are mainly exposed limestone bedrock. Strips of Alford soil are generally along the top of the sidewalls, and a talus slope is along the basin in places. Included in mapping are roads used in hauling the quarried material, stockpiles of crushed limestone, and some areas covered with machinery and debris. Included areas make up about 10 to 15 percent of this unit.

Runoff is medium in most areas but is ponded in depressional areas. Except for the bands of Alford soil along the top of the sidewalls, the areas have sparse plant cover or no plant cover.

This map unit has poor potential for most uses. Some areas are suitable for paths and trails. Some depressional areas are suitable as pond reservoir areas. Falling rock is a hazard.

Not assigned to a capability class or subclass.

930F—Alford-Goss complex, 20 to 35 percent slopes. This map unit consists of moderately steep and steep, well drained soils on dissected hillsides and toe slopes in the uplands. Individual areas are mainly irregular in shape and range from about 20 to 300 acres in size. They are about 50 to 75 percent Alford soil and 25 to 50 percent Goss soil. The Alford soil is on the upper part of the slopes on narrow ridgetops and on some foot

slopes. The Goss soil is on the lower part of the slopes. These two soils occupy the same hillsides on a dissected, wooded landscape and have not been separated in mapping.

Typically, the Alford soil has a dark brown silt loam surface layer about 7 inches thick. The subsoil is mainly strong brown silt loam about 41 inches thick. The substratum to a depth of about 72 inches is strong brown and yellowish brown silt loam. The subsoil is silty clay loam in places. Chert fragments are in the lower part of the subsoil in some areas.

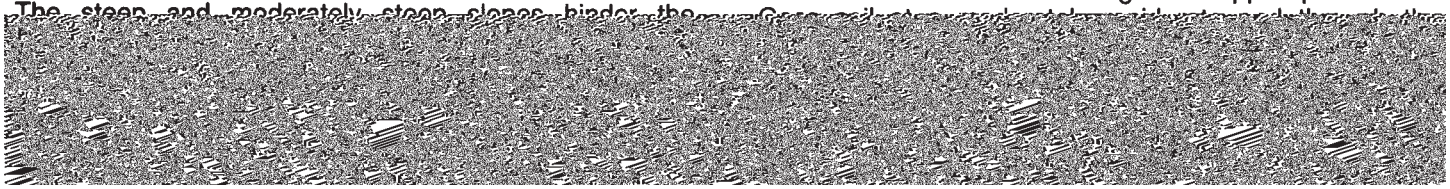
Typically, the Goss soil has a grayish brown and light yellowish brown silt loam surface layer about 6 inches thick. The subsoil is mainly very cherty silty clay loam about 48 inches thick. The substratum to a depth of about 60 inches is fractured chert bedrock. In places the surface layer is cherty silt loam. In many places the subsoil is reddish brown or yellowish red cherty silty clay loam.

Included with these soils in mapping are some areas of less sloping soils on the upper slopes and on narrow ridgetops, steeper areas of soils in some coves, and many areas, on the lower slopes, of a cherty or very cherty loam that contains less clay in the subsoil. Also included are some areas of the Elsah soil on narrow bottom land. Included soils make up about 10 to 15 percent of this unit.

Water and air move through the Alford soil at a moderate rate. They move through the upper part of the Goss soil at a moderately rapid rate and through the lower part at a moderate rate. Surface runoff is rapid. The subsoil of both soils is mainly medium acid to very strongly acid, but the lower part of the subsoil in the Goss soil ranges to neutral. Organic-matter content is low in both soils. Natural fertility is medium in the Alford soil and low in the Goss soil. Available water capacity is high in the Alford soil and low in the Goss soil. The penetration of roots is restricted by the chert fragments in the Goss soil.

Most areas remain in native woodland. These soils have poor potential for most uses but have fair potential for woodland and for woodland wildlife habitat.

The Alford soil is very well suited and the Goss soil poorly suited to woodland. The equipment limitation and a severe erosion hazard are the chief problems in managing the soils as woodland. Trees adequately protect the soils against erosion, but areas exposed during logging can erode rapidly. Logging trails and roads should be established on the contour if possible, and bare areas should be seeded after logging. Diverting surface water from haul roads and skid trails helps to control erosion. The steep and moderately steep slopes hinder the



constructed for hiking and sightseeing. Control of erosion is needed.

Because they are steep and moderately steep, these soils generally are unsuited as sites for buildings, local roads and streets, and waste disposal systems. Other limitations are the coarse fragments and bedrock, possible soil creep, and shrinking and swelling of the more clayey material. The soils generally are well suited as roadfill or as material supporting footings. The erosion hazard is severe in exposed areas, and revegetating is difficult. Special design, layout, and construction methods are needed. The cost may be prohibitive.

Capability subclass VIs.

930G—Goss-Alford complex, 30 to 70 percent slopes. This map unit consists of steep and very steep, well drained soils on ridgetops and dissected hillsides in the uplands. Individual areas are irregularly shaped or round and range from about 20 to more than 1,000 acres in size. They are about 50 to 80 percent Goss soil and 20 to 45 percent Alford soil. The Goss soil is on the mid and lower part of slopes and in coves, and the Alford soil is on the upper part of the slopes and on narrow ridgetops. The proportion of the Goss soil is generally higher on south-facing slopes than on north-facing slopes. The two soils are closely associated on ridgetops and hillsides on a wooded landscape and have not been separated in mapping.

Typically, the Goss soil has a very dark grayish brown very cherty silt loam surface layer about 3 inches thick. The subsurface layer is brown very cherty silt loam about 3 inches thick. The subsoil to a depth of about 60 inches is strong brown very cherty or cherty silt loam, silty clay loam, and silty clay.

Typically, the Alford soil has a dark brown and yellowish brown silt loam surface layer about 6 inches thick. The subsoil is yellowish brown silt loam about 61 inches thick. The substratum to a depth of about 92 inches is yellowish brown silt loam. Chert fragments are in the lower part of the subsoil and in the substratum in places.

Included with these soils in mapping are less sloping areas near ridgetops and on some foot slopes; some areas, in the southern part of the county, where cherty limestone bedrock and shale bedrock are near the surface; and, on many of the lower slopes and near the southern part of the county, a soil that has a cherty or very cherty loam subsoil. Also included is a sandy area, of apparently wind-blown material, along Clear Creek near State Route 146. Included areas make up about 10 to 15 percent of this unit.

Water and air move through the upper part of the

surface layer of both soils. Natural fertility is low in the Goss soil and medium in the Alford soil. Available water capacity is low in the Goss soil and high in the Alford soil. Slopes facing south are somewhat more droughty than those facing north. The penetration of roots is restricted by the cherty fragments in the Goss soil.

Most areas are native woodland. These soils have poor potential for most uses but have fair potential for woodland and for woodland wildlife habitat.

The Goss soil is poorly suited and the Alford soil very well suited to woodland. The equipment limitation and a severe erosion hazard are the main problems in managing these soils as woodland. Trees adequately protect the soils against erosion, but areas exposed by logging are rapidly eroded. Logging trails and roads should be established on the contour if possible, and bare areas should be seeded after logging. Diverting surface water away from haul roads and skid trails helps to control erosion. The steep and very steep slopes hinder the equipment used in cutting and removing logs, but special equipment and safety precautions can overcome this limitation.

Because they are steep and very steep, these soils are generally unsuited as sites for buildings, local roads and streets, and waste disposal systems. Other limitations are the coarse fragments and bedrock, possible soil creep, and shrinking and swelling of the more clayey material. The cherty material is suitable as roadfill or as material supporting footings. The hazard of erosion is severe, and revegetating exposed areas is difficult. Special design, layout, and construction methods are needed. The cost may be prohibitive.

Capability subclass VIIs.

940E—Zanesville-Westmore silt loams, 15 to 30 percent slopes. This map unit consists of strongly sloping and moderately steep, moderately well drained and well drained soils on long hillsides adjacent to drainageways or bottom land. Individual areas are mainly long or round and range from about 20 to 500 acres in size. They are about 30 to 70 percent Zanesville soil and 25 to 45 percent Westmore soil. The Zanesville soil is on the upper and mid parts of side slopes and convex spur is mixed strong brown and grayish brown silt loam. It has common sand grains and scattered stones and boulders.

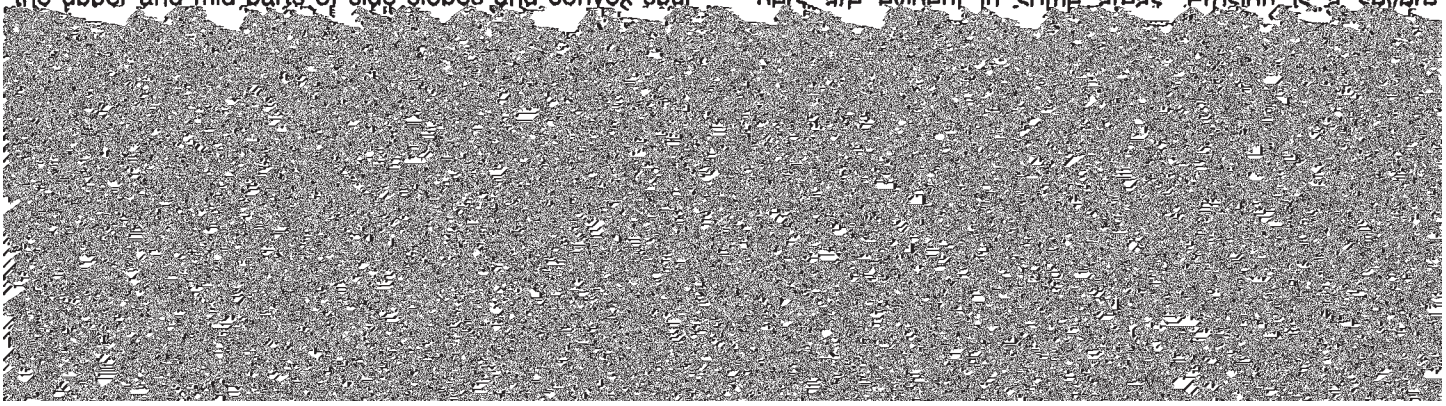
Typically, the Westmore soil has a dark grayish brown and yellowish brown silt loam surface layer about 6 inches thick. The subsoil is silty clay loam about 52 inches thick. The upper 14 inches is yellowish brown, and the lower 38 inches is mainly light brownish gray and gray. The substratum to a depth of about 62 inches is mixed brownish yellow and light gray silty clay.

Included with these soils in mapping are stony areas along drainageways and directly above and below bedrock escarpments, narrow areas of Burnside soil on bottom land along small streams, and less sloping areas, commonly on the convex spur ridges and on some of the foot slopes. Also included are small areas of Alford and Hosmer soils, which contain no coarse fragments to a depth of more than 50 inches. Included areas make up about 10 to 15 percent of this unit.

Water and air move through the upper part of the Zanesville and Westmore soils at a moderate rate and through the lower part of the subsoil at a moderately slow rate. Surface runoff is rapid. The subsoil of the Zanesville soil ranges from medium acid to very strongly acid. In the Westmore soil, the upper part of the subsoil is medium acid or strongly acid and the lower part ranges from very strongly acid to mildly alkaline. Organic-matter content is low in the surface layer. Natural fertility is low. Available water capacity is moderate in the Zanesville soil and moderate or high in the Westmore soil. The penetration of roots is restricted in the Zanesville soil by the fragipan and in the Westmore soil by the clayey lower part of the subsoil. Water is commonly perched on the fragipan in the Zanesville soil during rainy periods.

Most areas are native woodland. These soils have poor potential for cultivated crops and fair potential for hay and pasture. They have good potential for woodland and for woodland wildlife habitat. The potential for recreation uses, building site development, and sanitary facilities is poor.

These soils are suited to pasture. In the less sloping areas they are suitable as hayland, but the steeper slopes limit the use of equipment. Also, stones and boulders are evident in some areas. Erosion is a severe



skid trails helps to control erosion. Planting on the contour and in a plant cover or mulch helps to control erosion before the seedlings are established.

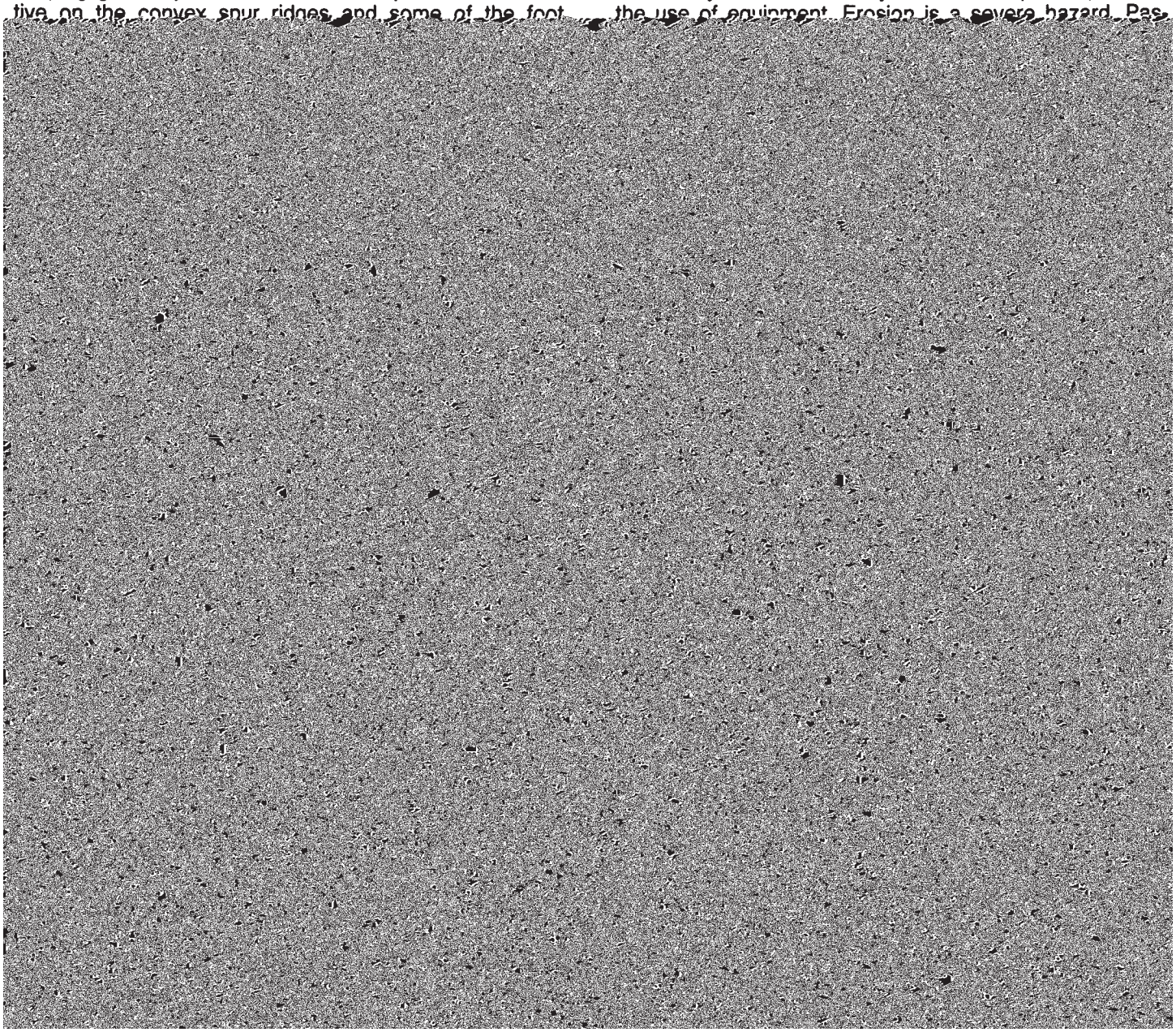
In most areas these soils are rolling or hilly and support native vegetation. Bedrock escarpments are on many side slopes. Also, the water in streams and drainageways commonly cascades over stones and ledges. Carefully planned trails or paths can be constructed for hiking and sightseeing. Control of erosion is needed.

Because they are strongly sloping and moderately steep, these soils are generally unsuited as sites for buildings, local roads and streets, and waste disposal systems. Extensive cutting and filling and extensive land shaping generally are needed. The slope is less restrictive on the convex spur ridges and some of the foot

is low in the surface layer. Natural fertility is medium in the Alford soil and low in the Baxter soil. Available water capacity is high in the Alford soil and moderate in the Baxter soil. The penetration of plant roots is restricted by the cherty fragments and the high content of clay in the Baxter soil.

Most areas are woodland or pasture. These soils have poor potential for cultivated crops and fair potential for hay or pasture. The potential for woodland and for woodland wildlife habitat is good. The potential for recreation uses, building site development, and sanitary facilities is poor.

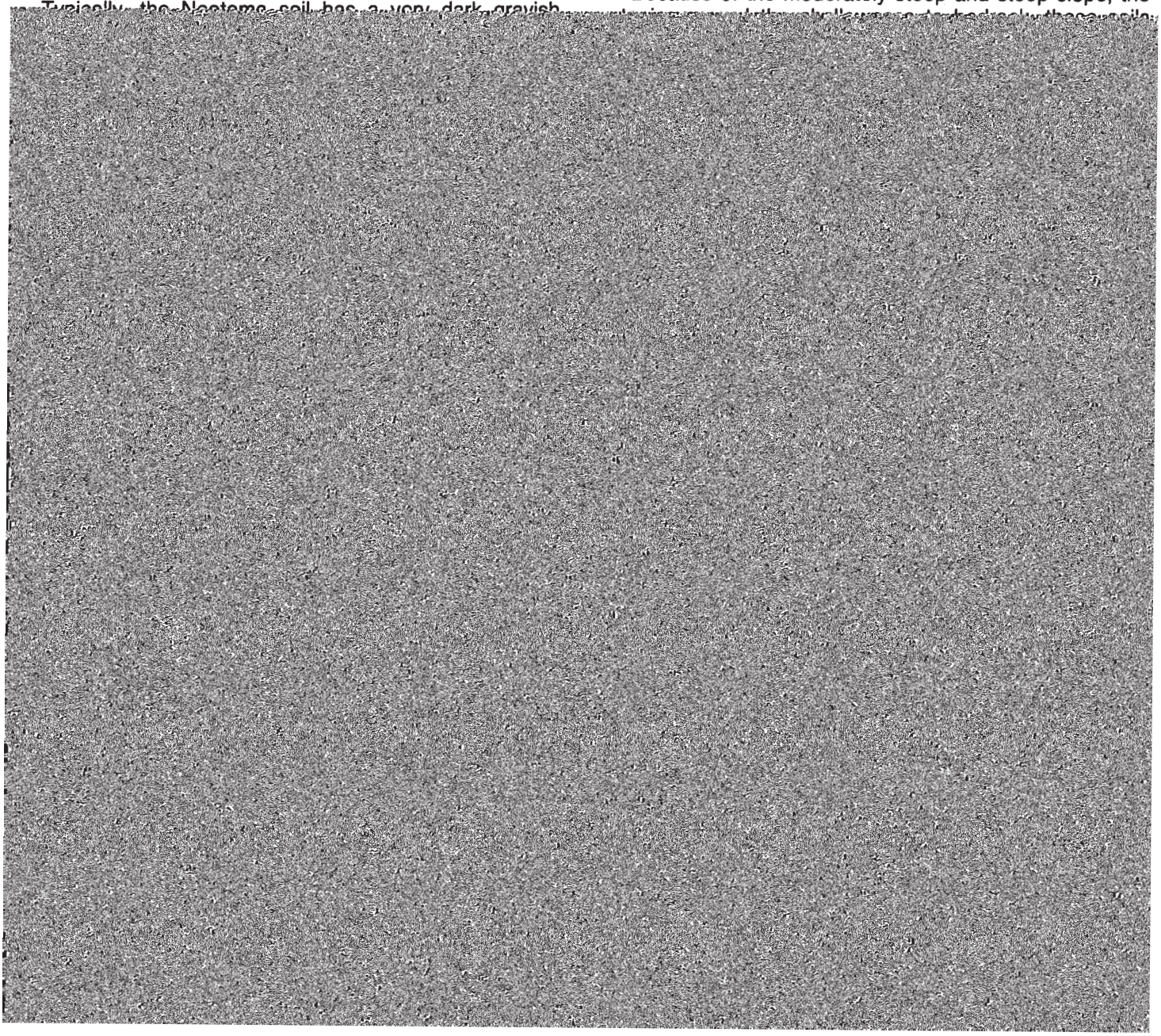
These soils are suited to pasture. In the less sloping areas they are suited to hay, but the steeper slopes limit the use of equipment. Erosion is a severe hazard. Pas-



in places on slopes along bedrock escarpments. The proportion of the Neotoma soil is generally higher on south-facing slopes than on north-facing slopes. The two soils occupy the same hillsides on a dissected, wooded landscape and have not been separated in mapping.

Typically, the Wellston soil has a dark grayish brown and pale brown silt loam surface layer about 9 inches thick. The subsoil is about 31 inches thick. The upper part is mainly strong brown silt loam, and the lower part is strong brown very channery silty clay loam. The substratum to a depth of about 60 inches is multicolored very channery loam. In places a thin, compact and brittle layer is in the lower part of the subsoil.

Typically, the Neotoma soil has a very dark grayish



tour helps to control erosion. Diverting surface water away from haul roads and skid trails also helps to control erosion. Bare areas should be seeded with grasses and legumes.

These soils are mainly on long slopes that have a significant range in elevation. Generally, the slopes are wooded and have bedrock escarpments. Also, the water in many of the drainageways or streams cascades over stones and ledges. The rugged landscape is an appealing setting for hiking and sightseeing, particularly in autumn, when boulders and escarpments show through the colorful hardwood foliage.

Because of the moderately steep and steep slope, the

This soil is suited to woodland. The equipment limitation is severe and seedling mortality moderate because the soil is wet. In most areas trees can be planted during dry periods if species tolerant of wet sites are selected. Competing vegetation can be removed by thinning or by cutting cull trees. Restricting the use of equipment during wet periods prevents compaction of the surface layer.

Many areas provide habitat for wetland wildlife. Some shallow water areas are evident, and many others could be developed easily. The wetness limits the choice of plants that can be grown to provide food for wetland wildlife. This soil is well suited as habitat for woodland wildlife if it is left in native vegetation.

Because of the wetness and the flood hazard, this soil is generally unsuited as a site for buildings and waste disposal systems. Providing a system of levees and pumps or filling in the area can help to overcome these limitations.

Capability subclass Vw.

1426—Karnak silty clay, wet. This nearly level, very poorly drained soil is on broad flats and in narrow depressions on flood plains. It is subject to frequent flooding for long periods in spring. Individual areas are mainly long and narrow or oblong and range from about 5 to more than 200 acres in size.

Typically, the surface layer is dark gray silty clay about 8 inches thick. The subsoil is dark gray silty clay about 44 inches thick. The substratum to a depth of about 60 inches is gray silty clay. In some areas the subsoil or substratum has strata of silty clay loam.

Included with this soil in mapping are areas near overflow channels where silty overwash is evident and small areas of Cairo soils on slight rises. Cairo soils are loamy within a depth of 40 inches. Also included are some areas where the subsoil has slightly acid to mildly alkaline layers. Included areas make up about 10 to 15 percent of this unit.

Water and air move through this soil at a very slow rate. Surface runoff is ponded. The seasonal high water table is at or near the surface for extended periods in most years. The subsoil is medium acid or strongly acid. The surface layer is very hard when dry and very sticky when wet. Clods form if the soil is worked when wet. This very clayey soil shrinks during dry periods and swells during wet periods. Organic-matter content is low in the surface layer. Natural fertility is low or medium. Available water capacity is moderate. The penetration of roots is restricted by the fluctuating water level and by the high content of clay.

Most areas are woodland. A few areas are pastured. This soil has poor potential for cultivated crops and hay. It has fair potential for pasture and woodland and good to fair potential for wetland and woodland wildlife habitat. The potential for recreation uses, building site development, and sanitary facilities is poor.

This soil generally is not suited to cultivated crops or hay because of the extended seasonal wetness and the overflow hazard. A few areas are pastured. Grasses and legumes that can tolerate wet sites should be selected. Restricted use during wet periods, timely deferment of grazing, and proper stocking rates improve the condition of the pasture and the soil.

The soil is well suited to woodland. Seedling mortality, plant competition, and the equipment limitation are problems. Plant competition can be controlled by harvesting mature trees, thinning, and cutting cull trees. Most areas can be hand planted during the drier periods. Trees that are tolerant of wet sites should be selected.

Many areas provide habitat for wetland or woodland wildlife. Some shallow water areas are evident, and many others could be developed. The wetness limits the choice of plants that can be grown as food for wildlife.

The soil has serious limitations as a site for buildings, local roads and streets, and waste disposal systems. Because it is depressional, it is subject to ponding for long periods and to overflow during rainy periods. Providing adequate drainage is difficult because water moves very slowly through the soil and the soil is in a low-lying position on the landscape.

Capability subclass Vw.

3071—Darwin silty clay, frequently flooded. This nearly level, poorly drained and very poorly drained soil is on broad flats and in overflow channels on the flood plain of the Mississippi River. It is in the unprotected area between the levee and the river. It is subject to frequent flooding for long periods in winter and spring. Individual areas are mainly long and range from about 15 to 200 acres in size.

Typically, the surface layer is very dark gray silty clay about 8 inches thick. The subsoil is very dark gray and dark gray silty clay about 19 inches thick. The substratum to a depth of about 63 inches is dark gray, stratified silty clay and silty clay loam. In places the surface layer is silty clay loam. In some areas the substratum has strata of clay loam, loam, or fine sandy loam.

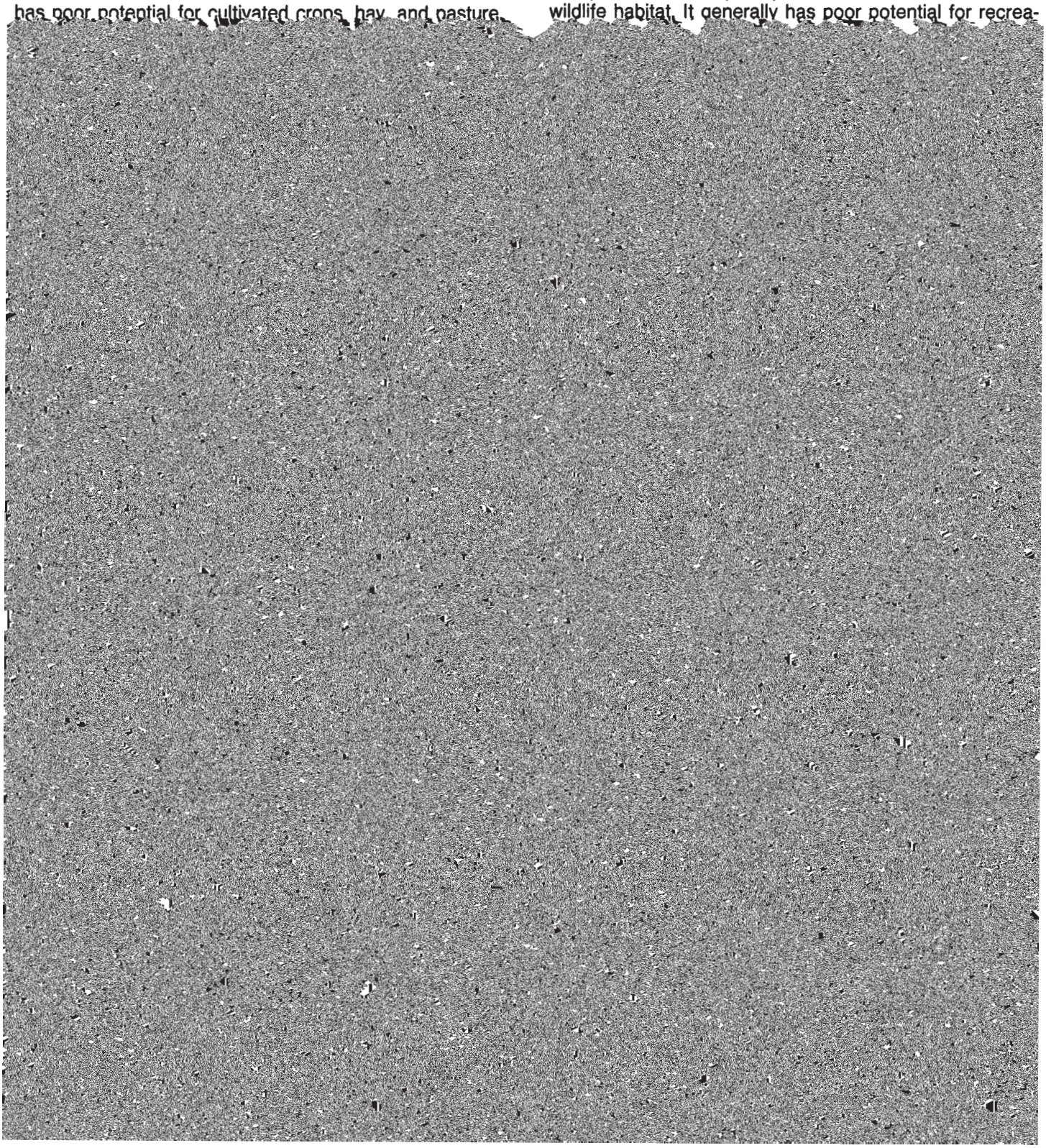
Included with this soil in mapping are areas where sandy or silty overwash is on the surface. Also included are areas of Cairo soils on similar or higher positions and areas of the somewhat poorly drained Medway soils on slight ridges. Included areas make up about 10 to 15 percent of this unit.

Water and air move through this soil at a very slow rate, and surface runoff is slow to ponded. The subsoil and substratum are slightly acid to moderately alkaline. The seasonal high water table is within 2 feet of the surface in winter and spring. The surface layer is very firm and difficult to till. It is very sticky when wet and very hard when dry. Clods form if the surface soil is worked when wet. The soil swells during wet periods and shrinks during dry periods. Organic-matter content and natural

fertility are medium. Available water capacity is moderate.

Most areas are cultivated. Some are wooded. This soil has poor potential for cultivated crops, hay, and pasture.

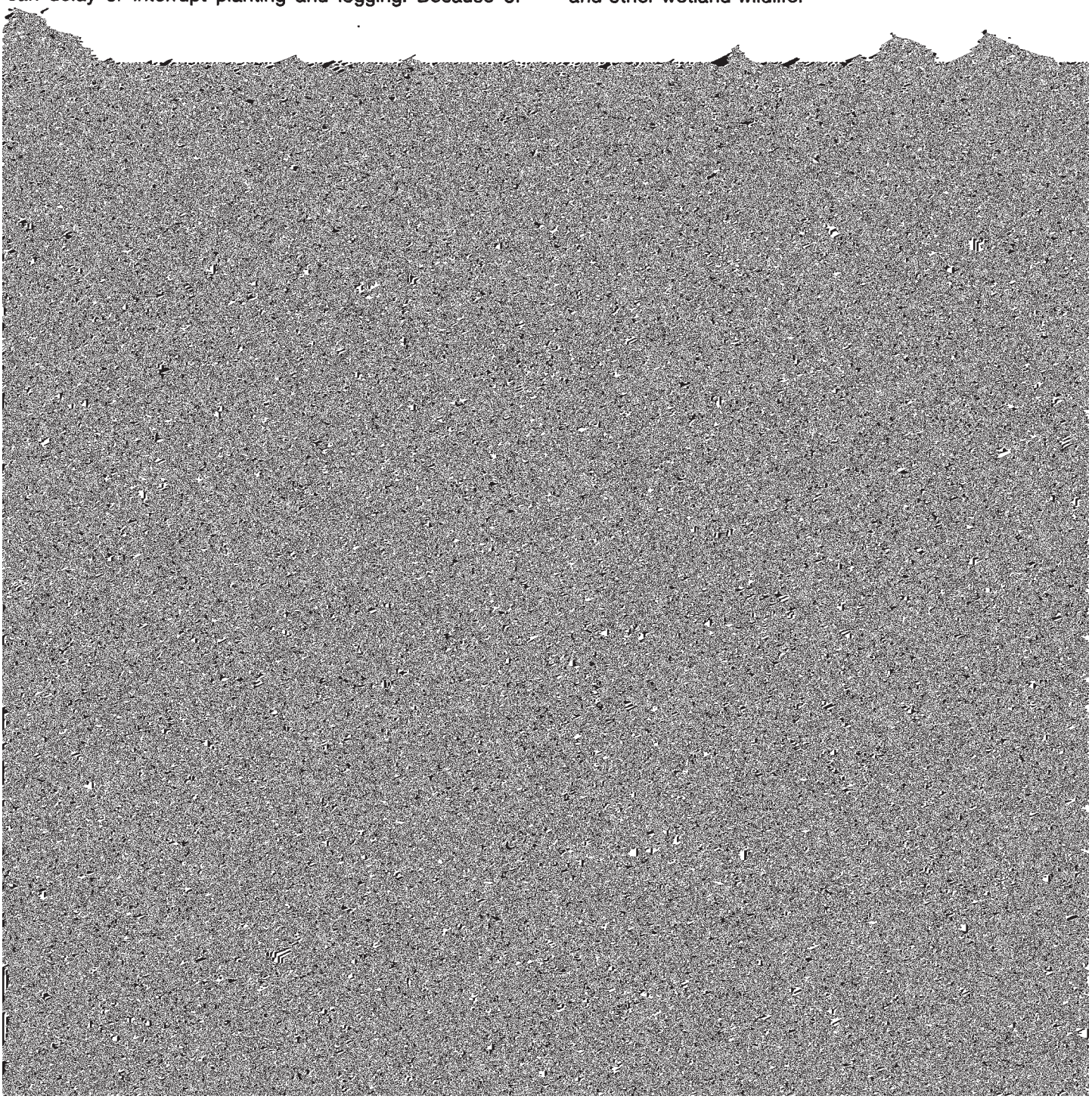
Most areas support recently established trees and shrubs. This soil has fair potential for cultivated crops and pasture. It has poor potential for woodland and for wildlife habitat. It generally has poor potential for recrea-



This soil is poorly suited to corn, soybeans, and grain sorghum. Flooding early in fall or late in spring is the main concern of management. Floodwater severely damages crops during the growing season in some years. Planting short-season crops reduces the risk of damage.

This soil is poorly suited to woodland. Flooding and deposition can result in damage to seedlings. Flooding can delay or interrupt planting and logging. Because of Tilth can be improved by conservation tillage and by returning crop residue to the surface layer or adding other organic material. Shallow ditches are effective in removing excess surface water.

If left in native vegetation, this soil is well suited to woodland wildlife habitat. If cleared, it is well suited to the development of shallow water areas for waterfowl and other wetland wildlife.



woodland or openland wildlife habitat. It is poor for most recreation uses, for building site development, and for sanitary facilities.

areas are mainly irregularly shaped and range from about 5 to 75 acres in size.

Typically, the surface layer is brown silt loam about 7

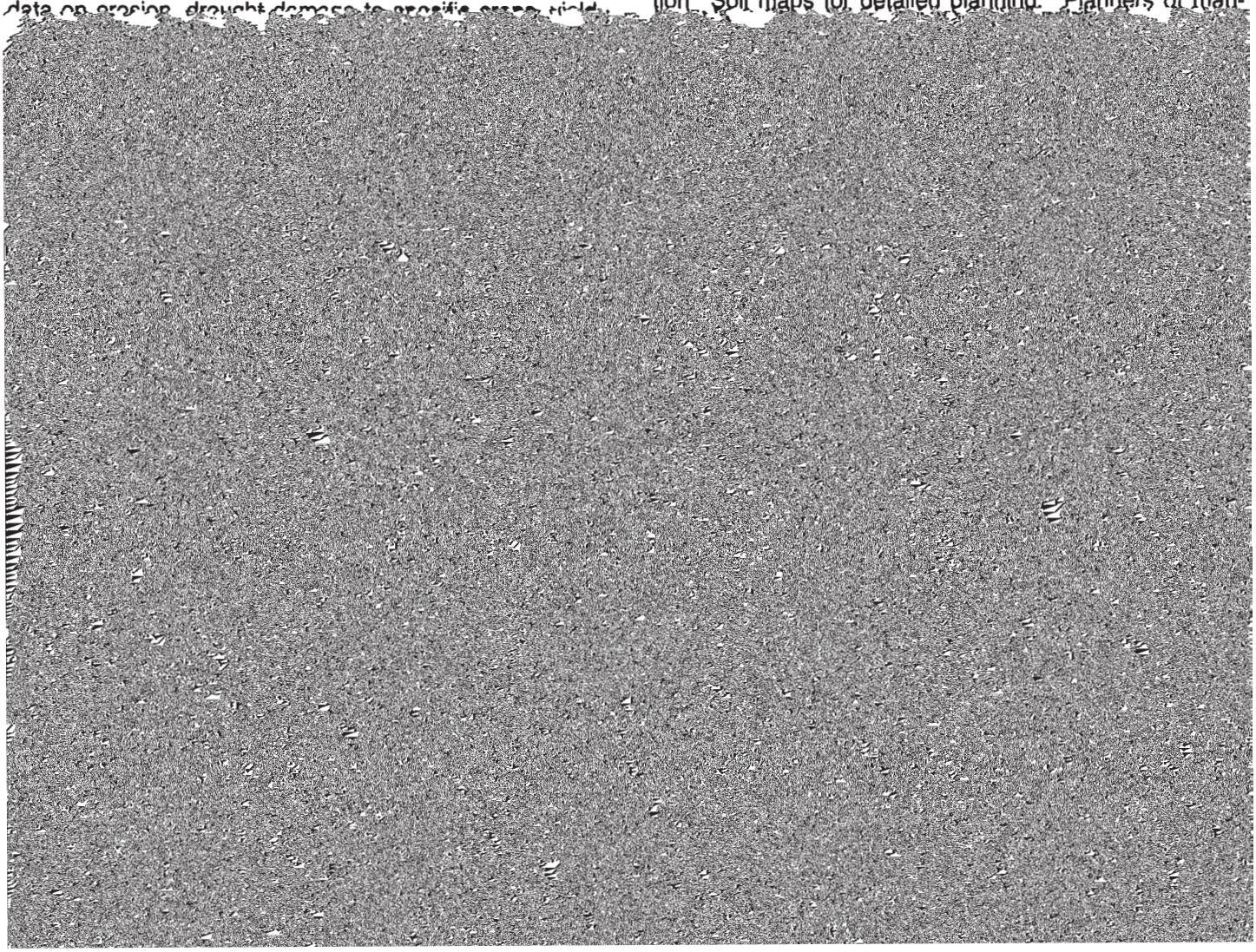
sloping. The hazard of erosion is severe. The ground water supply is likely to be contaminated if the effluent from an onsite waste disposal system enters a sinkhole. Special design, layout, and construction methods are needed for buildings. The cost may be prohibitive.

Capability subclass IIIe.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield



Crops and pasture

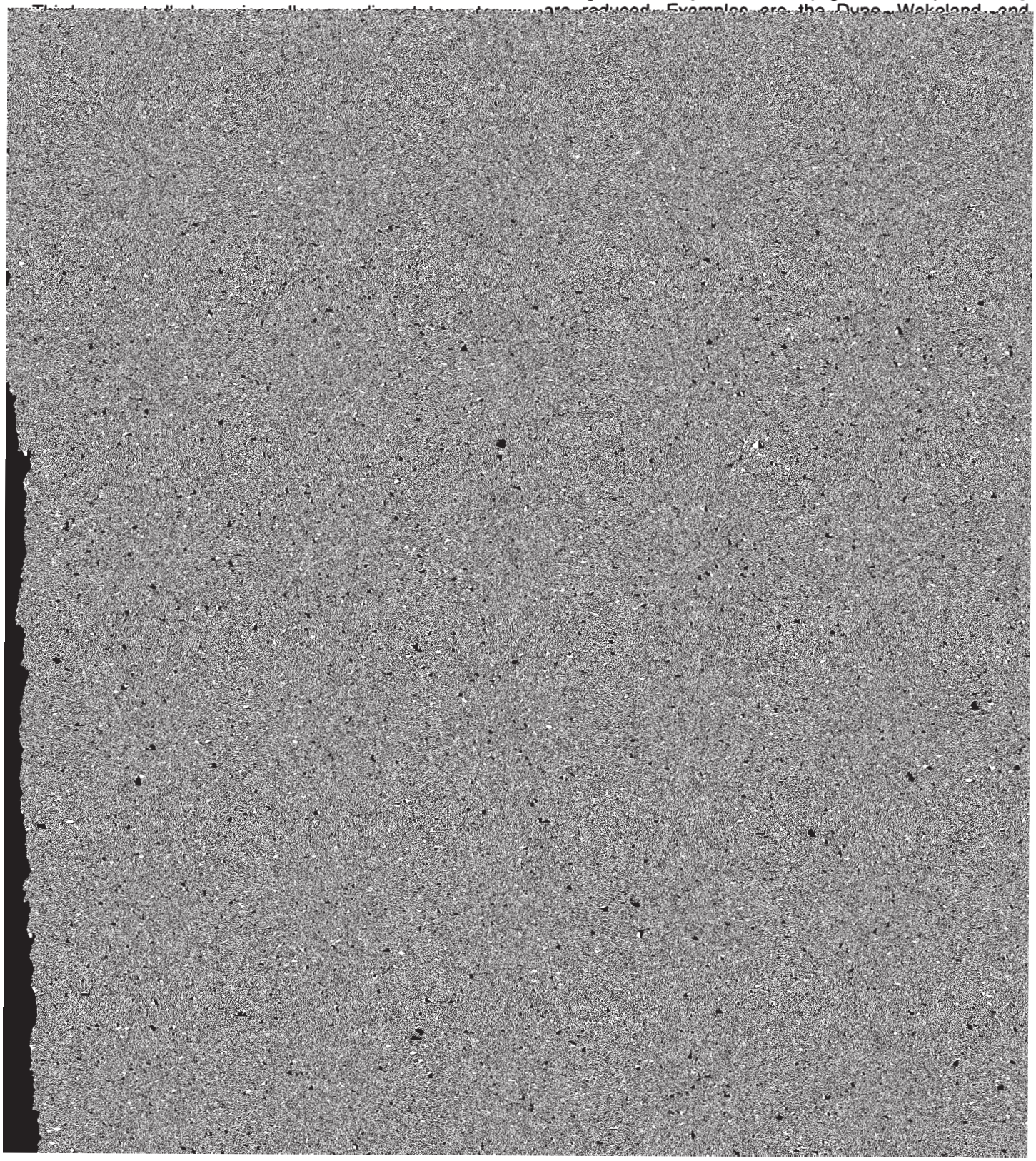
Joe Barkley, district conservationist, Soil Conservation Service, helped prepare this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

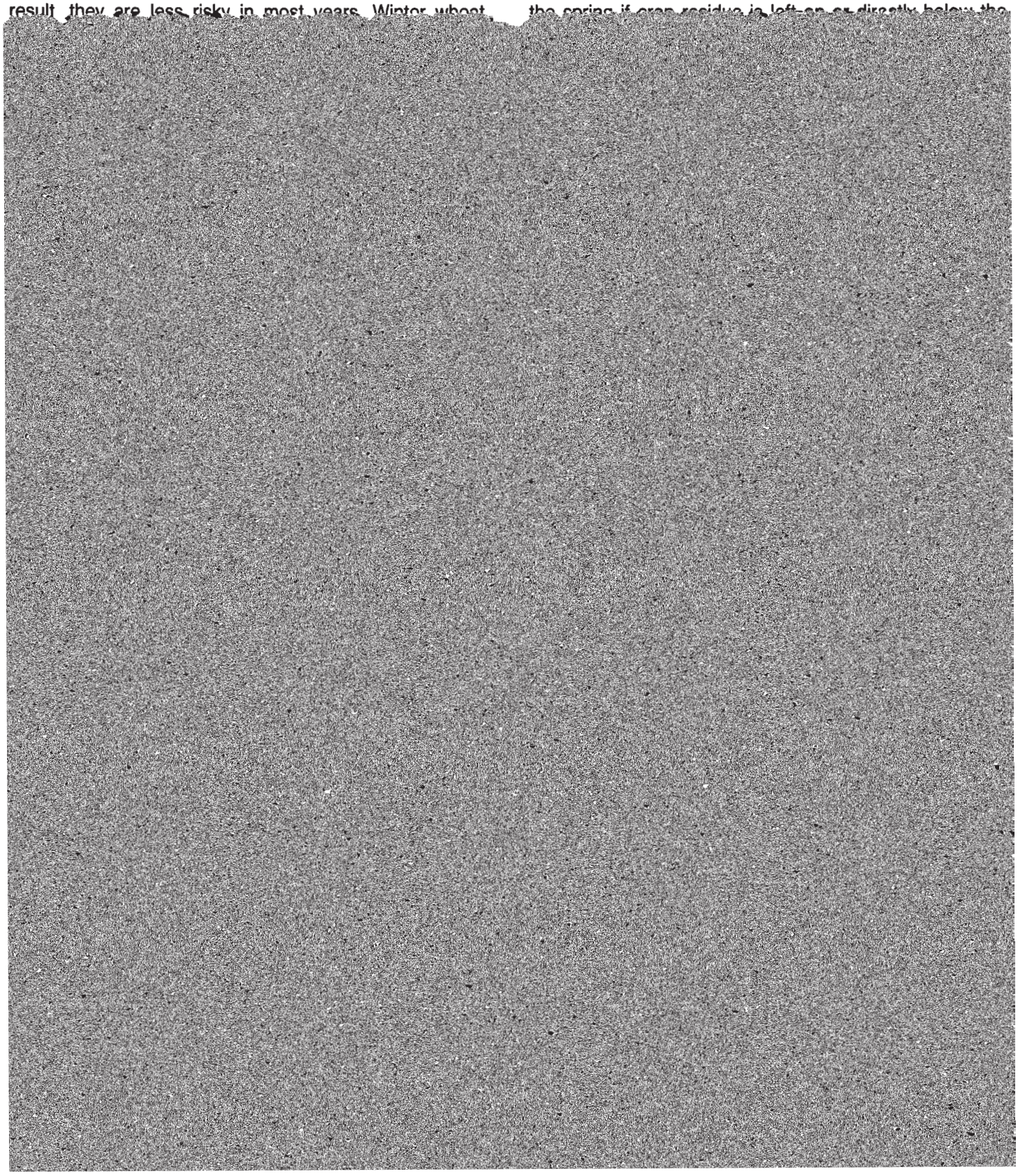
This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of man-

These soils tend to crust after hard rains. As a result, runoff is increased.

Unless drained, somewhat poorly drained soils are wet enough in some years that crop growth and productivity are reduced. Examples are the Dune, Wakeland, and



result, they are less risky in most years. Winter wheat, the spring if crop residue is left on or directly below the



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

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of soils for specific purposes.

In the capability system, soils are generally grouped at three levels—class, subclass, and unit. Capability classes, the broadest groups, are designated by the Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

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

Class IV soils have very severe limitations that reduce the choice of plants or require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use.

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

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

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

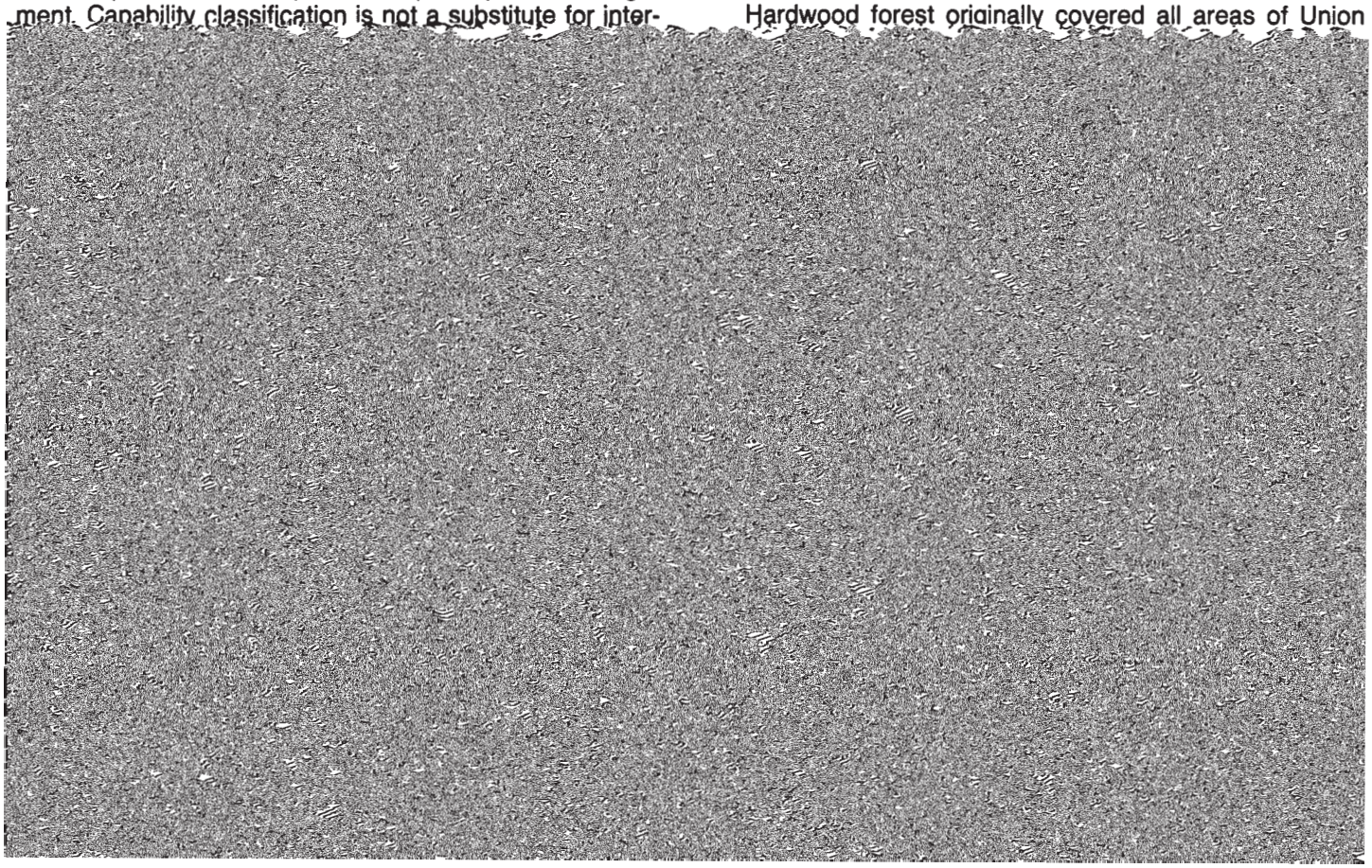
Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or 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 only some parts of the United States, 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 contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability subclass is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning."

Woodland management and productivity

Hardwood forest originally covered all areas of Union



firm enough to support the weight. If excessive erosion occurs or the slope is more than 15 percent, runoff should be diverted away from haul roads and skid trails. Surface drainage is beneficial on wet soils.

Table 6 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soils, sandy texture; *f*, high content of coarse fragments in the profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, s, f, and r.

In table 6 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* indicate the degree of the limitation. *Slight* means that the soil has few limitations that affect the use; *moderate*, that the limitations can be overcome or alleviated by planning and by moderate special practices; and *severe*, that the limitations are severe and that special practices are required. Ratings of *slight* or *moderate* equipment limitation indicate that the soil can be worked by the equipment commonly used in woodland management and that the soil is not wet enough for this use to severely damage the soil structure. Ratings of *slight* or *moderate* seedling mortality indicate that the soil is not expected to cause the death of enough seedlings to require replanting.

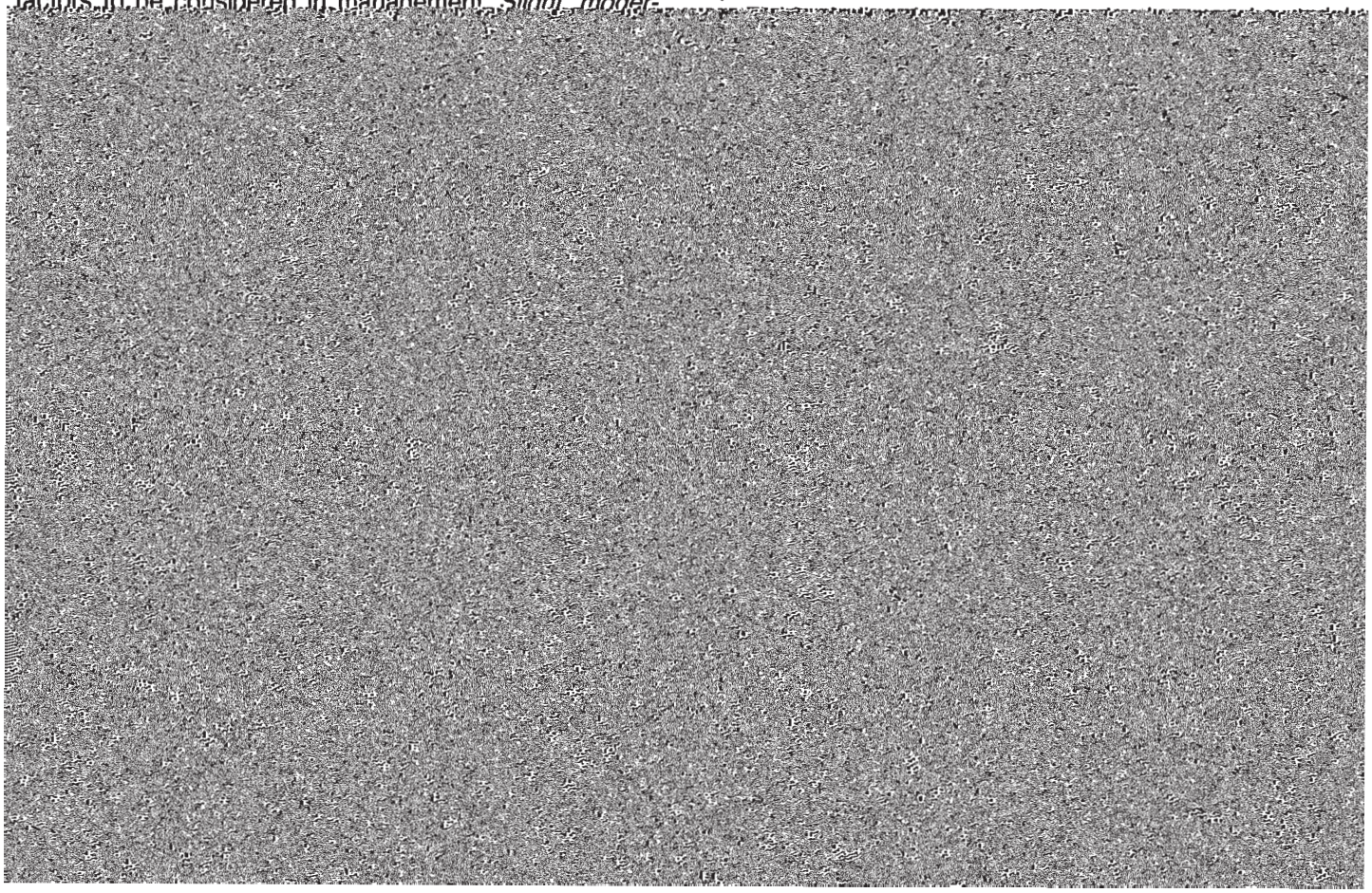
Ratings of *slight* or *moderate* windthrow hazard indicate that the soil is not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

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

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.



velopers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

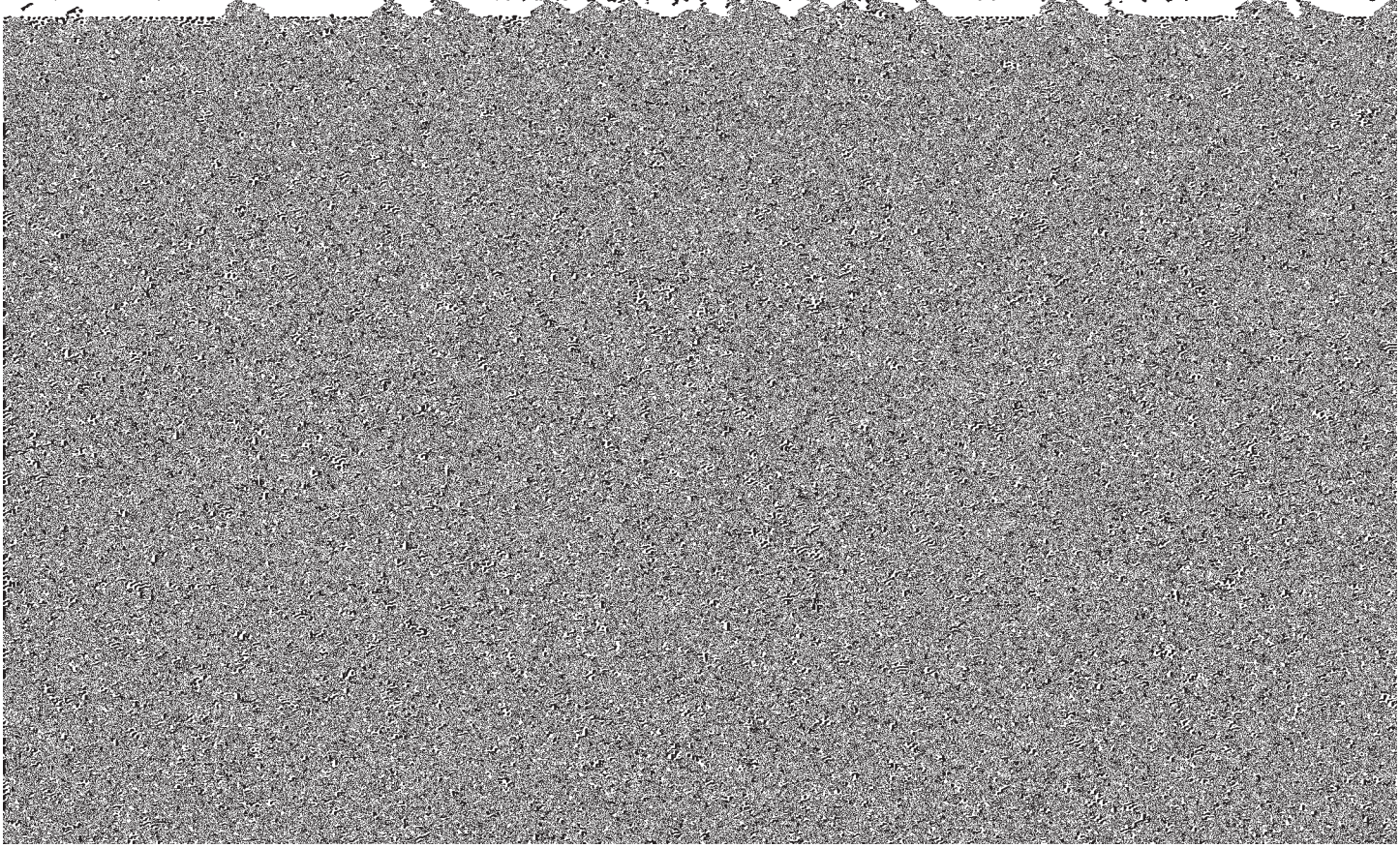
The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities. Table 11 shows the kind of limitations for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

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

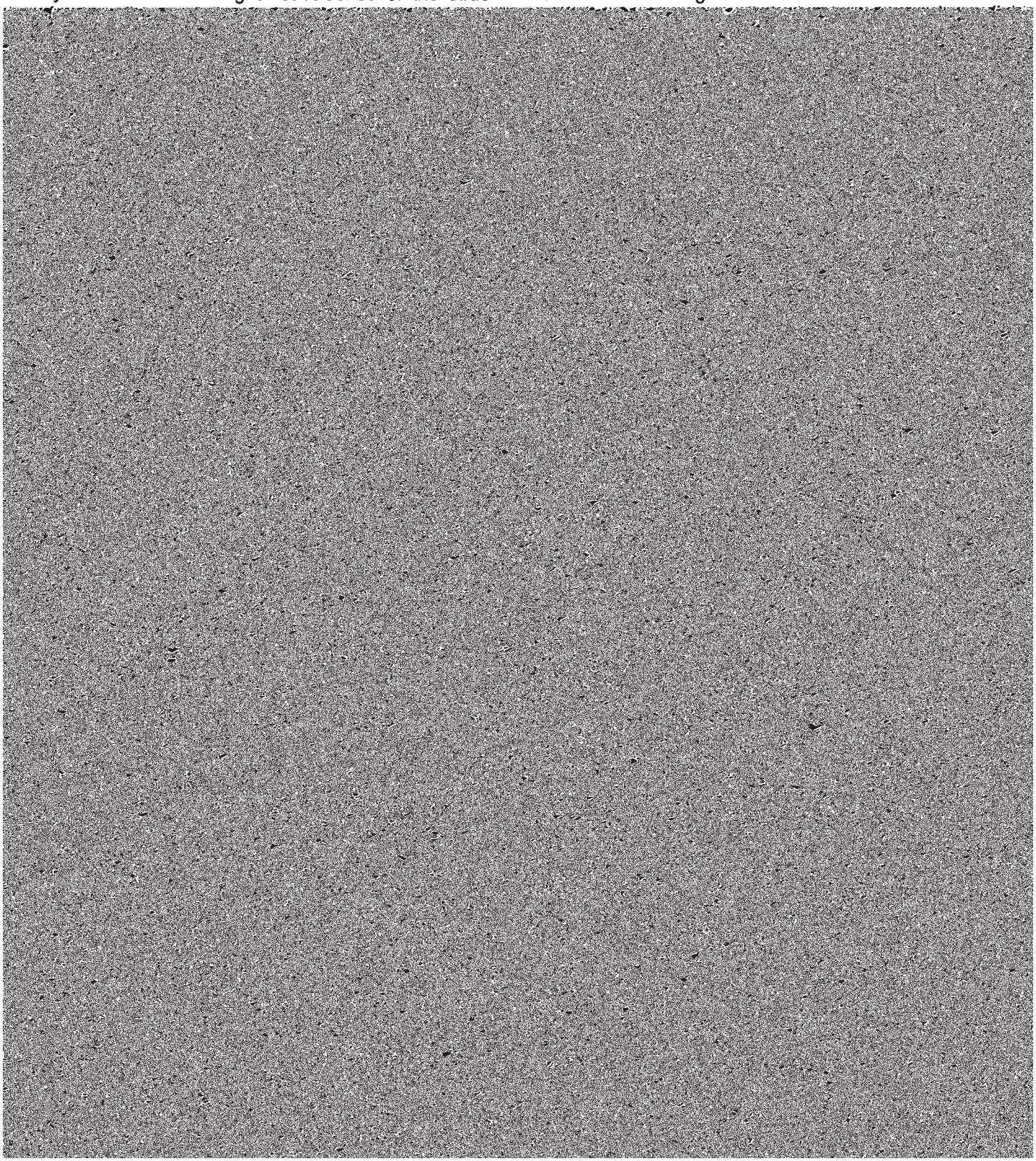
Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and



out basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the struc-

daily cover for landfills. It is important to observe local ordinances and regulations.



compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

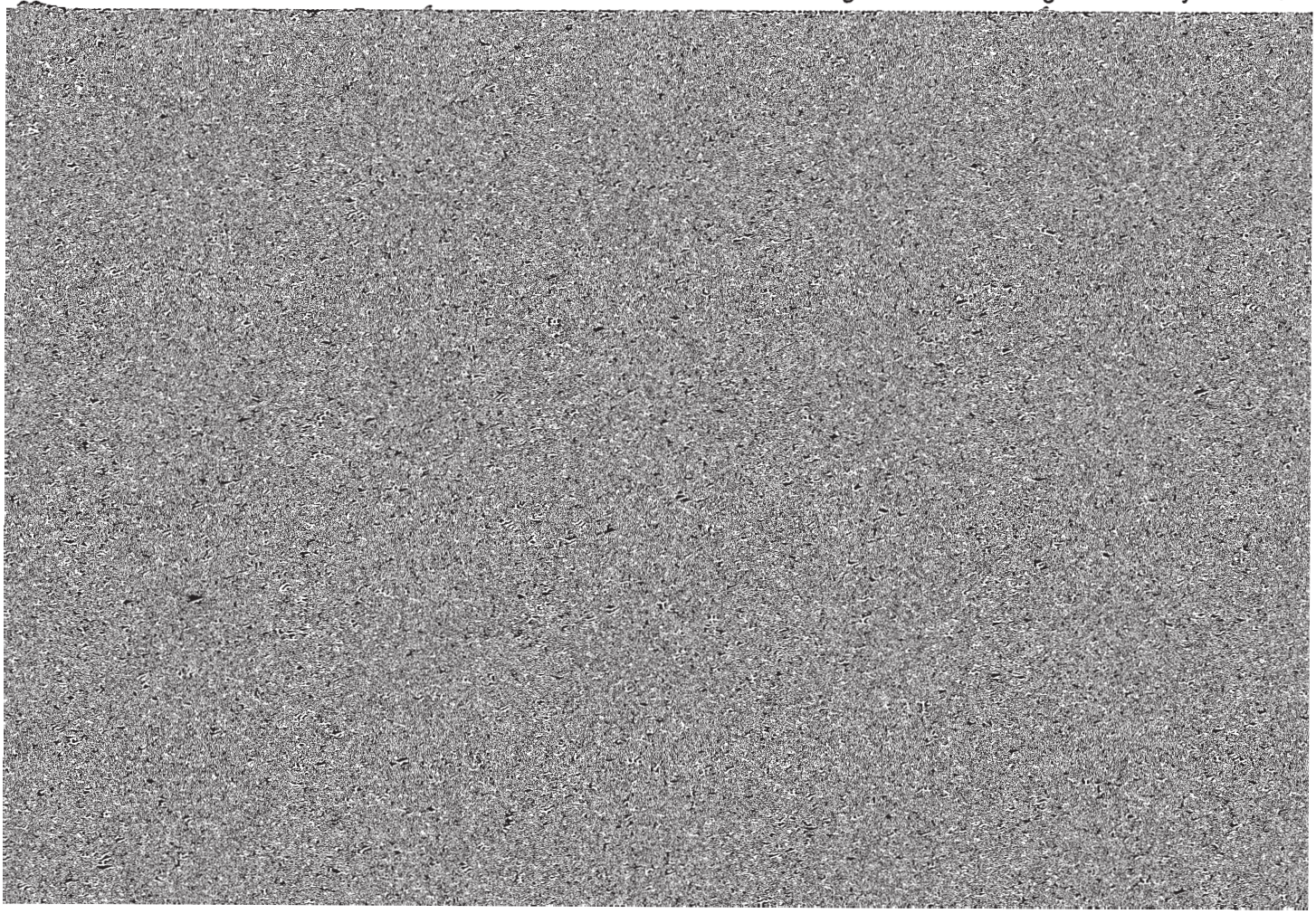
Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trench-

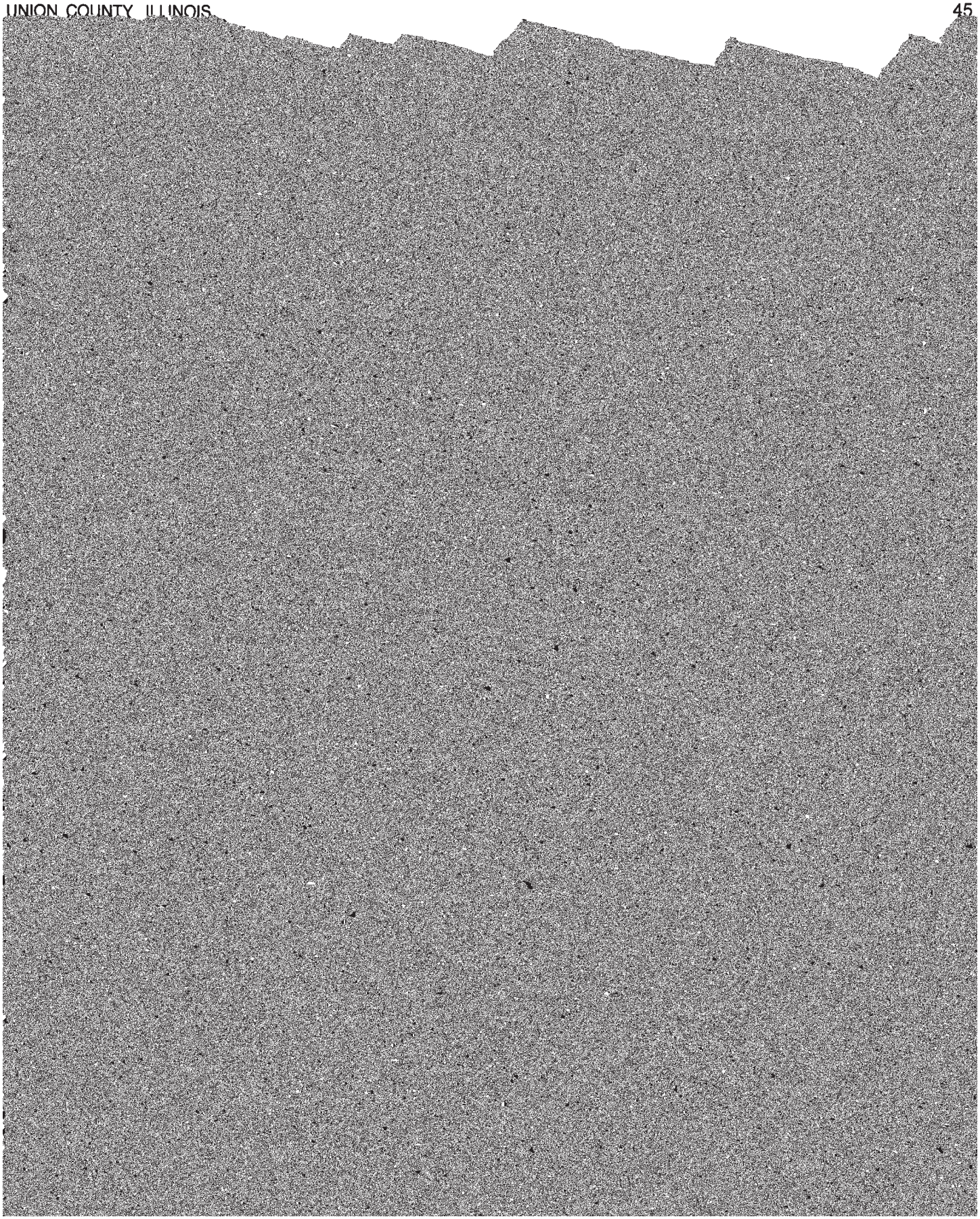
Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low





The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but re-

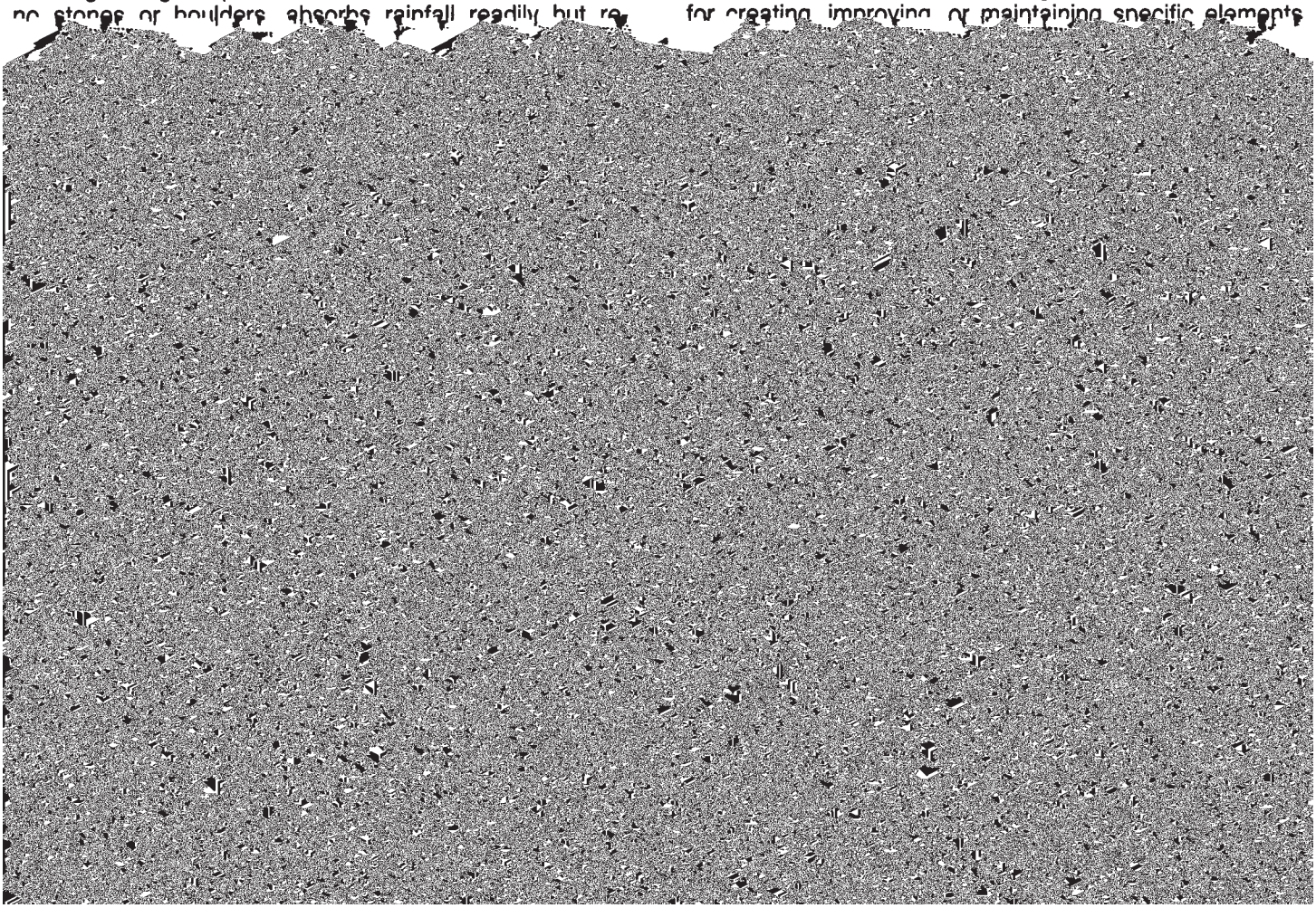
greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements



food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, ragweed, beggarweed, broomsedge, and partridgepea.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, blackgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

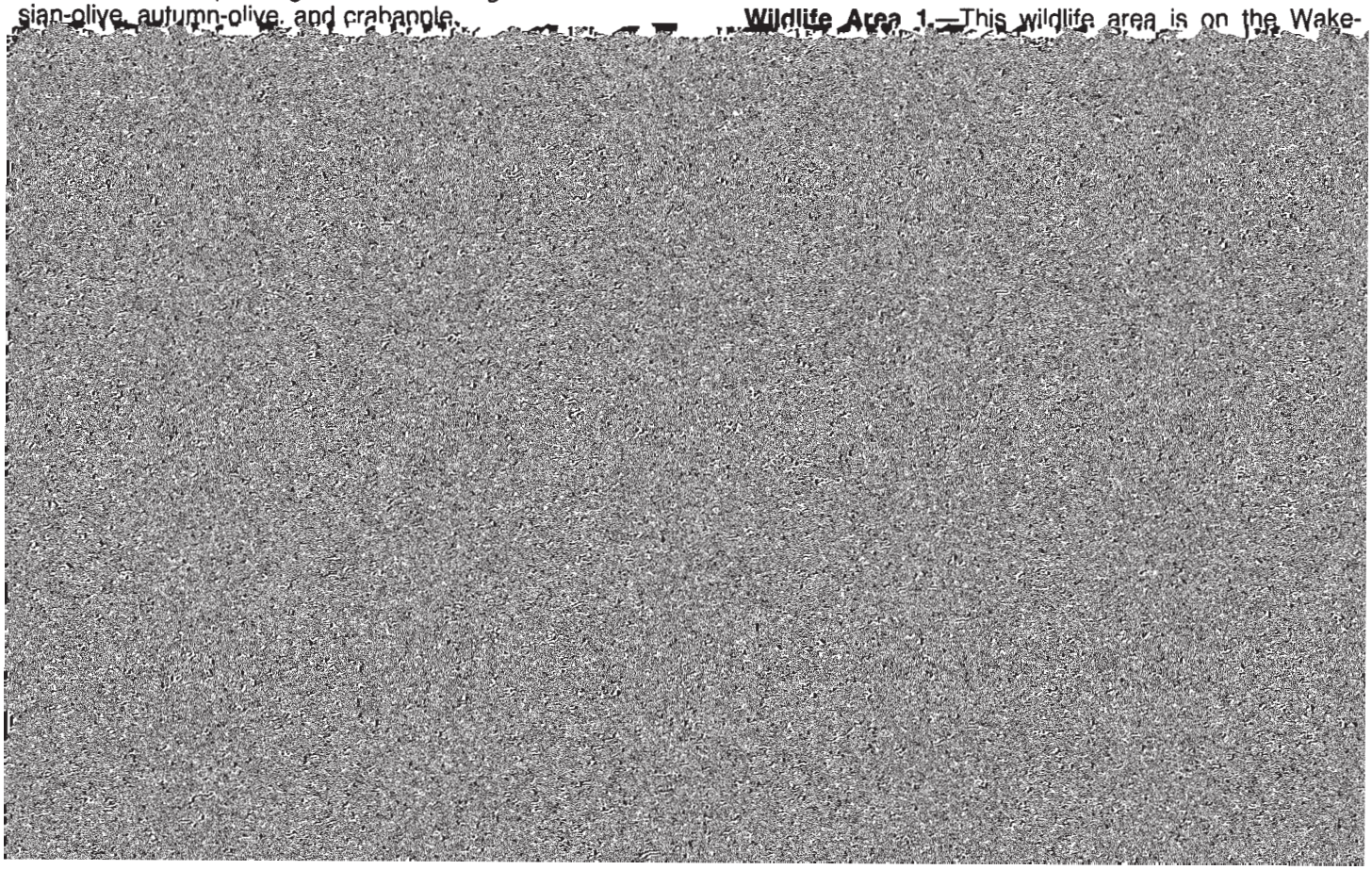
Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Union County provides a variety of habitat for wildlife, including forests, pastureland, extensive bottom land areas, bluffs, and wetlands. The wildlife also is varied. There are good populations of white-tailed deer, wild turkey, gray squirrels, fox squirrels, rabbits, bobwhite quail, and furbearers and many nongame birds, mammals, amphibians, and reptiles. Wetland areas and streams support waterfowl, wading birds, shore birds, mink, muskrat, and a few river otters.

Wildlife habitat is not a primary land use in most areas. Wildlife is a primary crop only on land especially set aside as wildlife habitat. It is a secondary crop on soils used for grain, hay and pasture, and forest.

The paragraphs that follow specify, by the soil associations described under the heading "General soil map for broad land-use planning," the kinds of habitat in three wildlife areas in Union County and the kinds of wildlife in those areas.

Wildlife Area 1.—This wildlife area is on the Wake-



by rock outcrops and steep bluffs. The Ozark Hills Nature Preserve and the Pine Hills part of Larue-Pine Hills Ecological Area are included in this wildlife area. The soils are moderately steep to very steep, well drained, and generally forested.

The bluffs provide habitat for eastern wood rat, a rare species in Illinois, and are denning areas for rattlesnakes and other snakes. This wildlife area is important as habitat for wild turkey and is one of the better locations in the State for turkey hunting. It is part of the only known range of scarlet snake and northern black-tail shiner in Illinois, and it provides habitat for spring cavefish and northern flat-headed snake, both of which have a very restricted range in the State.

Other important wildlife in this area are white-tailed deer, gray squirrel, raccoon and other furbearers, and numerous species of nongame birds, mammals, and reptiles. The wildlife can benefit from good timberland management, protection from fire, and exclusion of grazing livestock.

Wildlife Area 3.—This wildlife area is on the Hosmer, Hosmer-Zanesville, Alford-Wellston, and Alford associations. It extends over most of the eastern half of the county. The soils dominantly are gently sloping to steep and moderately well drained and well drained.

Most of the acreage is pasture, cropland, or woodland. As a result of the interspersion of pasture, cropland, and woodland, this wildlife area provides excellent habitat for small game species, such as bobwhite quail, rabbit, fox squirrel, and mourning dove, and for white-tailed deer. Other species include gray squirrel, wild turkey, furbearers, and some nongame animals. Numerous farm ponds provide good fishing for bass, bluegill, and channel catfish. Many of the streams also support good populations of fishes. Pasture management, crop residue management, and protection of woodland from fire and grazing have an important effect on the area as a habitat for wildlife.

Soil properties

moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

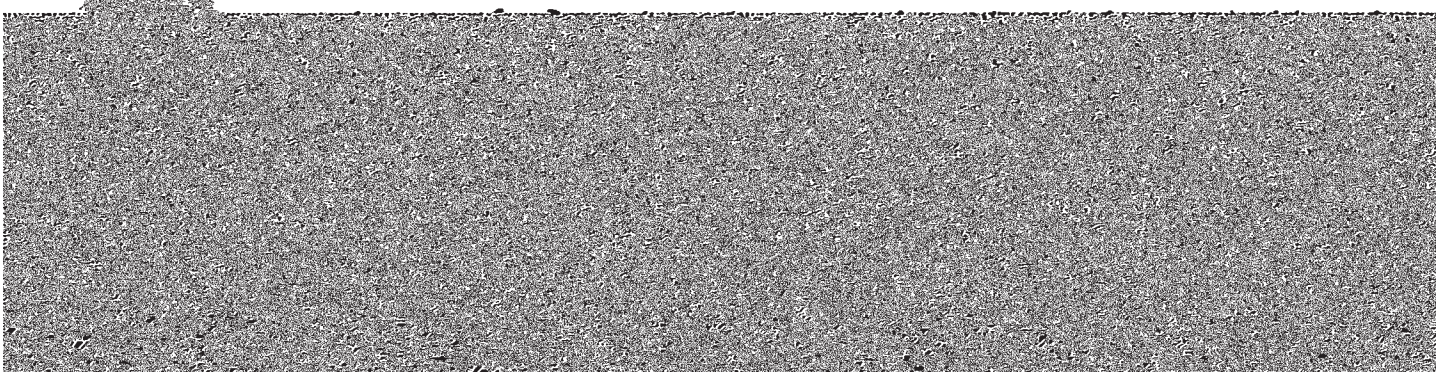
The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features and engineering test data.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.



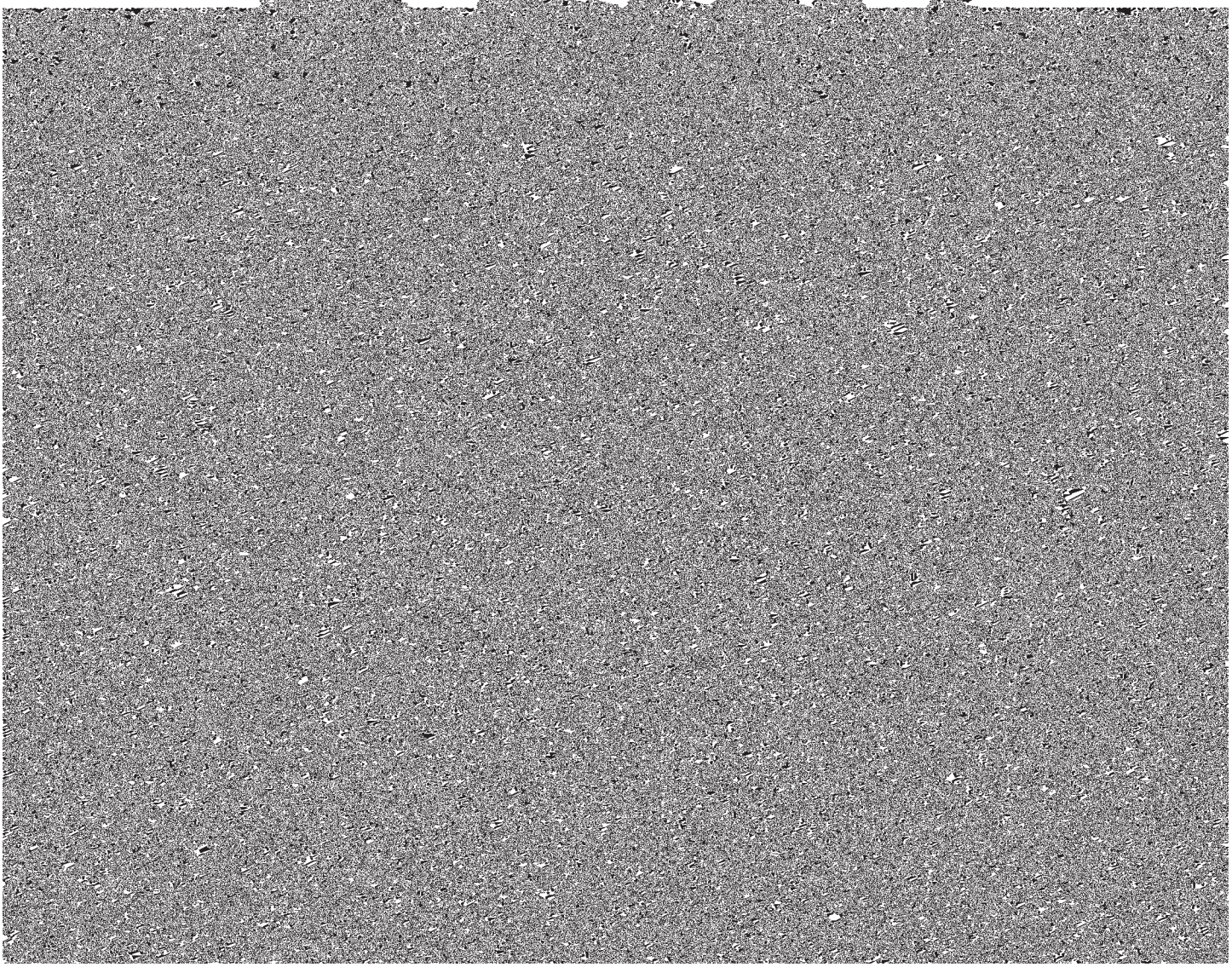
classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade ma-

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use



Organic matter is plant and animal residue in the soil at various stages of decomposition. In table 15 the content of organic matter in the surface layer is estimated as a percent of the soil material that is less than 2 millimeters in diameter.

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

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

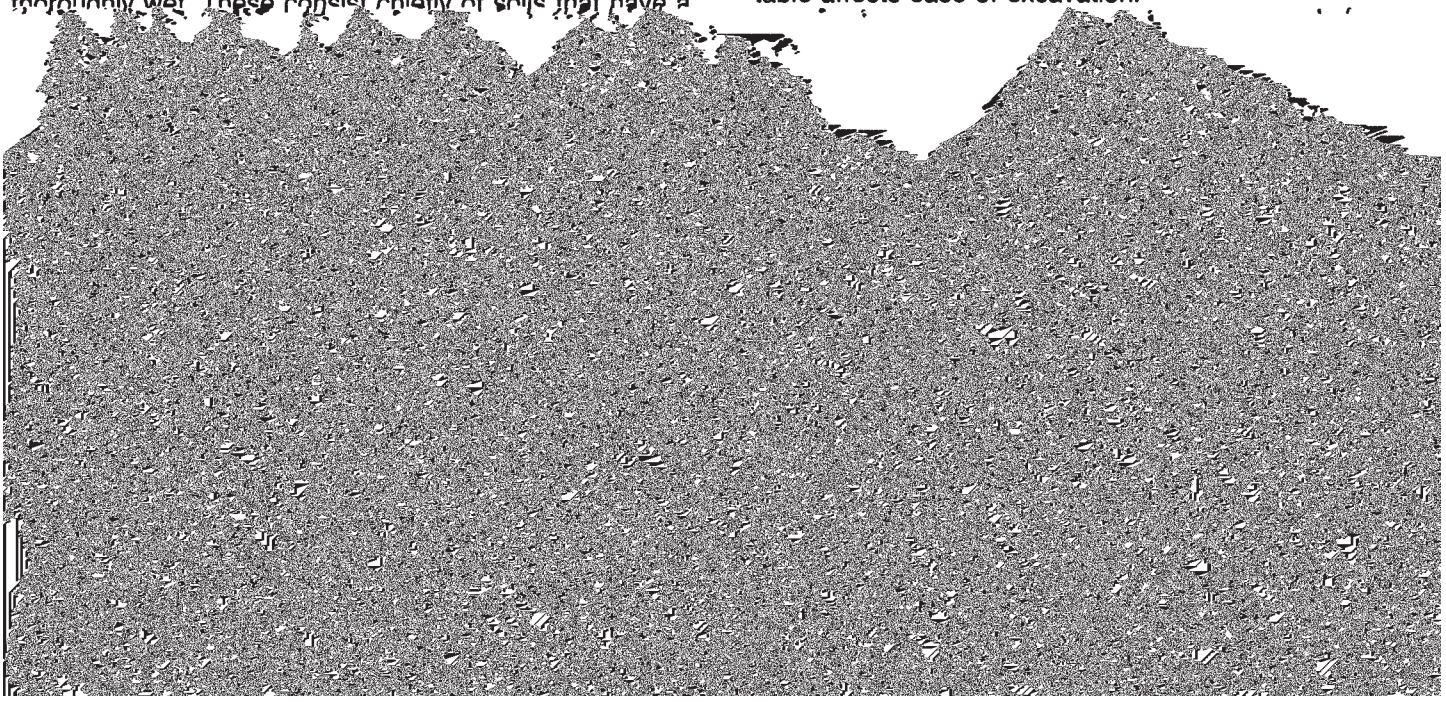
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a

that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.



drained very gravelly or sandy soils are the least susceptible.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are given in table

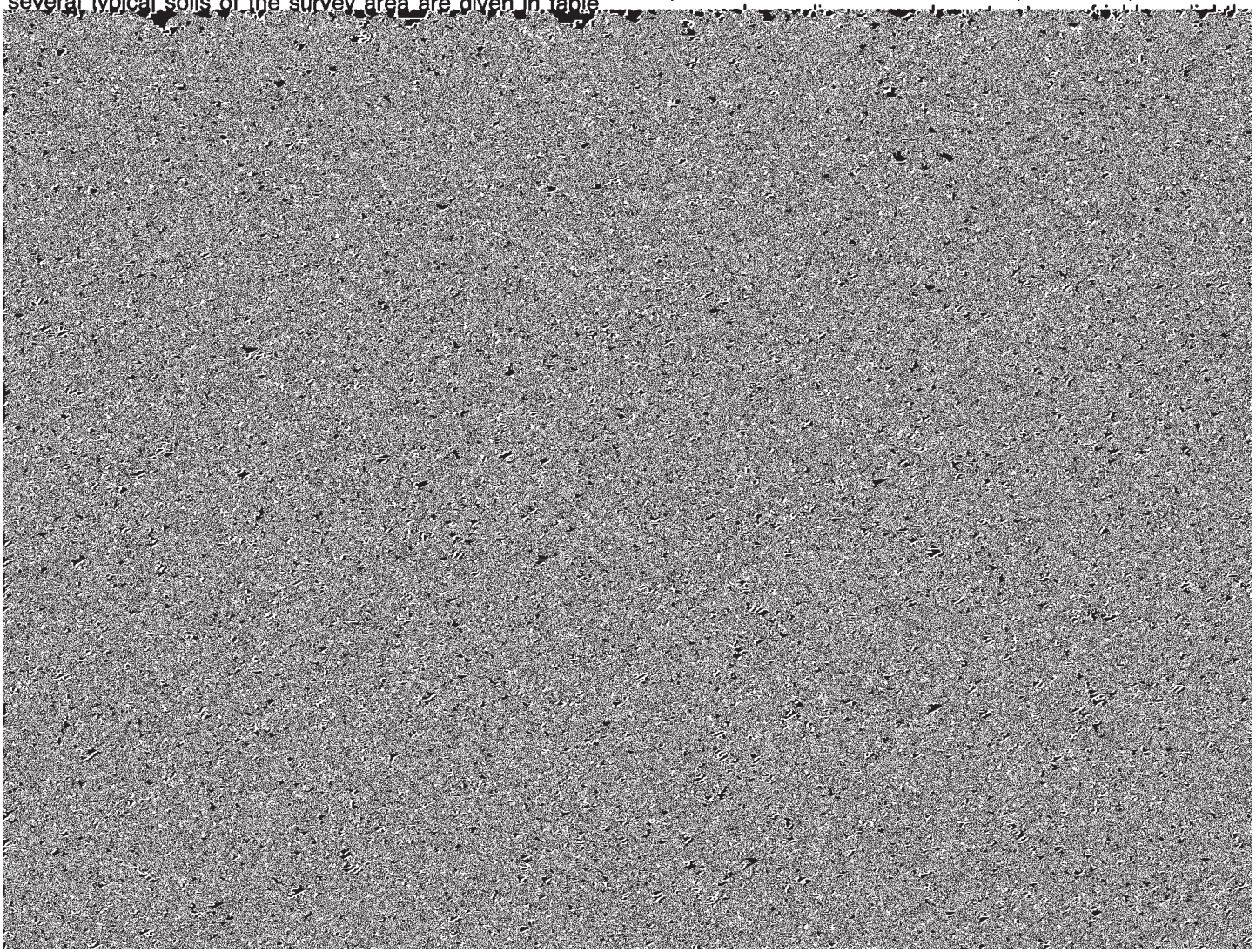
Alford series

The Alford series consists of well drained, moderately permeable soils formed in loess. These soils are on ridgetops and hillsides in the uplands. Slope ranges from 2 to 70 percent.

In this survey area Alford soils are commonly mapped with or are adjacent to Hosmer, Goss, Baxter, or Wellston soils. They are similar to Hosmer and Wellston soils but lack the Bx horizon characteristic of Hosmer soils and the coarse fragments in the lower part of the solum characteristic of Wellston soils. Goss and Baxter soils contain more clay in the B2t horizon than Alford soils and contain more coarse fragments in the solum.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, eroded, about 1,650 feet west and 660 feet south of the northeast corner of sec. 7, T. 13 S., R. 1 W., in a cultivated field:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam;



The Ap or A1 horizon is dominantly dark brown (10YR 4/3) or yellowish brown (10YR 5/4), but it is very dark grayish brown (10YR 3/2) in wooded areas. In some pedons the C horizon has mottles with chroma of 2 or lower.

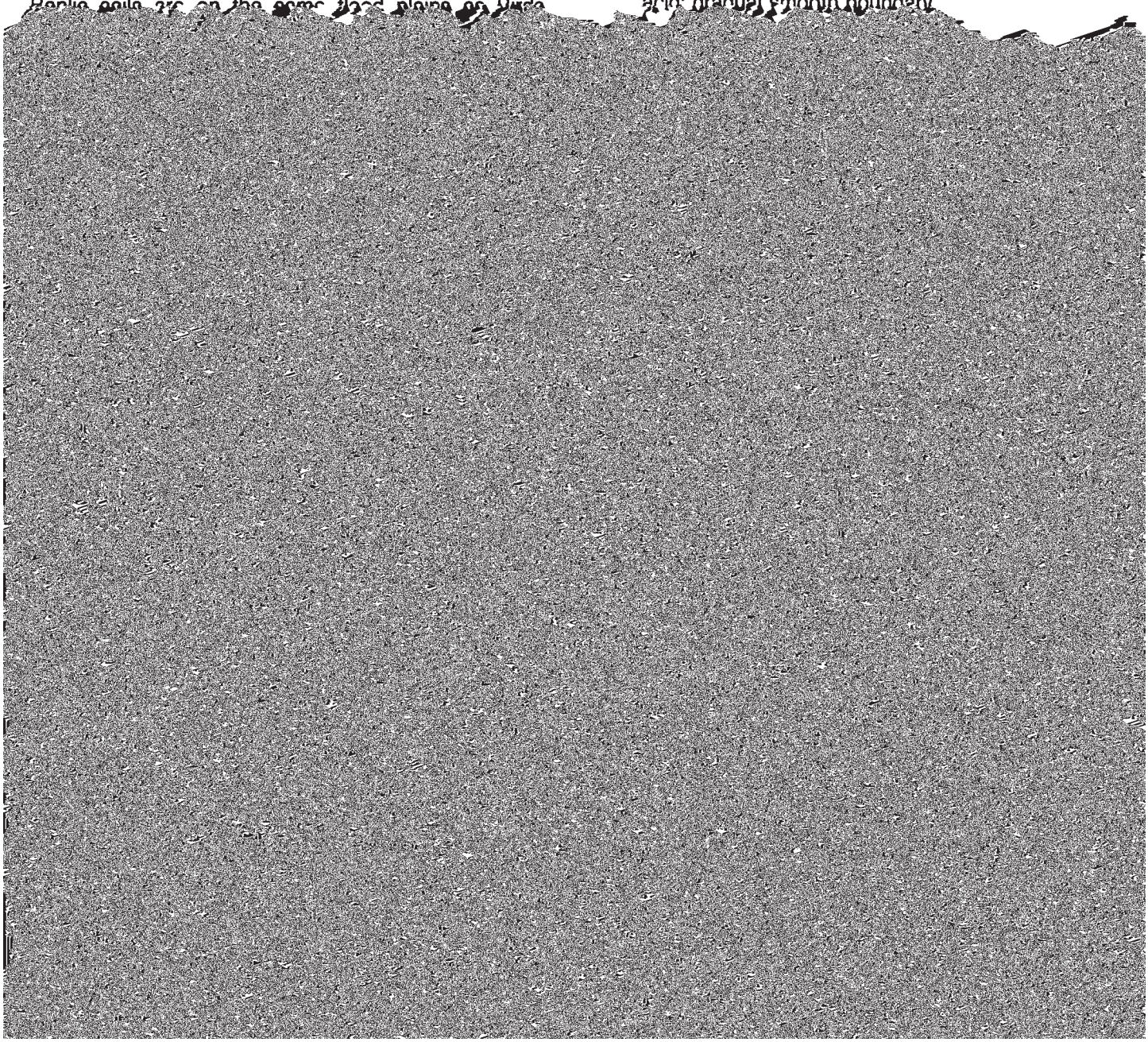
Banlic series

The Banlic series consists of somewhat poorly drained, slowly permeable soils formed in silty alluvium. These soils are on slight rises on flood plains. Slope ranges from 0 to 3 percent.

Banlic soils are on the same flood plains as Pirkle

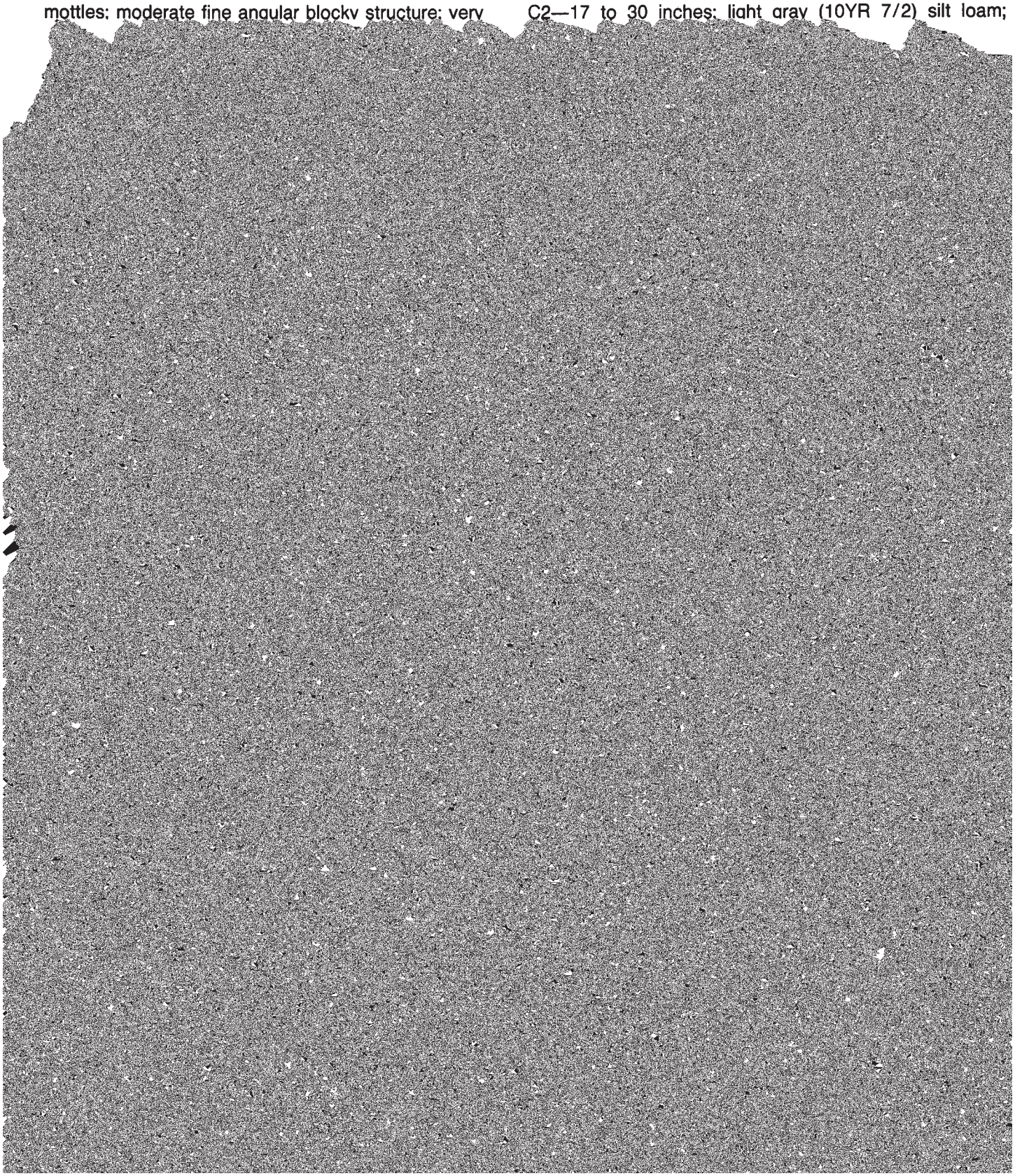
Bx3—35 to 48 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm and brittle; patchy light gray (5Y 7/2) uncoated silt grains and thin patchy grayish brown (5Y 5/2) clay films on faces of peds; common fine to large dark concretions; very strongly acid; clear smooth boundary.

Cx1—48 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; massive; firm and brittle; common light gray (5Y 7/2) uncoated silt grains on faces of peds; many dark stains and concretions; very strongly acid; gradual smooth boundary.



mottles; moderate fine angular blocky structure; very

C2—17 to 30 inches; light gray (10YR 7/2) silt loam;



on faces of some peds; common roots; slightly acid; clear smooth boundary.

IIC1—23 to 42 inches; dark brown (10YR 4/3) very fine sandy loam; common medium distinct grayish brown (2.5Y 5/2) and common fine faint dark yellowish brown (10YR 4/4) mottles; massive; very friable; common root and worm channels with dark gray (10YR 4/1) clay lining; many roots; neutral; clear wavy boundary.

IIC2—42 to 53 inches; brown (10YR 5/3) very fine sandy loam with thin strata of loam and silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; few thin black (10YR 2/1) strata; massive; very friable; few roots; neutral; clear wavy boundary.

IIC3—53 to 60 inches; 50 percent grayish brown (10YR 5/2), 35 percent dark gray (10YR 4/1), and 15 percent brown (10YR 5/3), stratified very fine sandy loam, loam, and silt loam; massive; very friable; few roots; mildly alkaline.

Depth to the IIB3 horizon ranges from 12 to 20 inches. Reaction ranges from slightly acid to moderately alkaline throughout the profile.

The A horizon is dominantly silty clay, but in some pedons it is heavy silty clay loam or clay. The mollic epipedon is 8 to 14 inches thick. The B horizon is mottled with shades of brown or gray. The B2 horizon is silty clay or heavy silty clay loam. The IIB3 horizon is loam or silt loam. The IIC horizon is commonly very fine sandy loam or loamy very fine sand and can have strata of silty material.

Burnside series

The Burnside series consists of moderately well drained, moderately permeable soils formed in loamy stream sediments and the underlying channery or flaggy sediments. These soils are on narrow bottom land. Slope ranges from 0 to 4 percent.

Burnside soils are similar to Elsah soils and are on the same flood plains as Haymond and Wakeland soils. They are more acid than Elsah soils and also differ from those soils in containing coarse fragments of sandstone and siltstone rather than chert. They contain more coarse fragments within a depth of 40 inches than Haymond and Wakeland soils.

Typical pedon of Burnside loam, about 425 feet south and 2,620 feet west of the northeast corner of sec. 2, T. 11 S., R. 1 W., in a wooded area:

A11—0 to 3 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; very friable; strongly acid; clear smooth boundary.

A12—3 to 14 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; very friable; very strongly acid; gradual wavy boundary.

IIB2—14 to 22 inches; dark yellowish brown (10YR 4/4) channery loam; weak medium subangular blocky structure; very friable; 30 percent coarse fragments; very strongly acid; gradual wavy boundary.

IIC1—22 to 43 inches; dark yellowish brown (10YR 4/4) flaggy loam; massive; very friable; 45 percent coarse fragments; very strongly acid; gradual wavy boundary.

IIC2—43 to 63 inches; dark yellowish brown (10YR 4/4) very flaggy loam; massive; friable; 60 percent coarse fragments; very strongly acid; gradual irregular boundary.

R—63 to 69 inches; weathered sandstone with few thin bands of shale.

The depth to loamy-skeletal material ranges from 12 to 24 inches. The depth to bedrock ranges from 40 to 80 inches. The A horizon is dominantly loam but in some pedons is silt loam. It is 8 to 16 inches thick. The B horizon and the upper part of the C horizon range from 20 to 50 percent coarse fragments.

Cairo series

The Cairo series consists of poorly drained soils that are very slowly permeable in the upper part and rapidly permeable in the lower part. These soils formed in clayey material and in the loamy underlying material. They are on broad flats and low terraces on flood plains. Slope ranges from 1 to 5 percent.

The Cairo soils in Union County lack the abrupt shift in texture from clayey to sandy material that is definitive for the Cairo series. This difference, however, does not greatly alter the use or behavior of the soils.

Cairo soils are on the same flood plains as Bowdre, Darwin, Medway, and Gorham soils and are similar to those soils. They are more poorly drained than Bowdre soils and have a sandier substratum. They contain more sand below a depth of 40 inches than Darwin soils and more clay in the solum than Medway and Gorham soils.

Typical pedon of Cairo silty clay, about 1,773 feet south and 435 feet west of the northeast corner of sec. 17, T. 12 S., R. 3 W., in a cultivated field:

Ap—0 to 5 inches; black (2.5Y 2/2) silty clay; strong fine granular structure in upper 3 inches grading to weak medium angular blocky in lower part; firm, plastic; many worm casts and holes; neutral; abrupt smooth boundary.

A12—5 to 10 inches; black (2.5Y 2/2) silty clay; weak medium angular blocky structure; very firm, plastic; neutral; clear smooth boundary.

B21—10 to 20 inches; very dark grayish brown (2.5Y 3/2) heavy silty clay; weak medium prismatic structure parting to moderate medium angular blocky; very firm; patchy dark gray (5Y 3/1) clay films and pres-

sure faces; few vesicles and worm casts; mildly alkaline; clear smooth boundary.

B22—20 to 31 inches; dark gray (N 4/0) silty clay; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to moderate medium angular blocky; very firm; thin patchy dark gray (5Y 3/1) clay films on faces of peds; many vesicles; few worm casts; mildly alkaline; clear smooth boundary.

IIB3—31 to 39 inches; gray (5Y 5/1) clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; thin patchy very dark grayish brown (2.5Y 3/2) clay films on vertical faces of peds; many vesicles; few worm channels; mildly alkaline; clear smooth boundary.

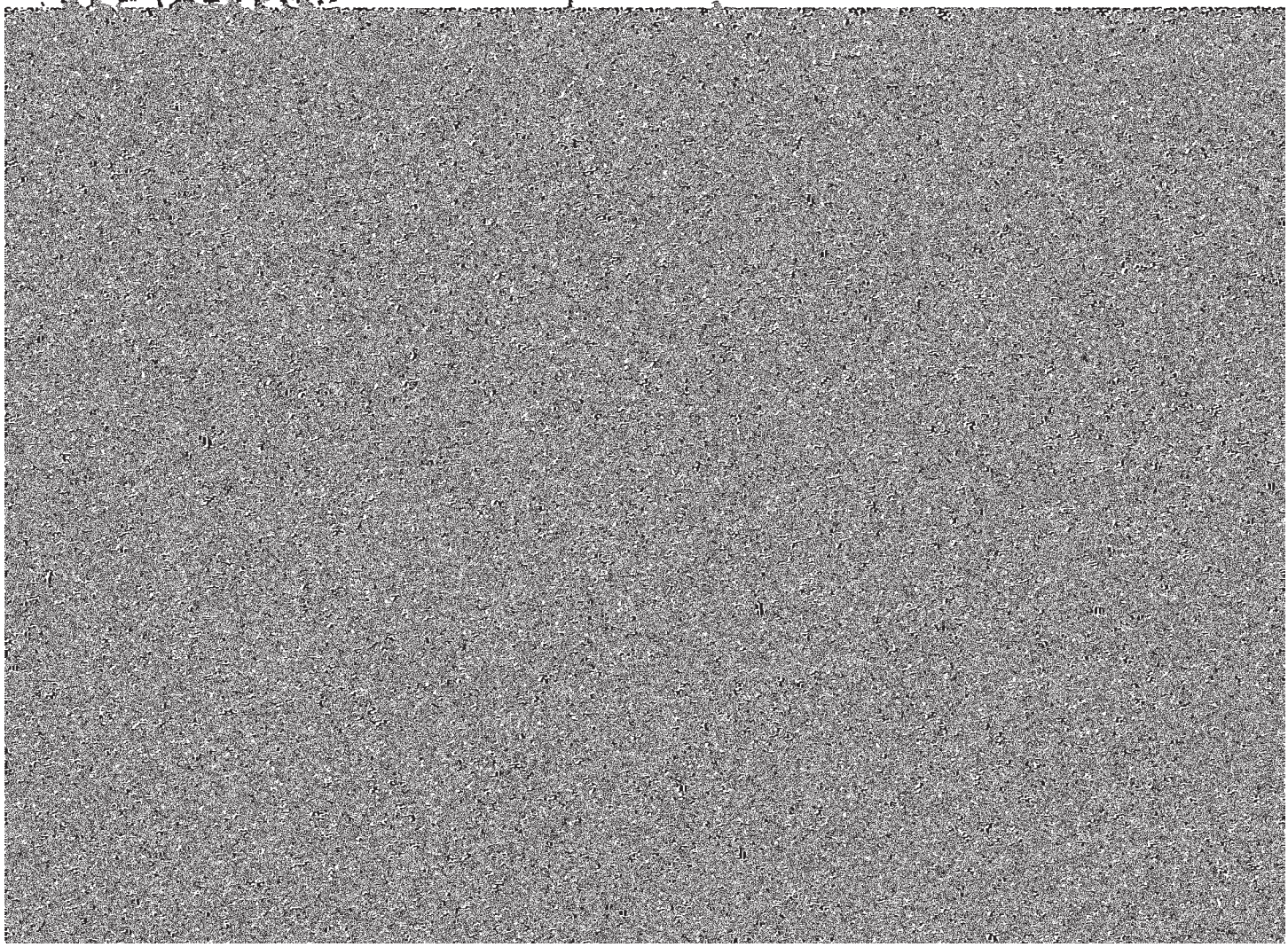
IIC1—39 to 47 inches; olive gray (5Y 5/2) loamy very fine sand; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; dark gray (5Y 4/1) clay flows in worm holes; mildly alkaline; clear smooth boundary.

mottles; weak medium subangular blocky structure; firm; common fine dark concretions; strongly acid; clear smooth boundary.

B21g—18 to 23 inches; dark gray (10YR 4/1) silty clay; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common fine dark concretions; strongly acid; clear smooth boundary.

B22g—23 to 30 inches; grayish brown (2.5Y 5/2) silty clay; common medium prominent strong brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; dark grayish brown (2.5Y 4/2) clay films or coatings on faces of peds; strongly acid; gradual smooth boundary.

B3g—30 to 47 inches; grayish brown (5Y 5/2) heavy silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; very firm; few dark accumulations; very strongly



common worm casts and channels; neutral; clear smooth boundary.

B21g—10 to 25 inches; gray (10YR 5/1) silty clay; common medium faint olive brown (2.5Y 4/4) mottles; moderate fine and medium angular blocky structure; very firm; dark gray (10YR 4/1) coatings on faces of peds; neutral; gradual smooth boundary.

B22g—25 to 38 inches; dark gray (N 4/0) heavy silty clay loam; few fine distinct brown (7.5YR 4/4) and common medium distinct dark reddish brown (5YR 3/4) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; very firm; mildly alkaline; gradual smooth boundary.

B23g—38 to 62 inches; dark gray (N 4/0) silty clay; common medium distinct dark reddish brown (5YR 3/4) and few medium faint olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky in the lower

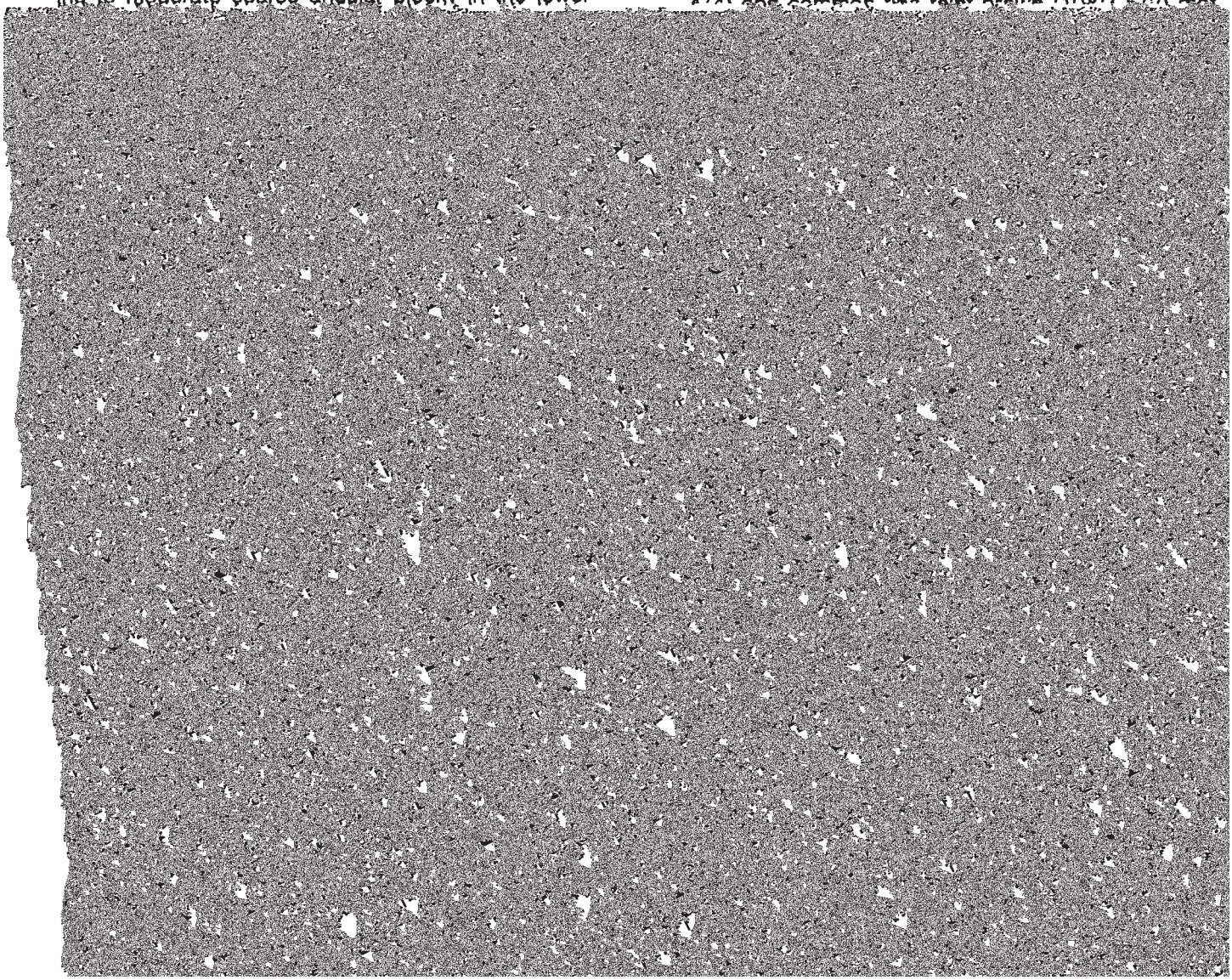
common vesicles; medium acid; gradual smooth boundary.

B22—15 to 25 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; very friable; dark brown (10YR 3/3) coatings on faces of some peds; common vesicles; medium acid; gradual smooth boundary.

B3—25 to 33 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; pale brown (10YR 6/3) uncoated silt grains on faces of many peds; few vesicles; slightly acid; gradual smooth boundary.

C1—33 to 49 inches; dark yellowish brown (10YR 4/4) and pale brown (10YR 6/3) silt loam; massive; friable; slightly acid; gradual smooth boundary.

C2—49 to 68 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and common fine faint brown (10YR 5/3) mot-



IIB21b—32 to 42 inches; dark brown (10YR 4/3) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; very firm; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine dark concretions; medium acid; clear smooth boundary.

IIB22b—42 to 55 inches; grayish brown (10YR 5/2) heavy silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; dark gray (10YR 4/1) coatings on faces of peds; few fine dark concretions; very strongly acid; clear smooth boundary.

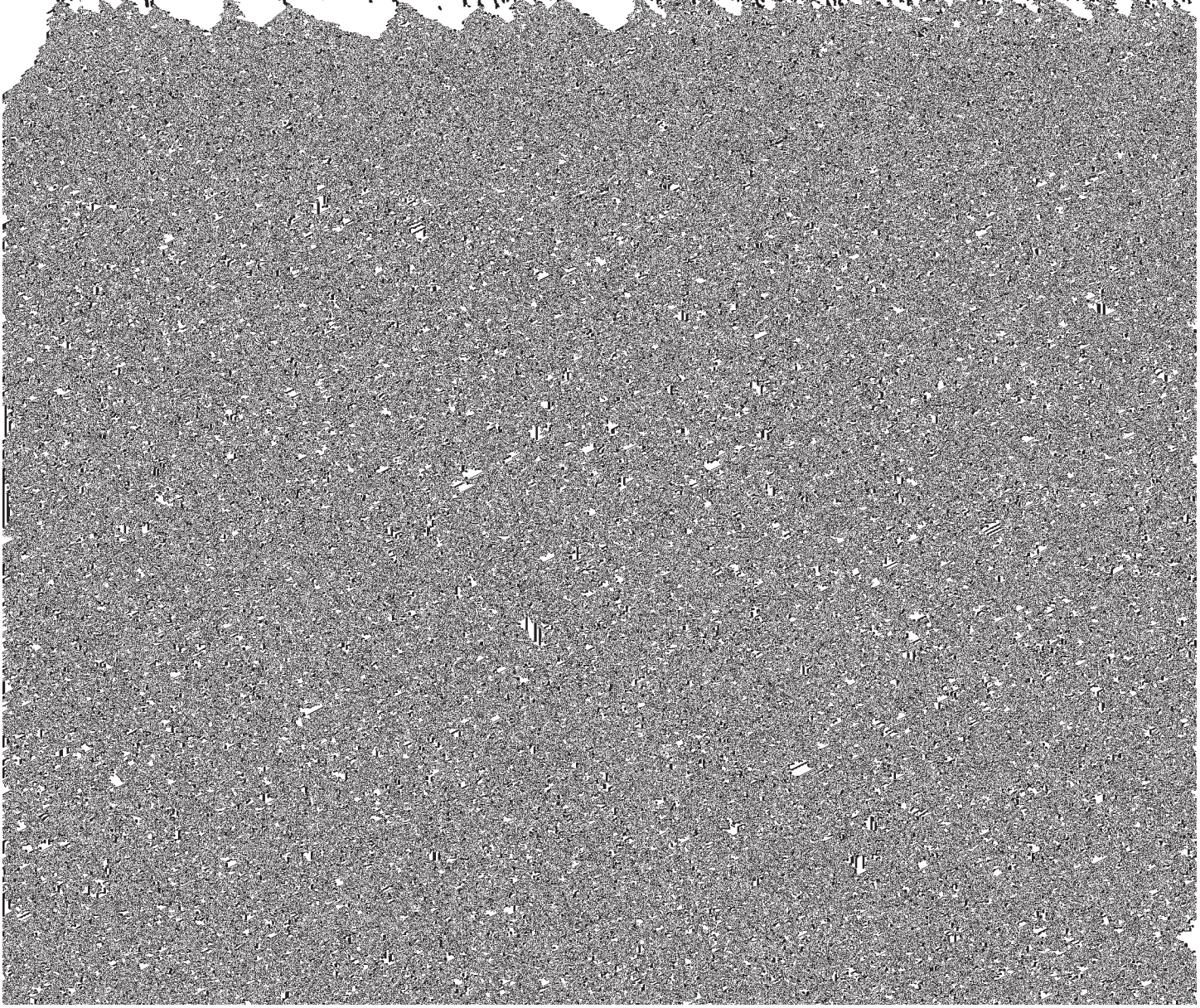
IIB3b—55 to 65 inches; grayish brown (10YR 5/2) heavy silty clay loam; common medium faint olive brown

IIC3—22 to 40 inches; light yellowish brown (10YR 6/4) very cherty loam; single grained; loose; 80 percent coarse fragments; common grass roots to a depth of 30 inches; medium acid; gradual wavy boundary.

IIC4—40 to 60 inches; brown (10YR 5/3) very cobbly loam; massive; friable; 85 percent coarse fragments as much as 6 inches in diameter; medium acid.

Depth to the cherty IIC horizon ranges from 10 to 25 inches, and depth to bedrock is generally 40 to 80 inches. The 10- to 40-inch control section ranges from medium acid to neutral.

The A horizon ranges from very dark grayish brown (10YR 3/2) to yellowish brown (10YR 5/4). The content of coarse fragments ranges from 0 to 15 percent in the



B23—26 to 39 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium faint dark brown (10YR 3/3 and 7.5YR 4/2) mottles; moderate coarse and medium subangular blocky structure; friable; patchy dark gray (10YR 4/1) coatings on faces of peds; 20 percent very fine sand; neutral; clear smooth boundary.

IIB3—39 to 43 inches; dark grayish brown (10YR 4/2) clay loam; few fine faint dark brown (7.5YR 4/4) and dark gray (10YR 4/1) mottles; weak coarse subangular blocky structure; friable; gray (10YR 5/1) coatings on vertical faces of peds; neutral; clear smooth boundary.

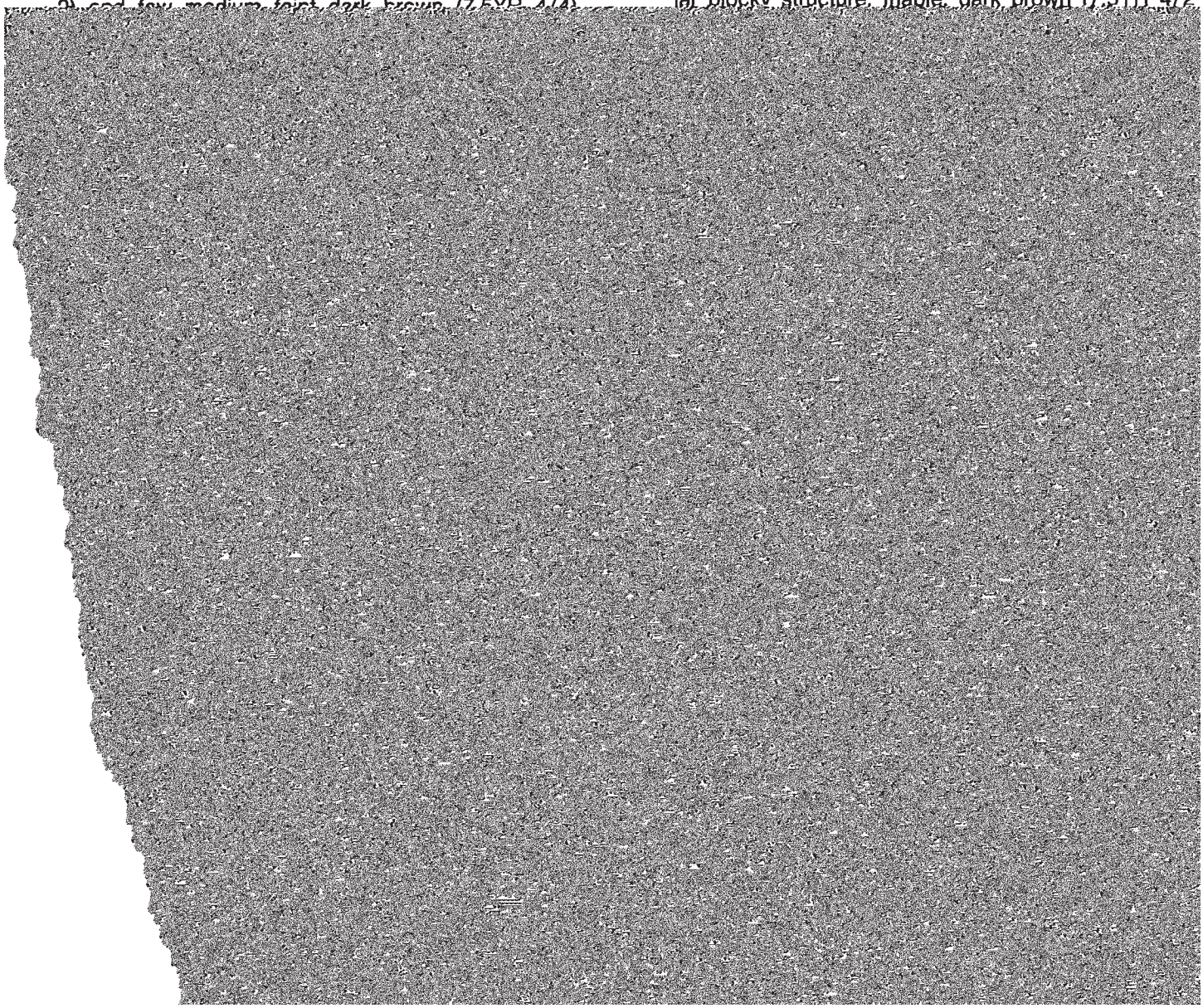
IIC1—43 to 47 inches; dark brown (10YR 4/3) fine sandy loam; many coarse distinct grayish brown (10YR 5/2) and few medium faint dark brown (7.5YR 4/4)

tree roots; 60 percent coarse fragments; neutral; clear smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) very cherty silt loam; moderate fine granular structure; very friable; dark brown (10YR 4/3) faces of peds; many tree roots; 65 percent coarse fragments; common worm casts and holes; neutral; clear smooth boundary.

B1—6 to 10 inches; strong brown (7.5YR 5/6) very cherty silt loam; moderate fine subangular blocky structure; friable; dark yellowish brown (10YR 4/4) faces of peds; 70 percent coarse fragments; many tree roots; few worm casts and holes; slightly acid; clear smooth boundary.

B21t—10 to 18 inches; strong brown (7.5YR 5/6) very cherty heavy silty clay loam; moderate fine subangular blocky structure; friable; dark brown (7.5YR 4/2



are on flood plains and alluvial fans along streams. Slope ranges from 0 to 3 percent.

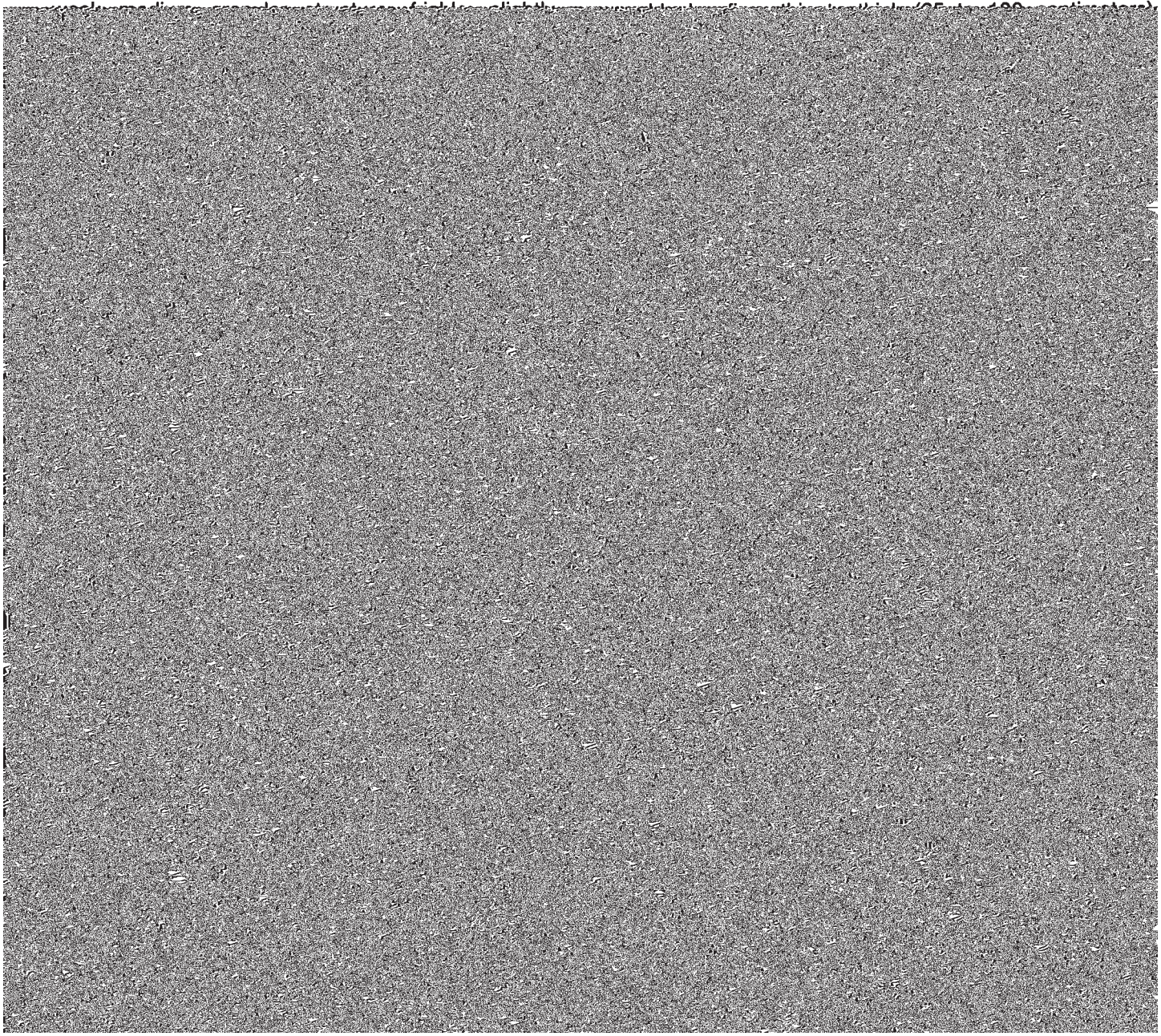
Haymond soils are on the same flood plains as Wakeland and Elsah soils and are similar to Drury soils. Wakeland soils are somewhat poorly drained. Elsah soils contain more coarse fragments in the control section than Haymond soils. Drury soils contain more clay in the solum than Haymond soils.

Typical pedon of Haymond silt loam, about 1,650 feet south and 530 feet east of the northwest corner of sec. 21, T. 12 S., R. 2 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; structure; firm; discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few krotovinas; common vesicles; common fine dark concretions; strongly acid; gradual smooth boundary.

B22t—18 to 25 inches; yellowish brown (10YR 5/4) heavy silt loam; few medium faint strong brown (7.5YR 5/8) and few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; firm; thin patchy clay films on faces of peds; few fine dark accumulations; strongly acid; abrupt smooth boundary.

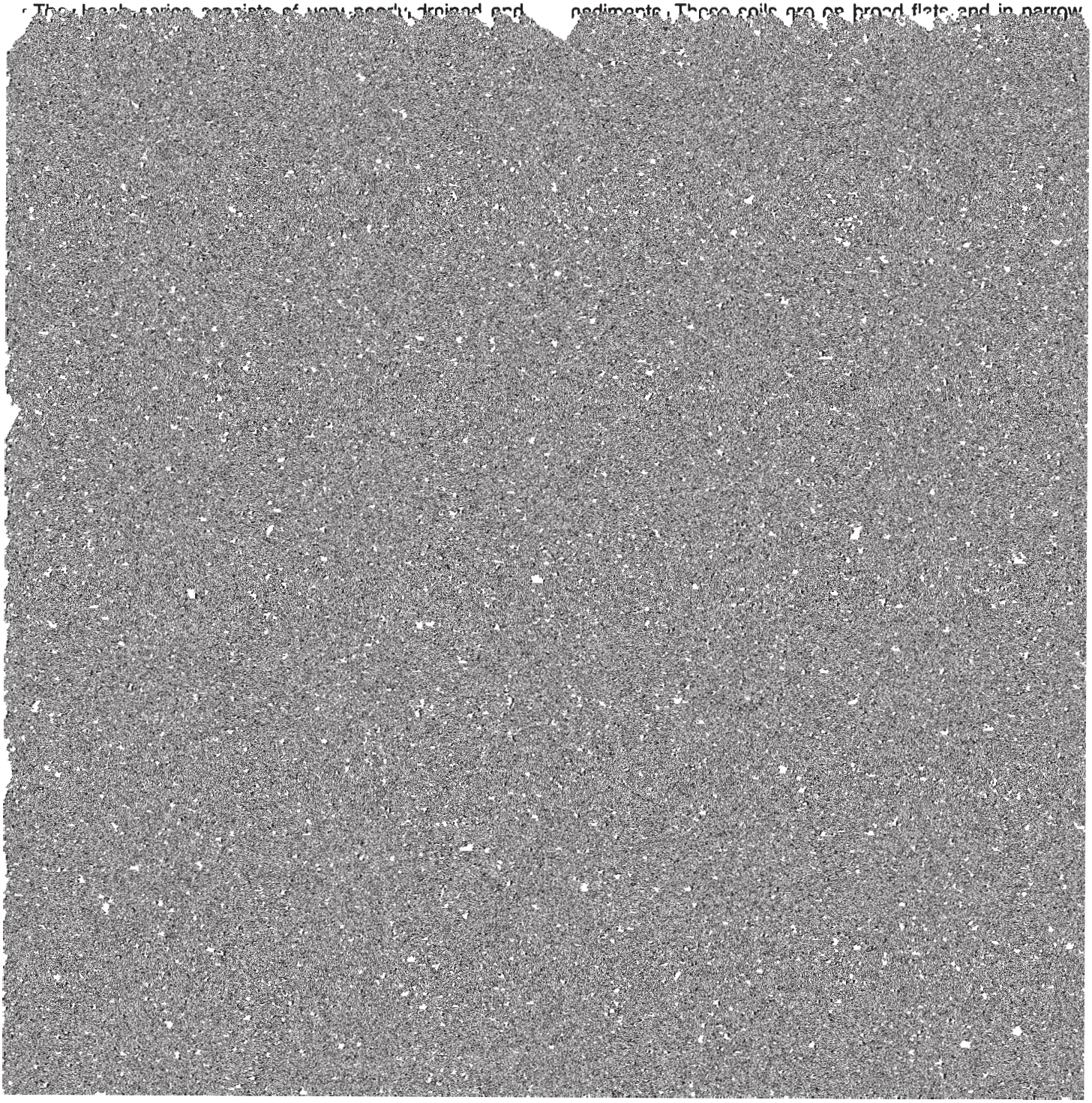
B&A—25 to 28 inches; yellowish brown (10YR 5/6) silt loam (B2); fine and medium moderate subangular



horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The Bx horizon has similar colors, but mottles having chroma of 2 or less are evident in most pedons.

Jacob series

The Jacob series consists of very poorly drained and



to 5, and chroma of 1 or 2. The B horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2.

Karnak series

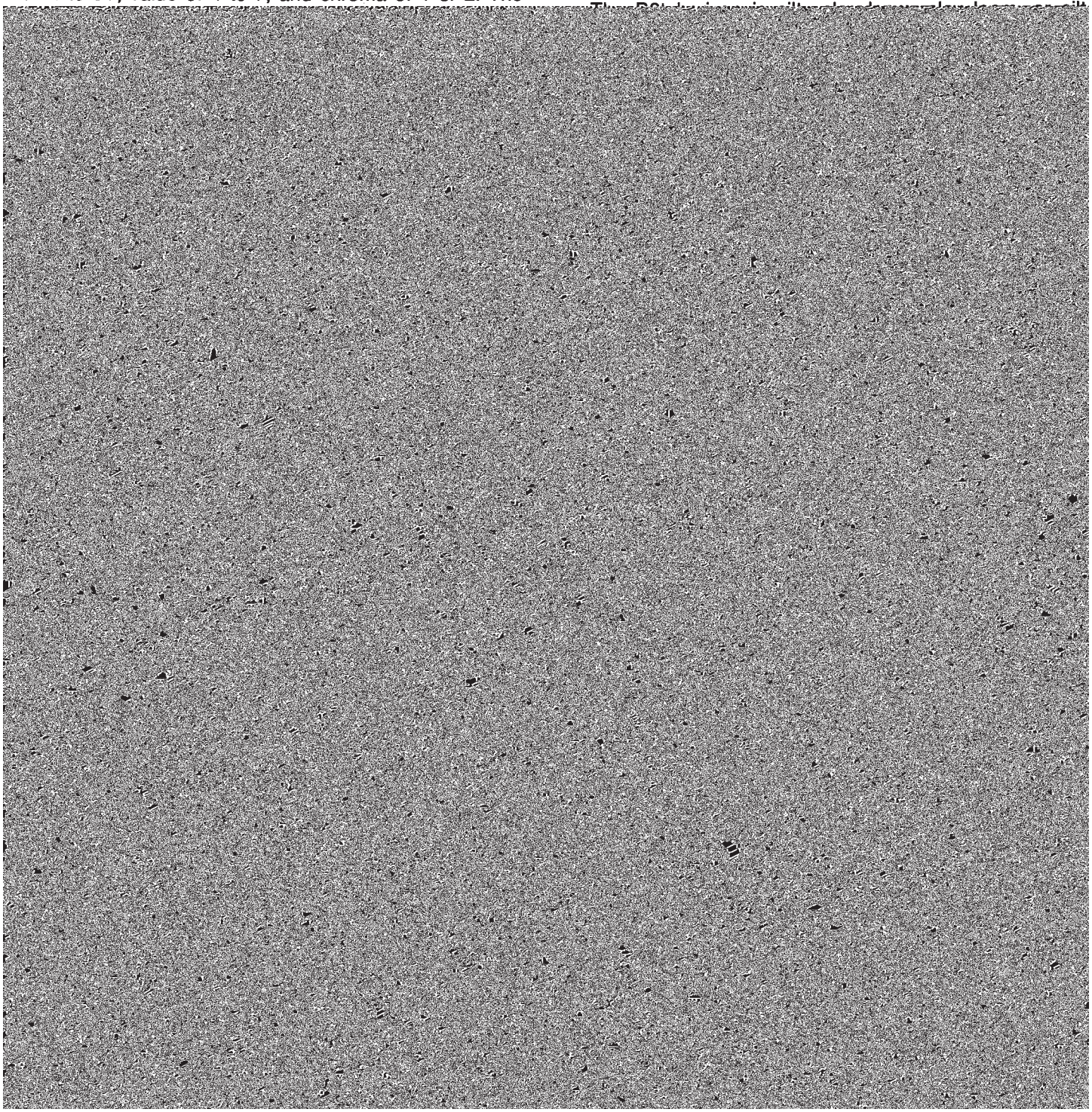
The Karnak series consists of very poorly and poorly drained, very slowly permeable soils formed in clayey sediments. These soils are on broad flats and in narrow

The solum ranges from about 45 to 60 inches in thickness. It is medium acid or strongly acid unless liming has reduced the acidity of the surface layer.

The Ap or A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. It generally has value of 3 if it is less than 10 inches thick. The B horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. The

IIC2—45 to 60 inches; pale brown (10YR 6/3) loamy fine sand with bands of dark brown (10YR 4/3); massive; very friable; mildly alkaline.

The solum ranges from about 28 to 50 inches in thickness and is slightly acid to mildly alkaline. The mollic epipedon ranges from 10 to 24 inches in thickness.



structure and massive; friable; 75 percent rock fragments; very strongly acid; abrupt smooth boundary.

C1—36 to 48 inches; brownish yellow (10YR 6/6), yellow (10YR 7/6), and very pale brown (10YR 7/4) very channery loam; massive; friable; 90 percent rock fragments; very strongly acid; abrupt irregular boundary.

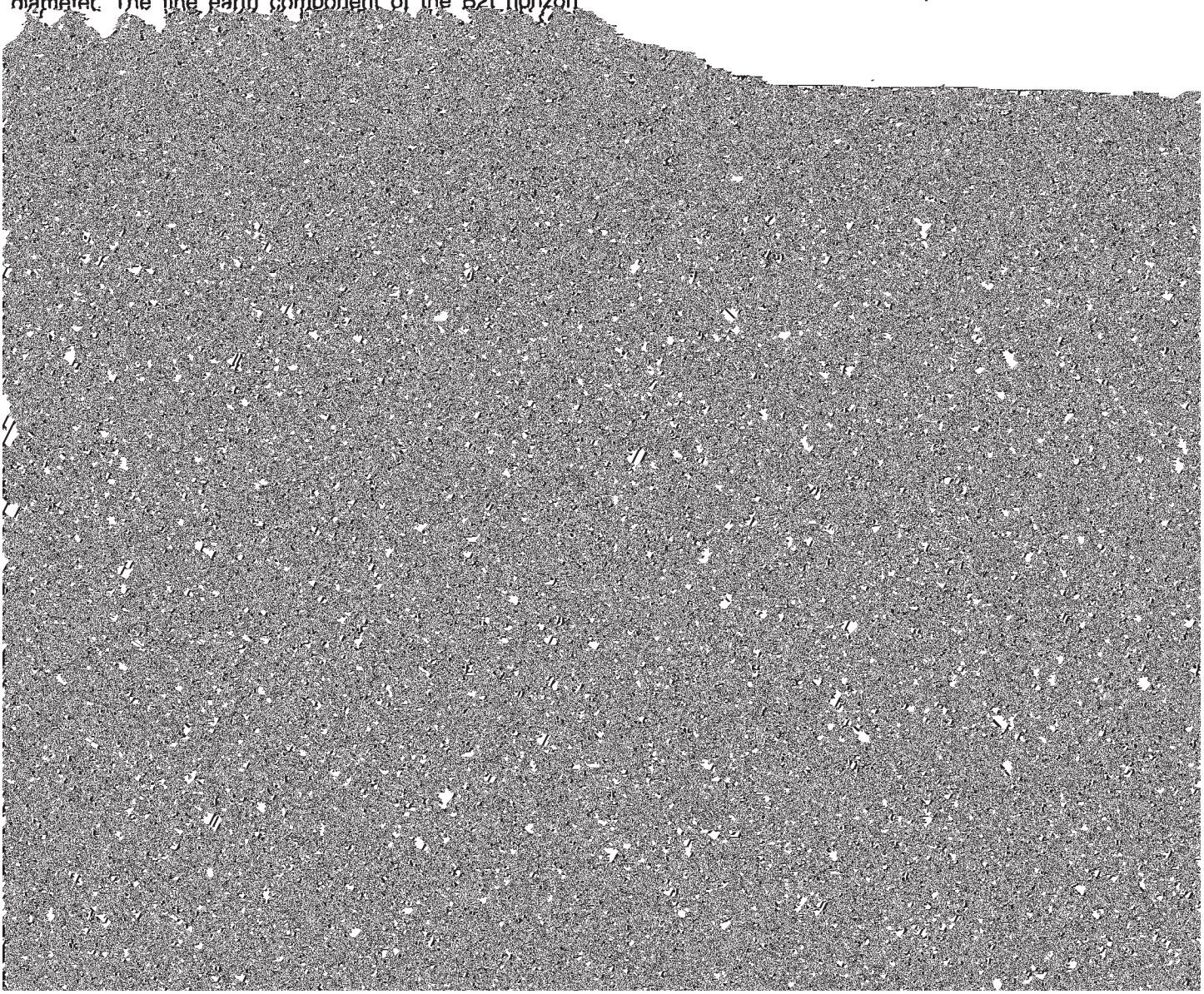
R—48 inches; acid sandstone and siltstone with thin bands of shale.

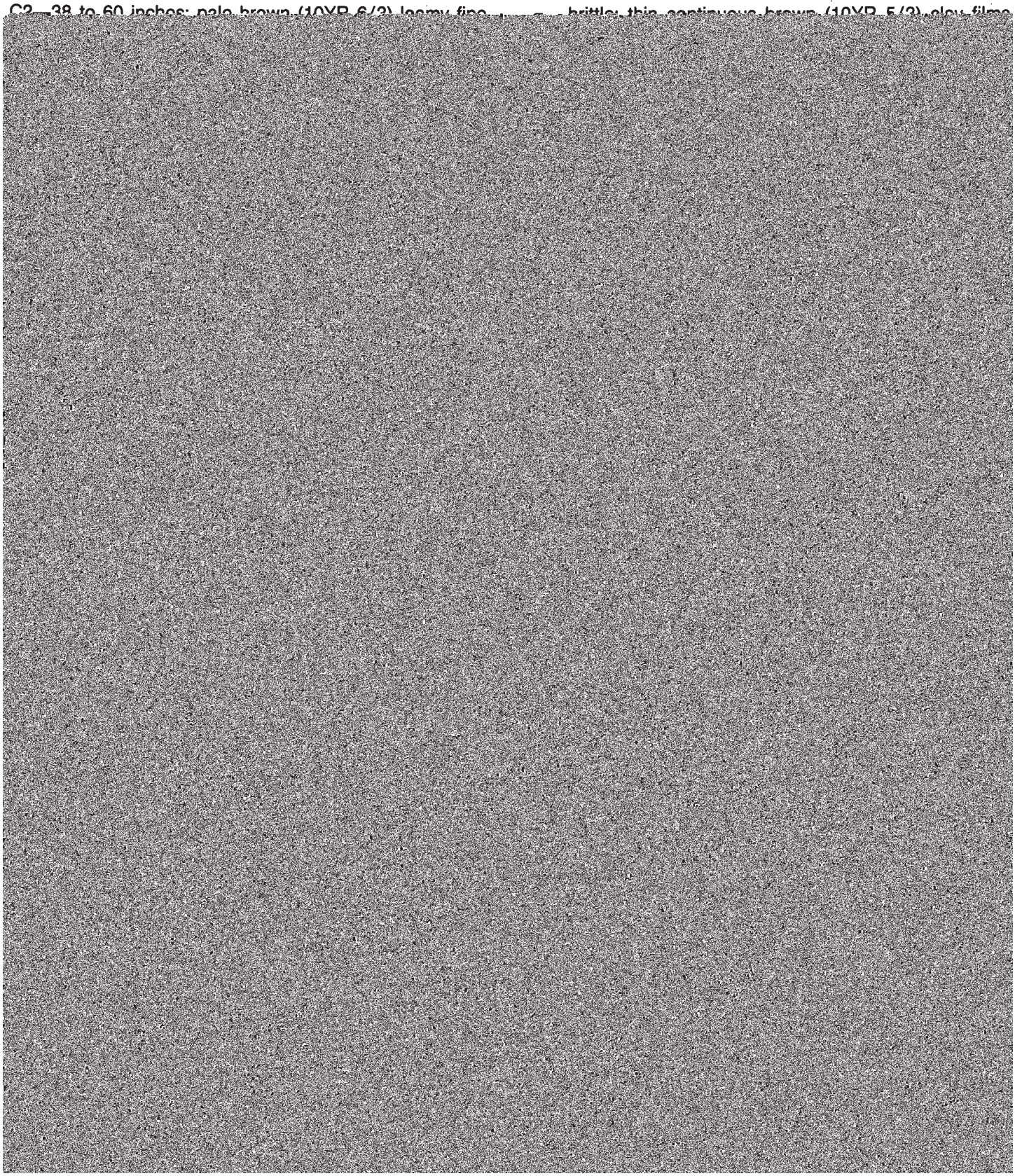
The depth to consolidated bedrock ranges from about 40 to 80 inches. The content of sandstone fragments generally ranges from about 35 to 75 percent in the solum, but in many pedons some part of the solum ranges from 15 to 30 percent sandstone fragments. These fragments range from 1 inch to 20 inches in diameter. The fine earth component of the B2t horizon

(10YR 5/6) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; firm; patchy thin olive gray (5Y 5/2) clay films on vertical faces of peds; 5 percent very fine sand; very strongly acid; gradual smooth boundary.

B3g—30 to 45 inches; light olive gray (5Y 6/2) heavy silty clay loam; few medium distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak fine subangular blocky; very firm; few fine dark stains and thin patchy clay films on vertical faces of peds; 5 percent very fine sand; very strongly acid; clear smooth boundary.

Cg—45 to 60 inches; light olive gray (5Y 6/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; 10 percent fine sand grains; few fine dark concretions; medium acid.

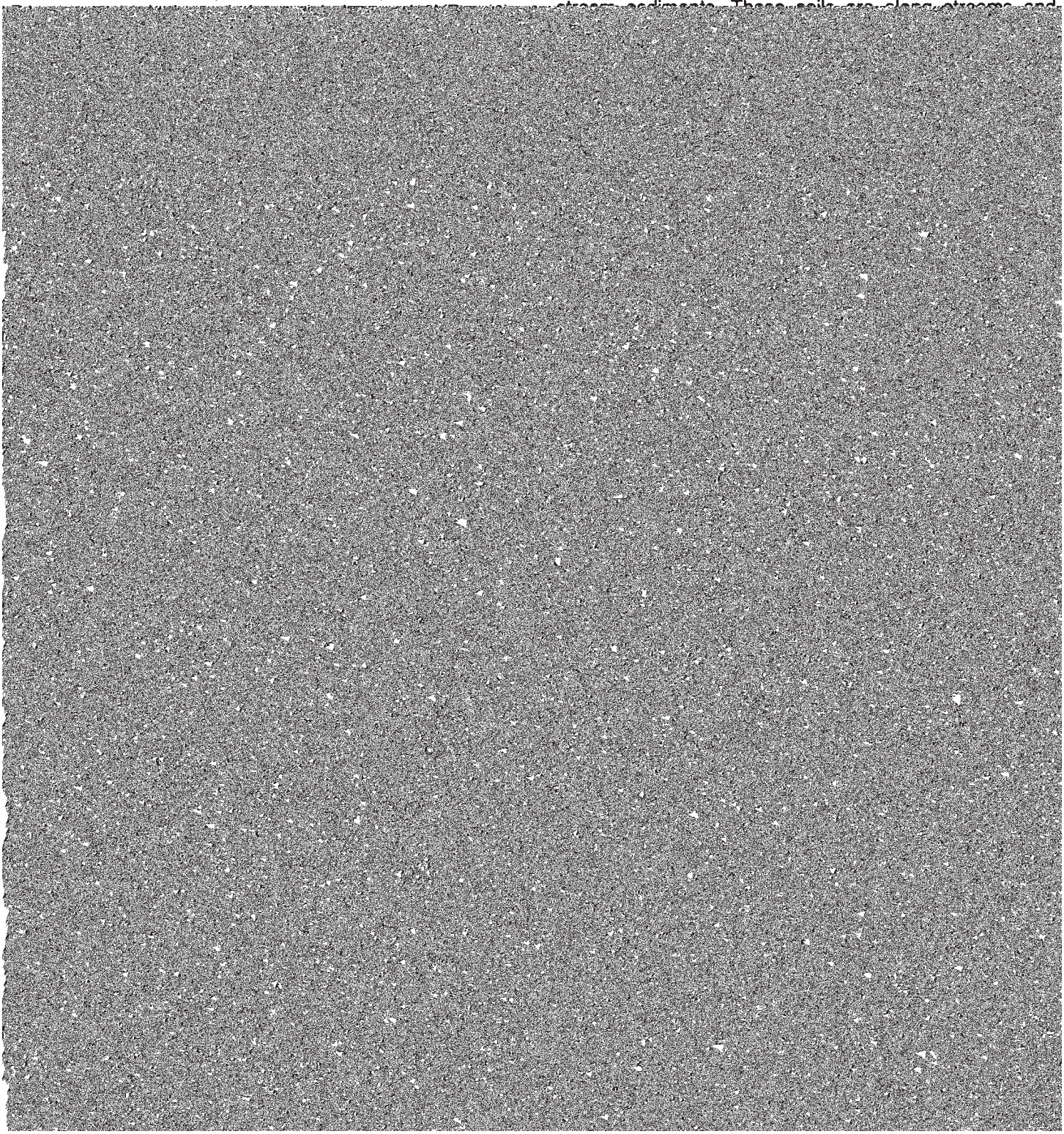




Ap2—5 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak coarse subangular blocky structure; firm; compacted traffic pan; common roots; neutral; abrupt smooth boundary.

Wakeland series

The Wakeland series consists of somewhat poorly drained, moderately permeable soils formed in silty



Ware series

The Ware series consists of moderately well drained soils that are moderately permeable in the upper part and moderately rapidly permeable in the lower part. These soils formed in loamy and sandy sediments. They are on ridges and natural levees on flood plains. Slope ranges from 1 to 6 percent.

Ware soils are on the same flood plains as Medway, Bowdre, and Sarpy soils. Bowdre and Medway soils contain more clay and Sarpy soils less silt and clay in the control section than Ware soils.

Typical pedon of Ware loam, about 250 feet south and 2,400 feet west of the northeast corner of sec. 16, T. 12 S., R. 3 W., in a cultivated field:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam; moderate medium granular structure; very friable; common roots; slightly acid; abrupt smooth boundary.

B1—9 to 12 inches; dark grayish brown (10YR 4/2) loam; weak medium subangular blocky structure; very friable; very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common roots; slightly acid; clear smooth boundary.

B2—12 to 21 inches; brown (10YR 5/3) fine sandy loam; weak coarse subangular blocky structure; very friable; common grayish brown (10YR 5/2) krotovinas and worm casts; neutral; clear smooth boundary.

C1—21 to 28 inches; pale brown (10YR 6/3) loamy very fine sand; massive; very friable; few krotovinas; few roots; neutral; clear smooth boundary.

C2—28 to 35 inches; brown (10YR 5/3) very fine sandy loam; massive; very friable; few krotovinas; few vesicles; few roots; neutral; clear smooth boundary.

C3—35 to 48 inches; brown (10YR 5/3) loam; common fine faint grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; massive; very friable; very thin silt loam strata; neutral; clear smooth boundary.

Ware fine sandy loam, frequently flooded, is outside the range of the Ware series because of the stratification in the upper part of the profile. This difference, however, does not alter the use or behavior of the soil.

Wellston series

The Wellston series consists of well drained, moderately permeable soils formed in loess and in the underlying material weathered mostly from siltstone and sandstone. These soils are on hillsides. Slope ranges from 15 to 35 percent.

In this survey area Wellston soils are mapped with Alford and Neotoma soils. Also, they are on the same hillsides as Zanesville and Westmore soils. Alford soils formed entirely in loess and do not have coarse fragments in the lower part of the B horizon. Neotoma soils have a higher content of coarse fragments in the control section than Wellston soils. Westmore soils contain fewer coarse fragments in the IIBt horizon than Wellston soils. Zanesville soils have a dense Bx horizon.

Typical pedon of Wellston silt loam, in an area of Wellston-Neotoma complex, 20 to 35 percent slopes, about 264 feet south and 495 feet west of the northeast corner of sec. 26, T. 11 S., R. 1 E., in a wooded area:

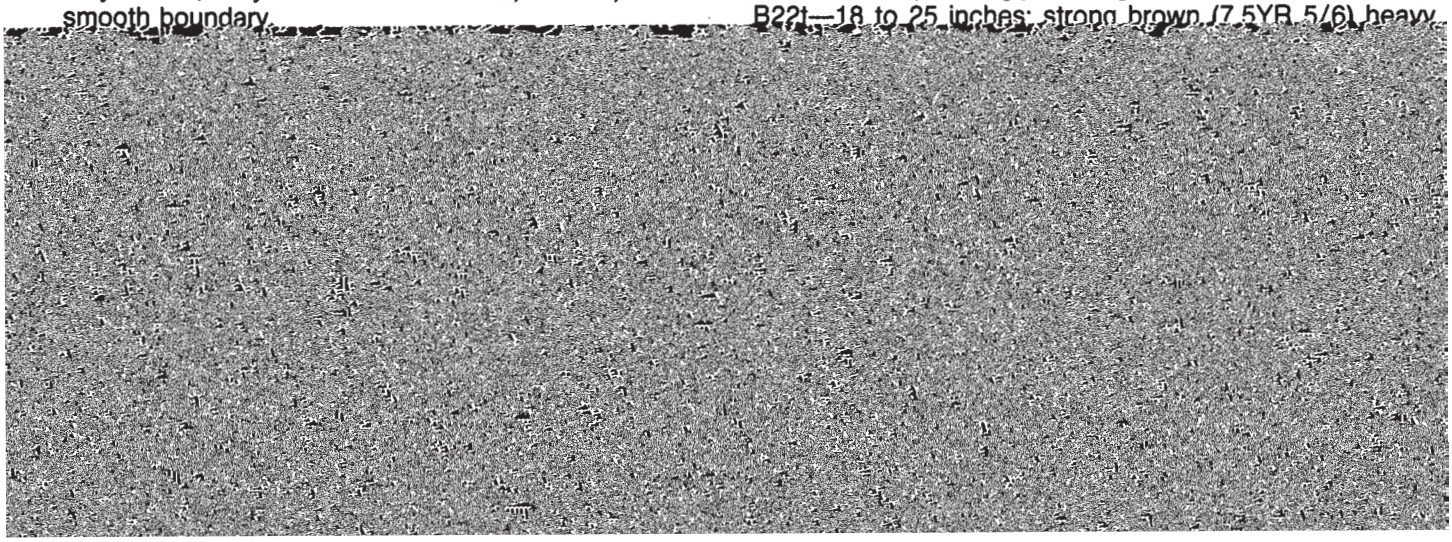
A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; strongly acid; clear smooth boundary.

A2—2 to 9 inches; pale brown (10YR 6/3) silt loam; weak fine granular and weak very fine subangular blocky structure; friable; strongly acid; clear smooth boundary.

B1—9 to 11 inches; brownish yellow (10YR 6/6) silt loam; weak medium subangular blocky structure; friable; very strongly acid; clear smooth boundary.

B21t—11 to 18 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; friable; very strongly acid; gradual smooth boundary.

B22t—18 to 25 inches; strong brown (7.5YR 5/6) heavy



(10YR 7/3) very channery loam; massive; friable; 90 percent rock fragments; extremely acid.

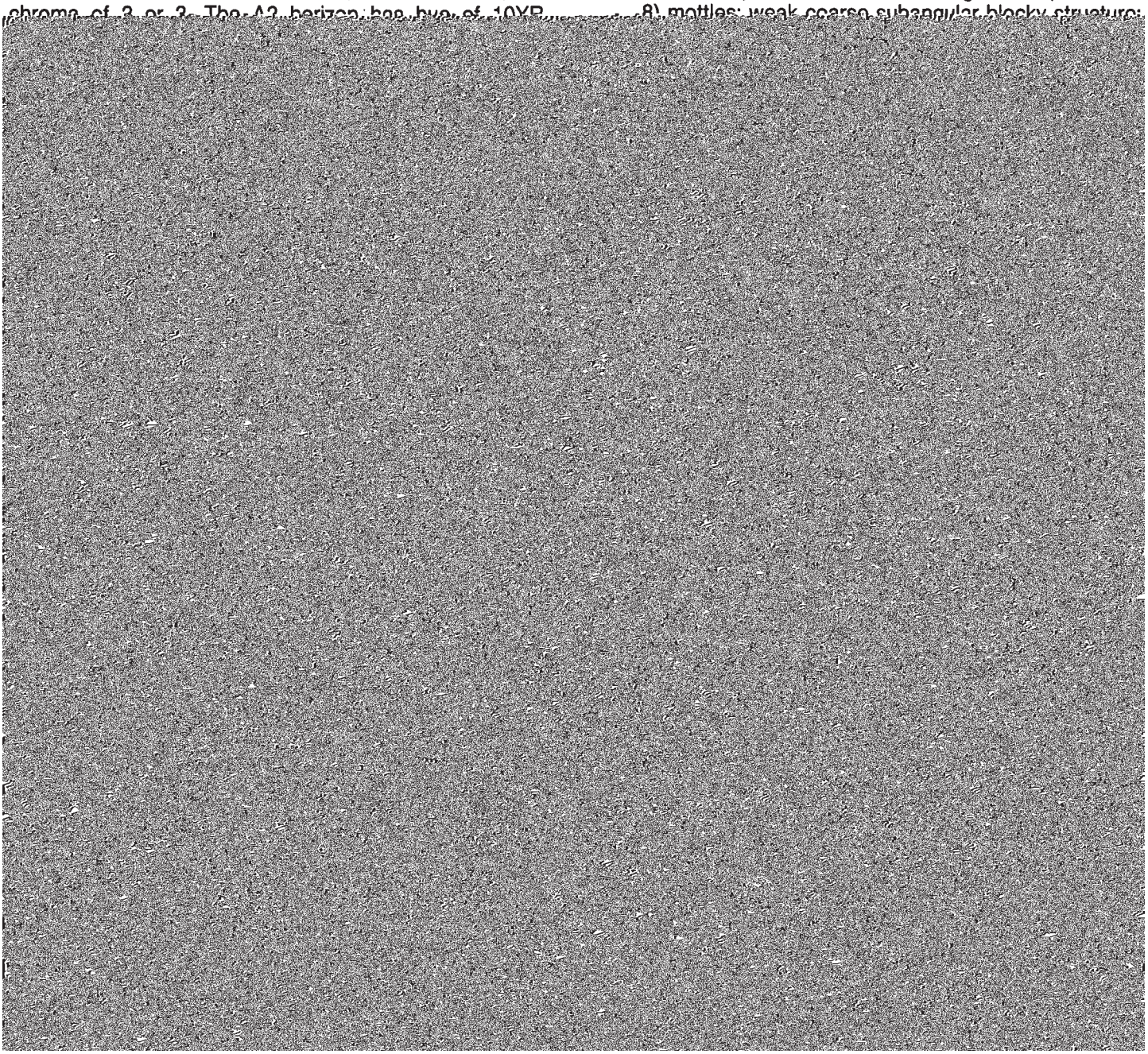
The depth to bedrock ranges from about 40 to 72 inches. The solum ranges from 32 to 50 inches in thickness. The control section ranges from strongly acid to extremely acid. In most pedons the content of sandstone and siltstone fragments increases with increasing depth, from 0 percent in the upper part of the B horizon to 65 percent in the IIB horizon. These fragments range from 1 inch to 6 inches in diameter.

The A1 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR

faces of peds; strongly acid; gradual smooth boundary.

IIB23t—25 to 35 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; very firm; thin continuous light brownish gray (10YR 6/2) clay films on faces of peds; 10 percent coarse fragments; very strongly acid; gradual smooth boundary.

IIB3—35 to 58 inches; gray (10YR 6/1) heavy silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure;



dark stains and concretions; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B1—6 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; 5 percent coarse fragments; common fine dark stains and concretions; very strongly acid; clear smooth boundary.

B21t—10 to 22 inches; strong brown (7.5YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable; patchy thin strong brown (7.5YR 5/6) clay films on faces of peds; 5 percent coarse fragments; common fine dark stains and concretions; very strongly acid; clear smooth boundary.

B22t—22 to 29 inches; strong brown (7.5YR 5/6) heavy silt loam; weak and moderate medium subangular blocky structure; friable; thin patchy brown (7.5YR 4/4) clay films and pale brown (10YR 6/3) uncoated silt grains on faces of peds; common fine dark stains and concretions; very strongly acid; abrupt smooth boundary.

B&A—29 to 32 inches; yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) silt loam (B2); weak and moderate medium subangular blocky structure; firm; thin to thick coatings and fillings of light brownish gray (10YR 6/2) silt (A2); thin patchy brown (7.5YR 4/4) clay films on faces of peds; few medium distinct strong brown (7.5YR 5/8) mottles in the lower part; very strongly acid; abrupt wavy boundary.

IIBx1—32 to 37 inches; brown (7.5YR 5/4) heavy silt loam; common medium distinct strong brown (7.5YR

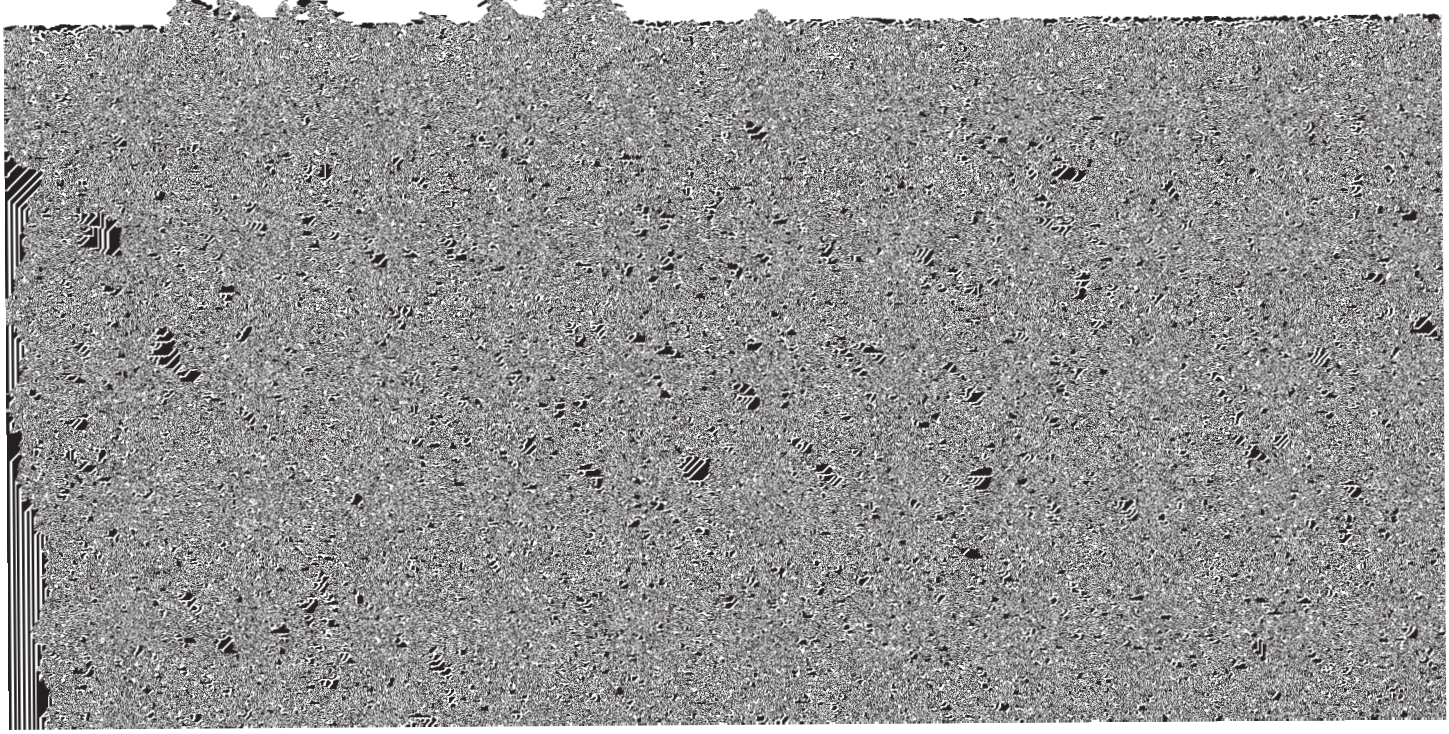
The depth to bedrock ranges from 40 to 80 inches. The thickness of the solum ranges from 35 to 60 inches and depth to the Bx horizon from 23 to 32 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The Bt horizon is strongly acid or very strongly acid. The Bt and Bx horizons have hue of 10YR or 7.5YR, value or 4 to 8, and chroma of 4 to 6. The Bx horizon has few to many mottles. It is silt loam, clay loam, loam, or fine sandy loam. Some pedons do not have a B&A horizon. The content of coarse fragments ranges from 0 to 15 percent in the Bx horizon and from 5 to 50 percent in the C horizon.

Classification of the soils

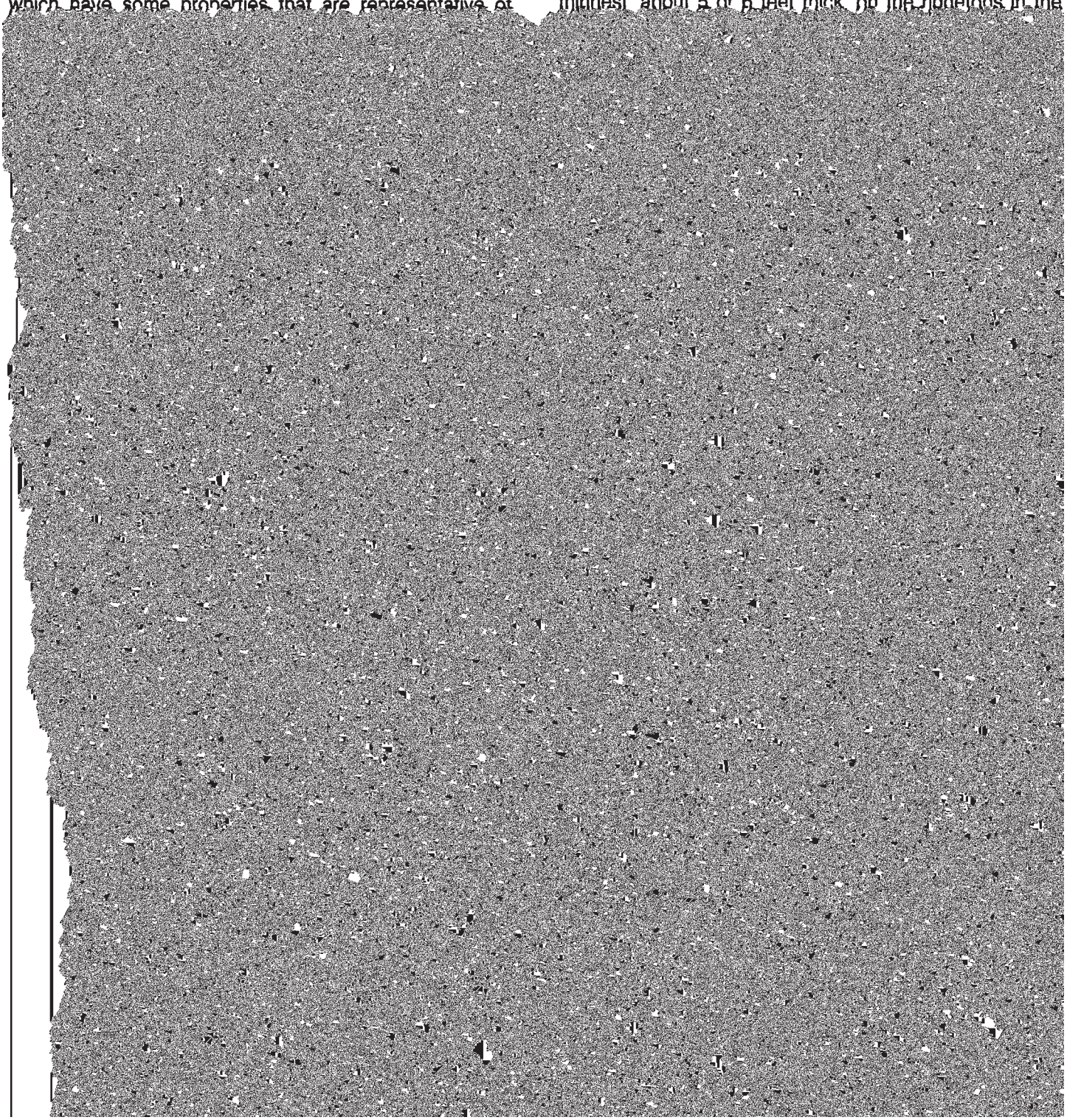
The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*6*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of



SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of

Loess, or wind-deposited material, is the most extensive parent material in the county. It blankets many of the other materials. It is the parent material of about two-thirds of the soils in the county. It is thickest, 25 to 30 feet thick, on the bluffs along the Mississippi River and thinnest, about 5 or 6 feet thick, on the ridgetops in the



Burrowing animals help to keep the soil open and porous. Bacteria and fungi aid in the decomposition of plant and animal remains.

Topography

Many differences among the soils in the county are the result of differences in topography. Slope, or lay of the land, affects drainage, runoff, erosion, and deposition. Slopes differ in gradient, length, shape, and exposure. Some or all of these slope characteristics are responsible for differences among the soils that formed in similar parent materials, such as Hosmer and Stoy soils. If the topography is similar, soils that formed in different parent materials have similar natural drainage characteristics. Alford and Baxter soils are examples.

As slope increases, the rate of runoff and the extent of erosion increase. Erosion constantly changes characteristics of soils, as is evident in the severely eroded, eroded, and uneroded Alford soils. In nearly level soils, water can move through the parent material and the subsoil has a higher content of clay than that of more

References

(1) American Association of State Highway and Transportation Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

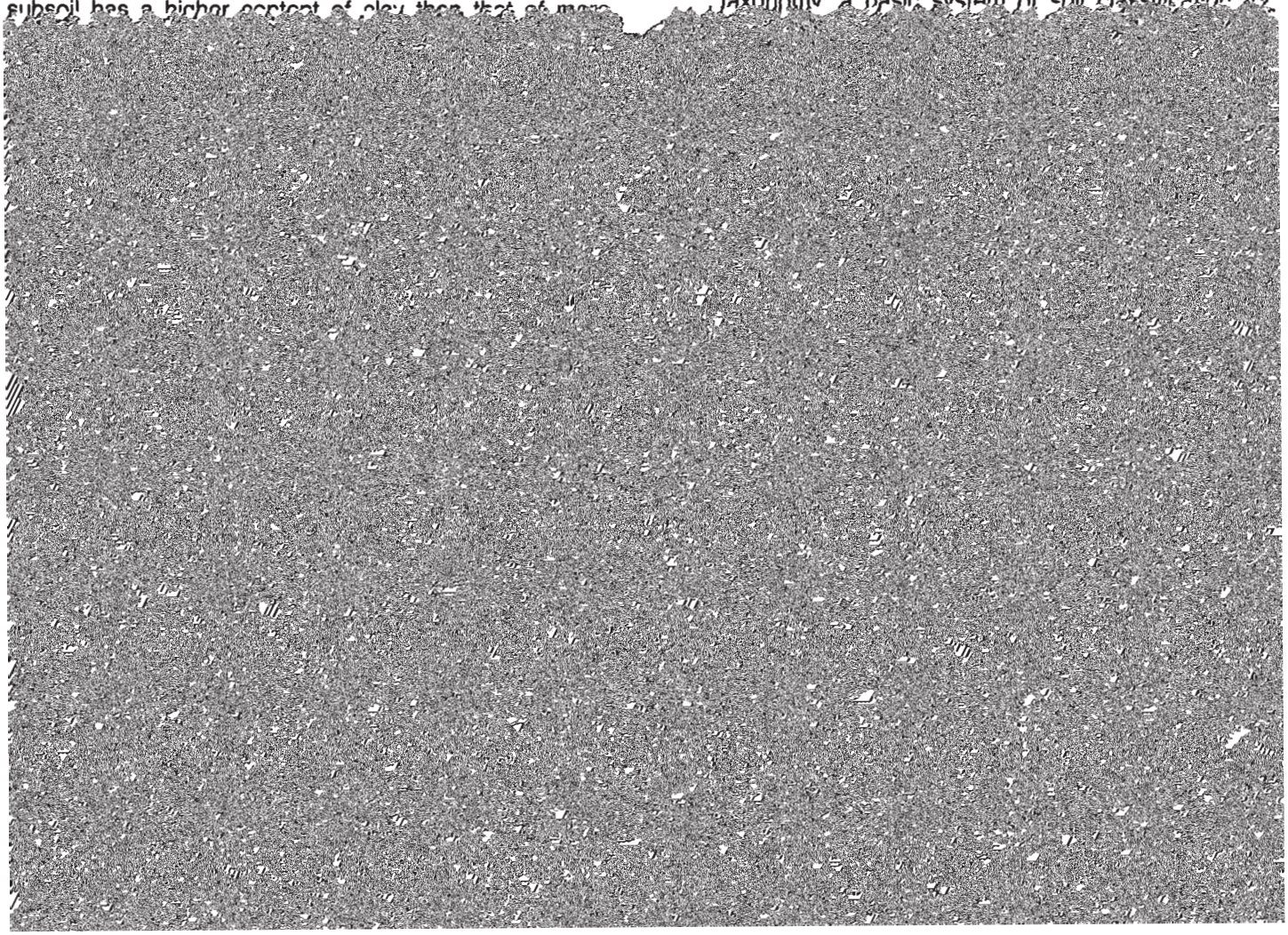
(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D-2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Illinois Conservation Needs Committee. 1970. Illinois soil and water conservation needs inventory. 192 pp., illus.

(4) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. Supplements replacing pp. 173-188 issued May 1962.

(5) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(6) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for



of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Basal till. Compact glacial till deposited beneath the ice.

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

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

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

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

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

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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

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

Cation-exchange capacity. The total amount of ex-

bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

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

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. A cropping system in which crops are grown under management that not only meets the economic needs of farmers but also improves or maintains the physical condition of the soil, protects the soil against erosion, and controls weeds, insects, and plant diseases.

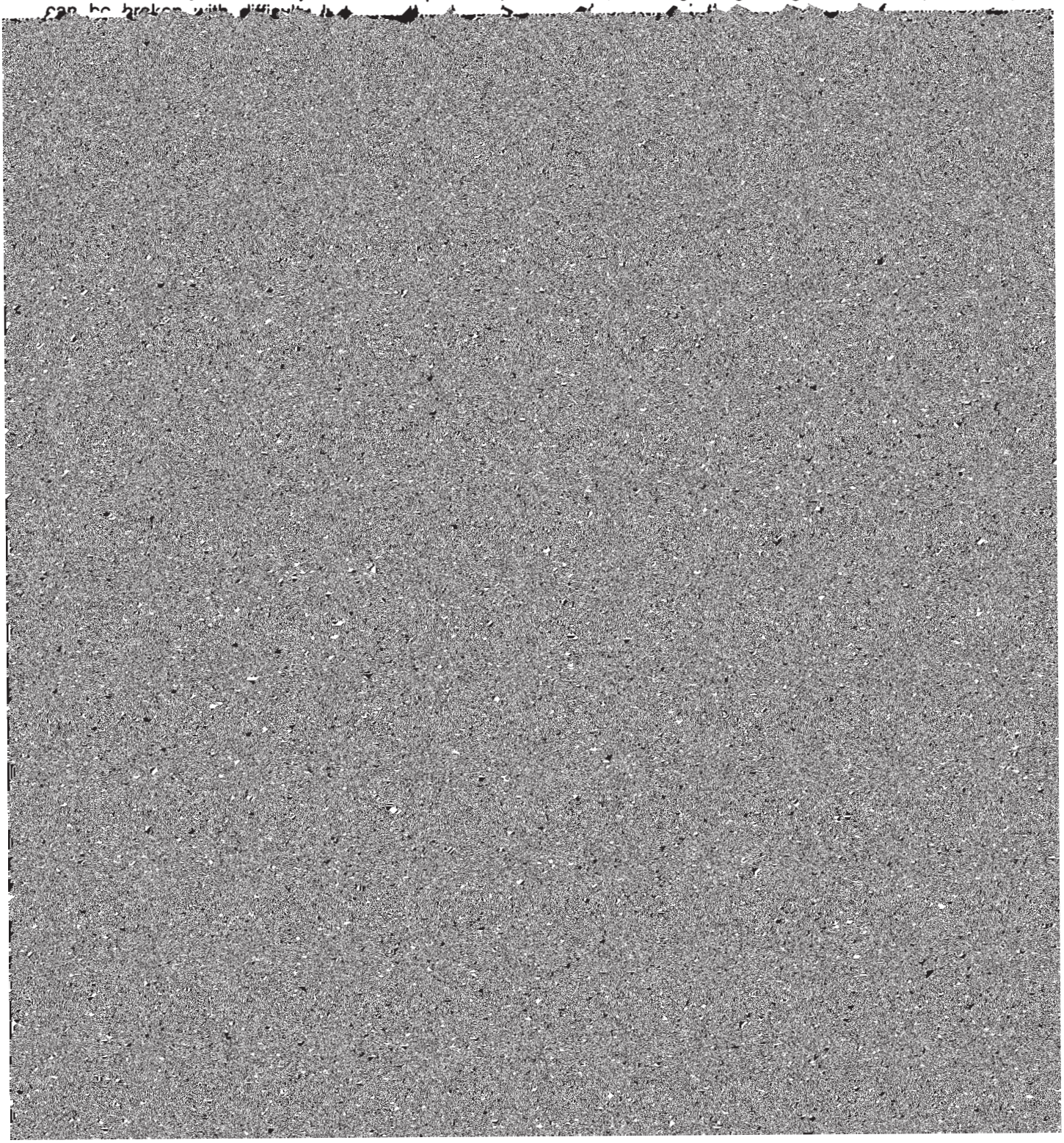
Conservation tillage. Any tillage system that protects the soil against erosion and maintains or improves tilth and the infiltration rate through the use of tillage implements that do not turn over the soil and through retention of crop residue on the surface during the entire year. Examples are no tillage, strip tillage, and stubble mulching.

Consistence, soil. The feel of the soil and the ease with

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 be broken with difficulty in the hands but can be

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for



Erosion pavement. A layer of gravel or stones that remains on the ground surface after fine particles are removed by wind or water. Desert pavements result from wind erosion in arid areas.

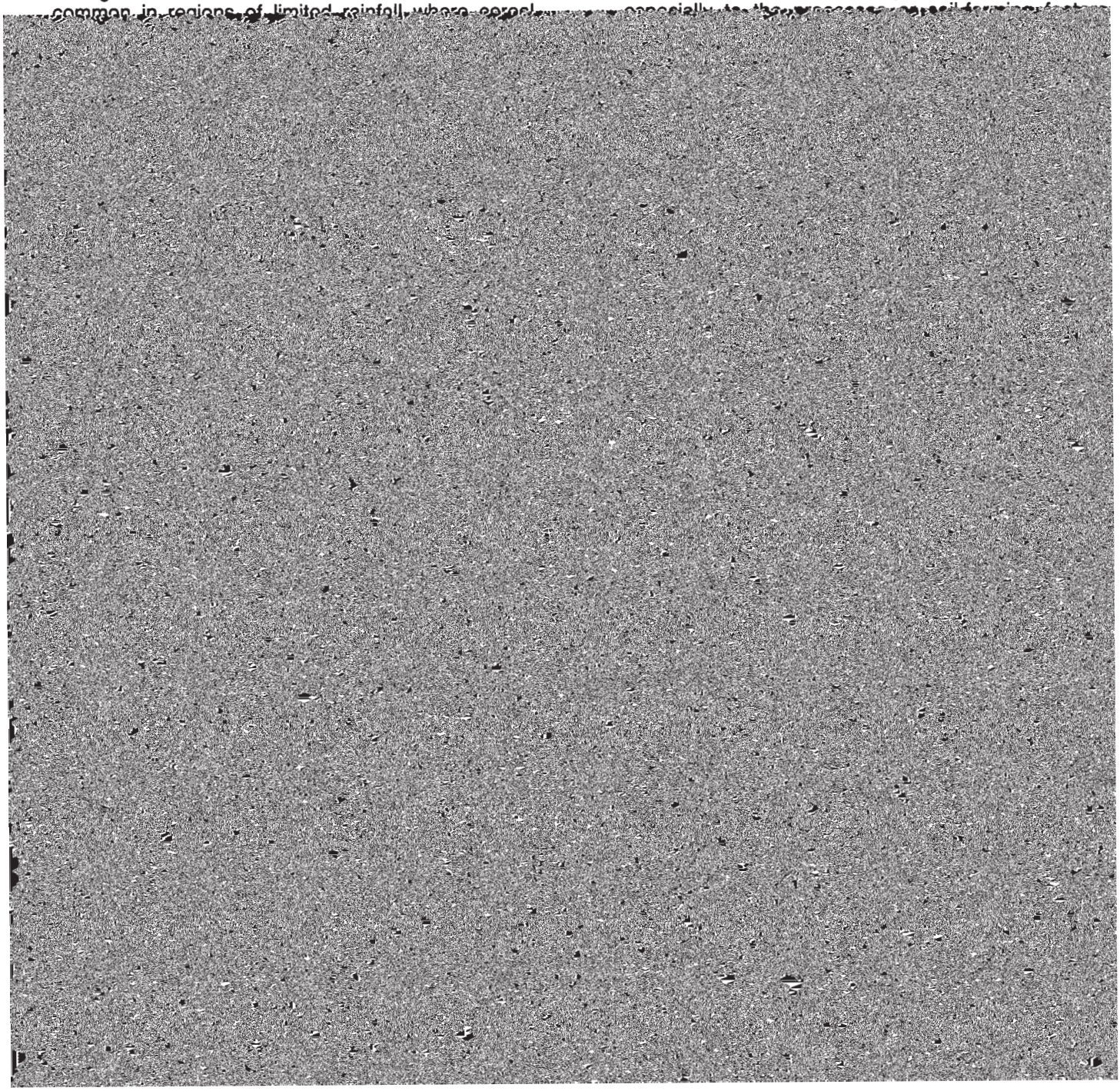
Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal

moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Genesis, soil. The mode of origin of the soil. Refers



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 a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep

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

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

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

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

Low strength. Inadequate strength for supporting loads.

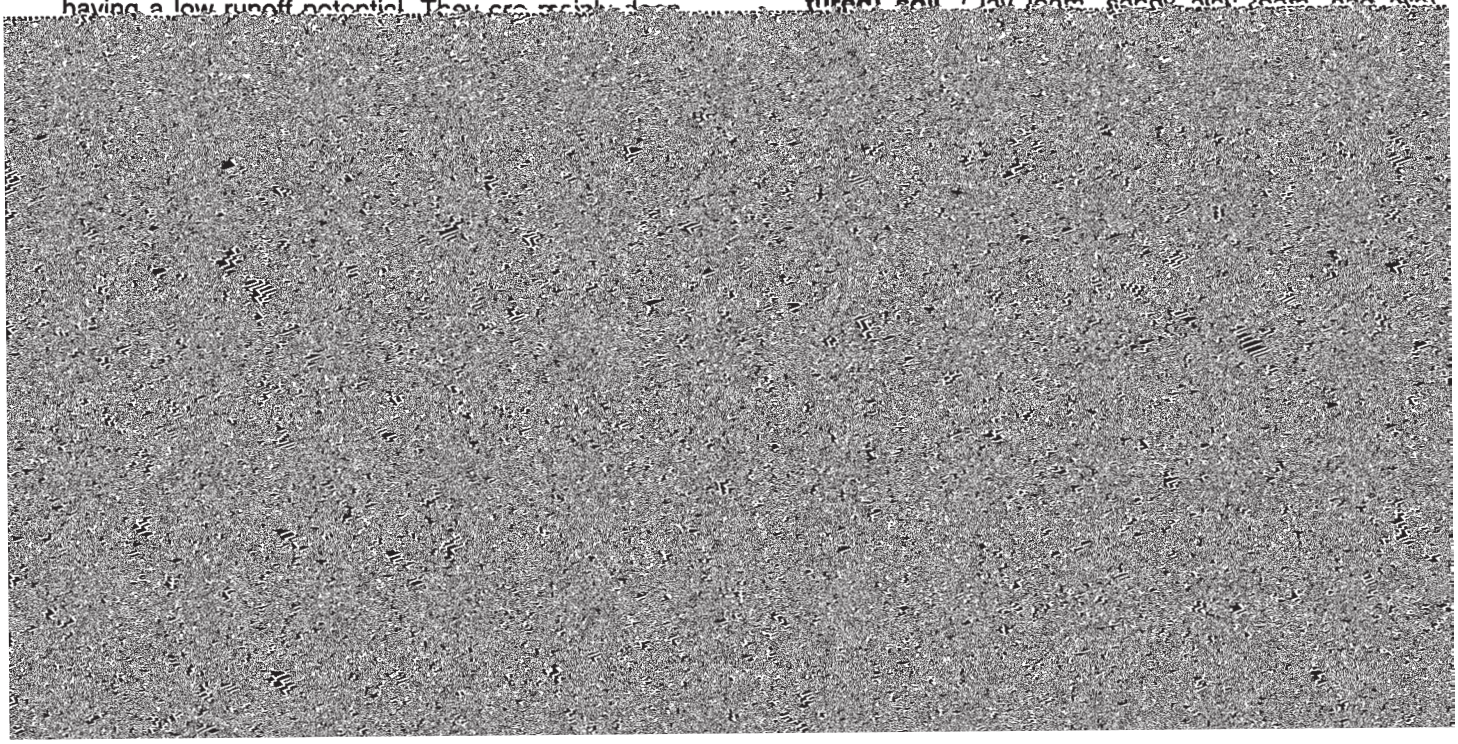
Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty



similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a gran-

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

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

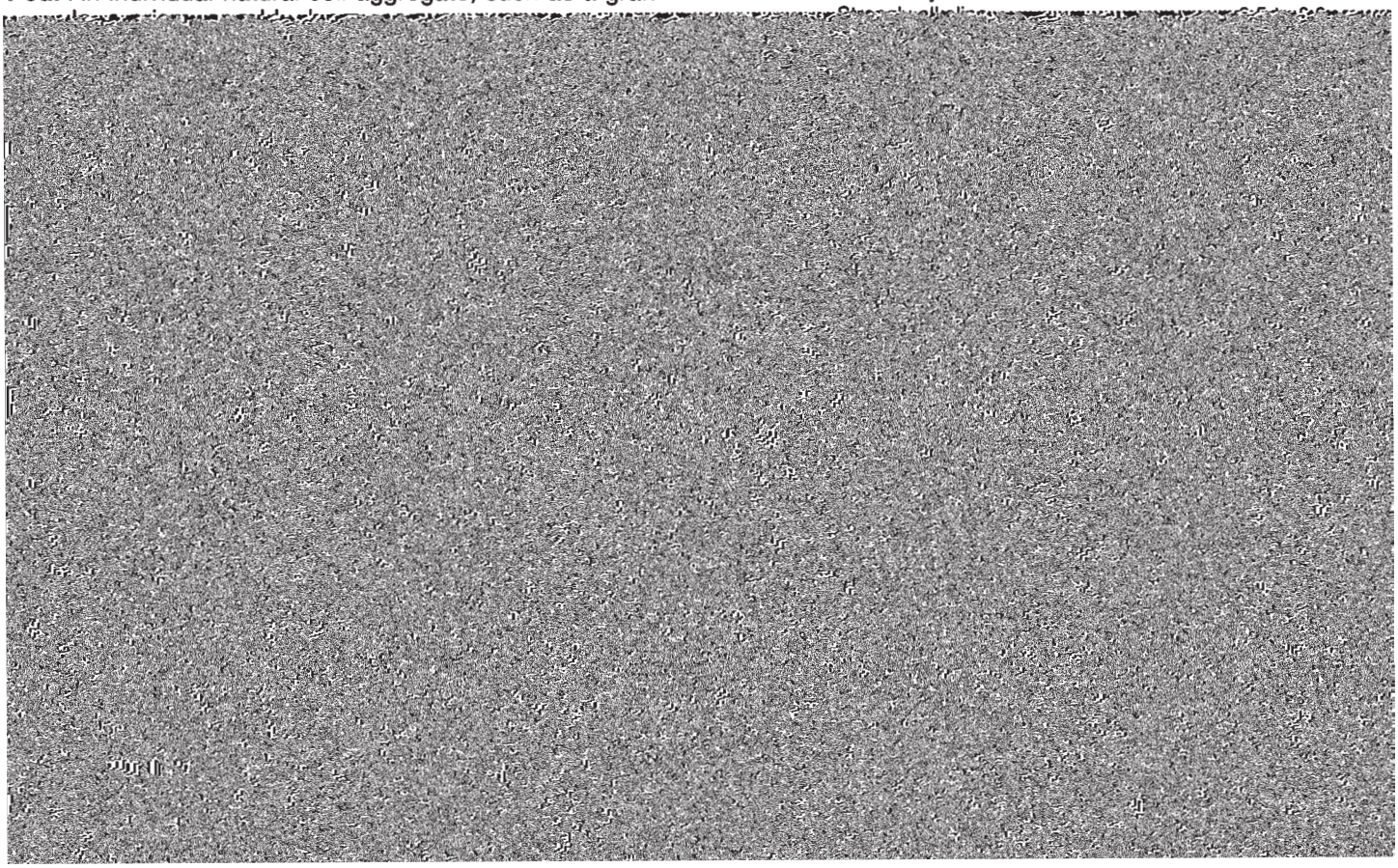
Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

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

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

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4

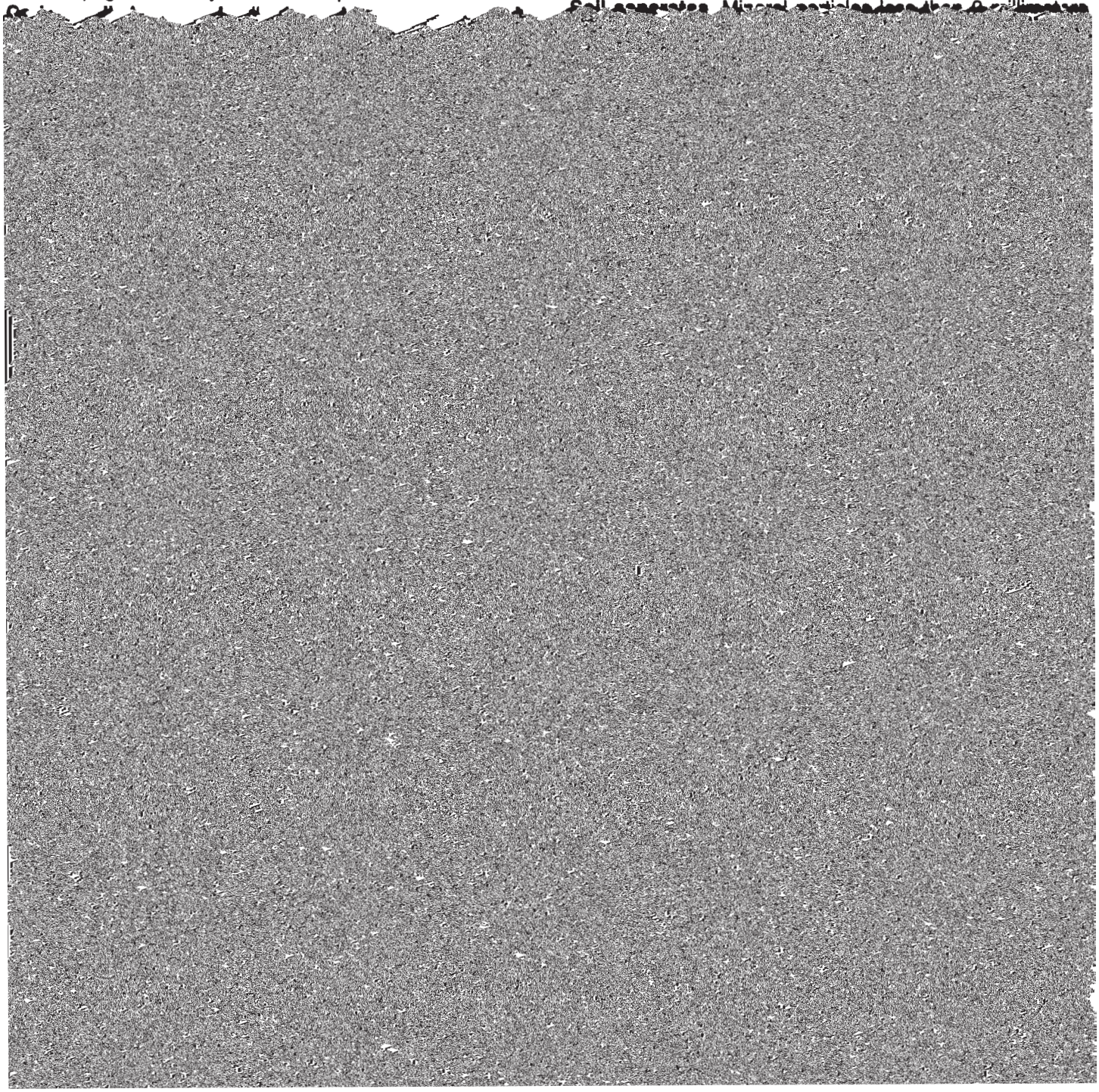


mentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

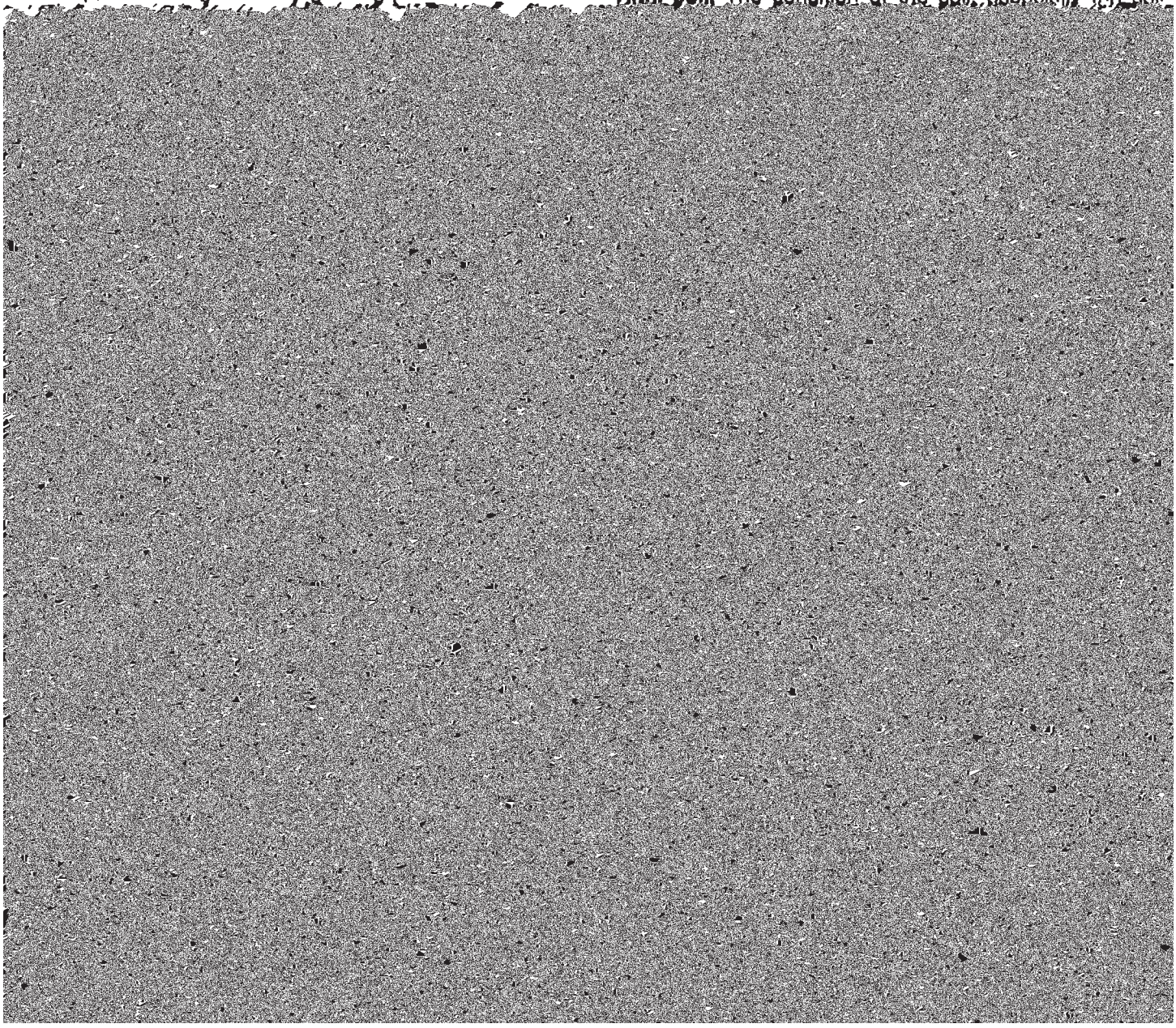
Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.



tion from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil



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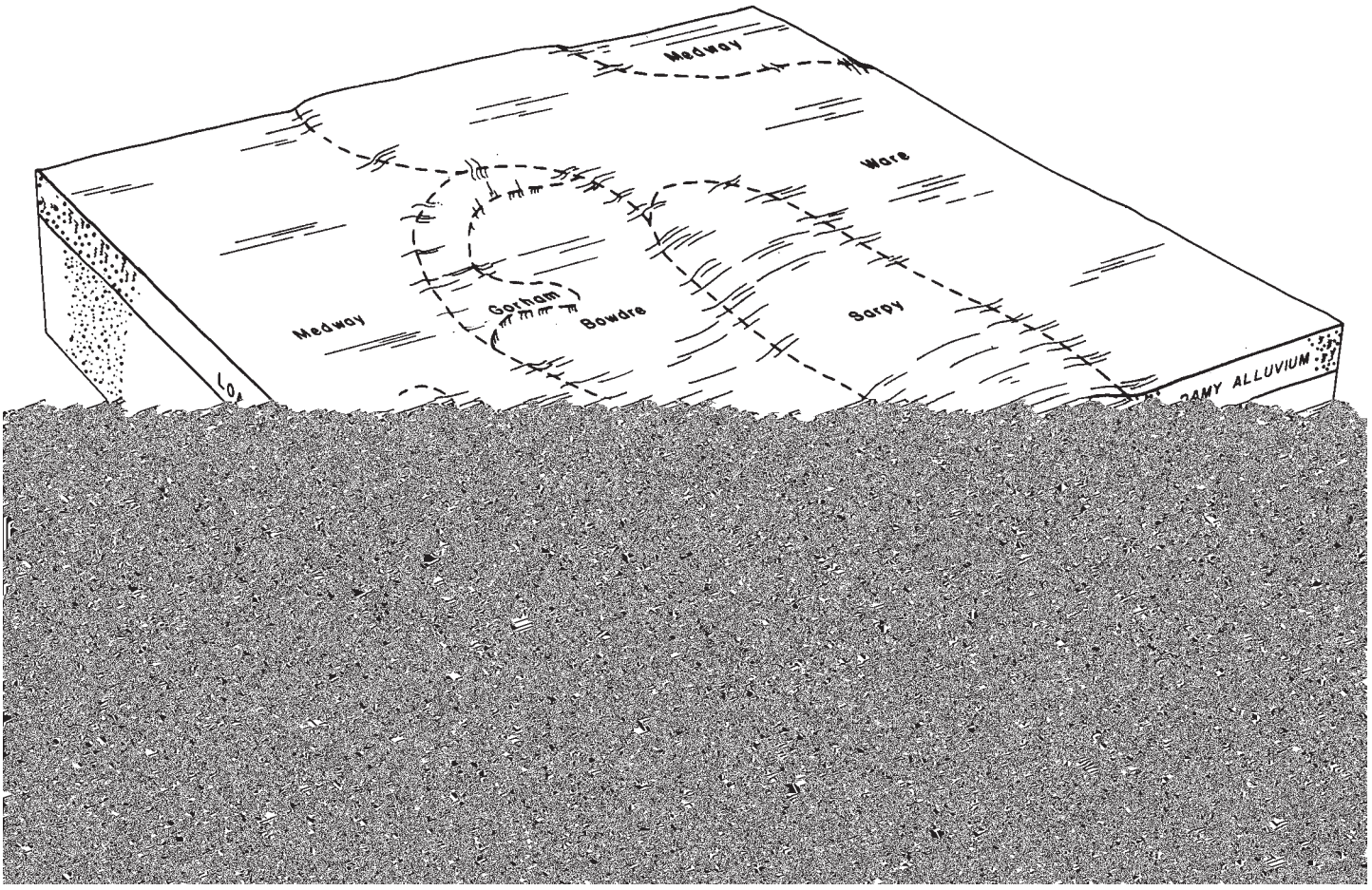
Medway
Ware
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SAMY ALLUVIUM

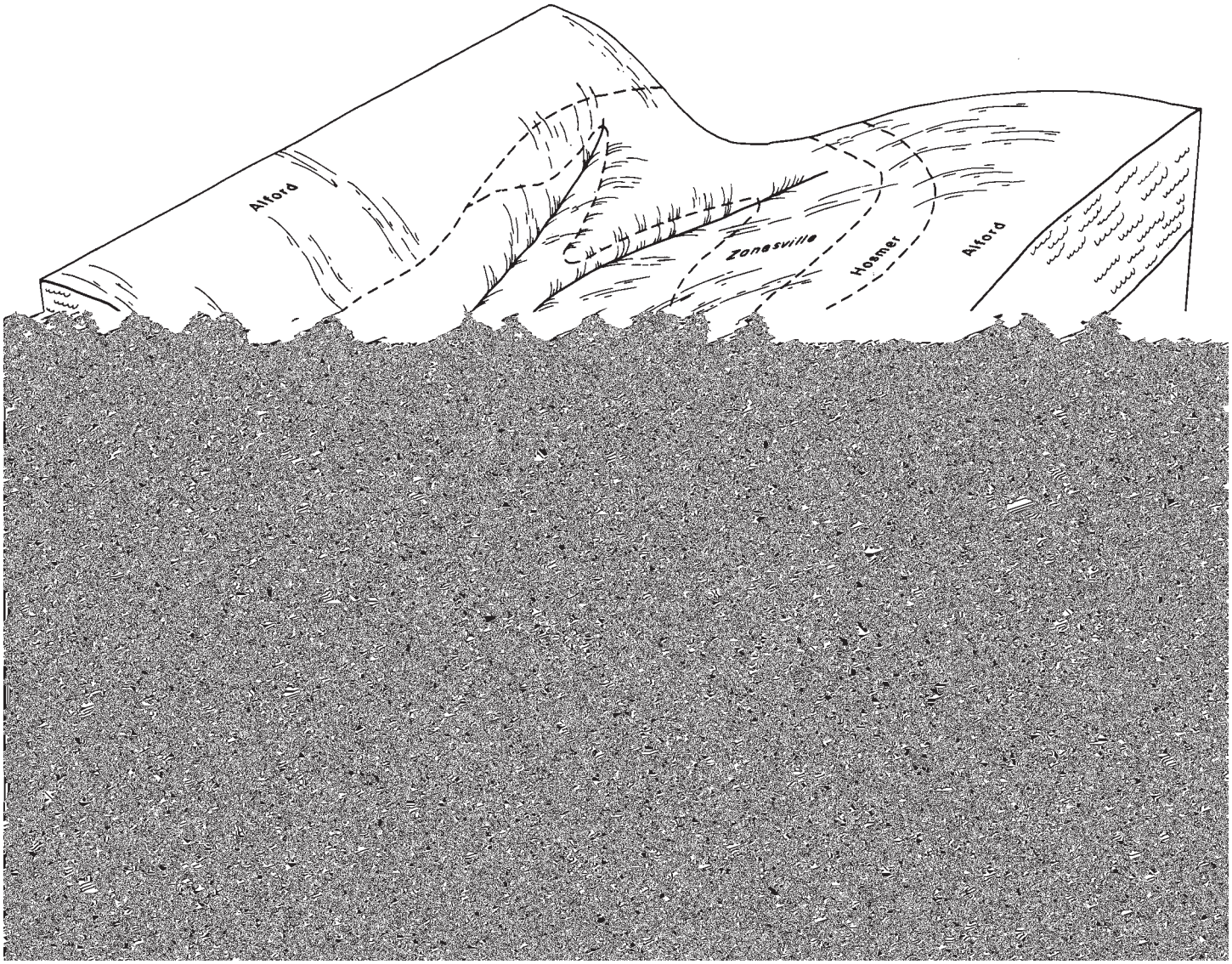

Alford
Zonesville
Hosmer
Alford

Figure 3.—Strawberries planted on the contour on Hosmer silt loam, 2 to 6 percent slopes.

Figure 4.—Dwellings without basements on Hosmer silt loam, 2 to 6 percent slopes. This soil is suitable as a site for such buildings.

Figure 5.—Tomatoes on Alford silt loam, 2 to 6 percent slopes, eroded. This soil is suited to tomatoes.

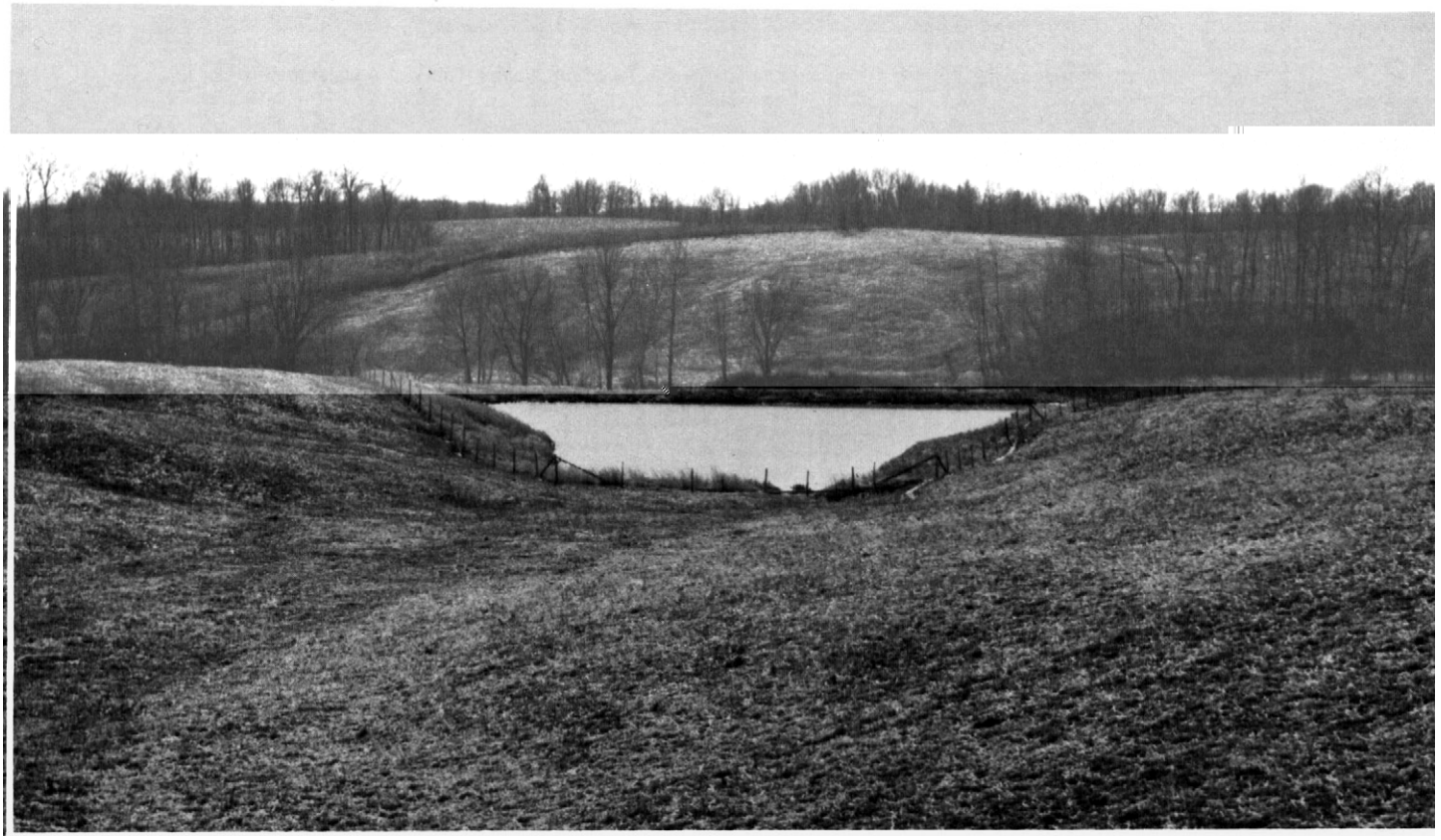


Figure 6.—Pasture in a formerly cropped area of Alford silty clay loam, 6 to 12 percent slopes, severely eroded.

Figure 7.—High-quality timber in a mature oak-hickory stand on Alford silt loam, 18 to 30 percent slopes.

Figure 8.—A stand of silver maple and cottonwood on Wakeland silt loan.

Figure 9.—An area of Karnak clay, ponded. This soil provides good habitat for wetland wildlife.

Figure 10.—An area of Alford soils, karst, 2 to 20 percent slopes.

Figure 11.—A peach orchard on Hosmer soils. The grass cover reduces the risk of erosion.

Figure 12.—Blueberries on Hosmer soils. Mulch between rows of specialty crops helps to protect the soil against erosion.

Figure 13.—A stony stream in an area of Burnside loam on narrow bottom land.

Figure 14.—Flooding on Birds silt loam. This soil is subject to frequent flooding.

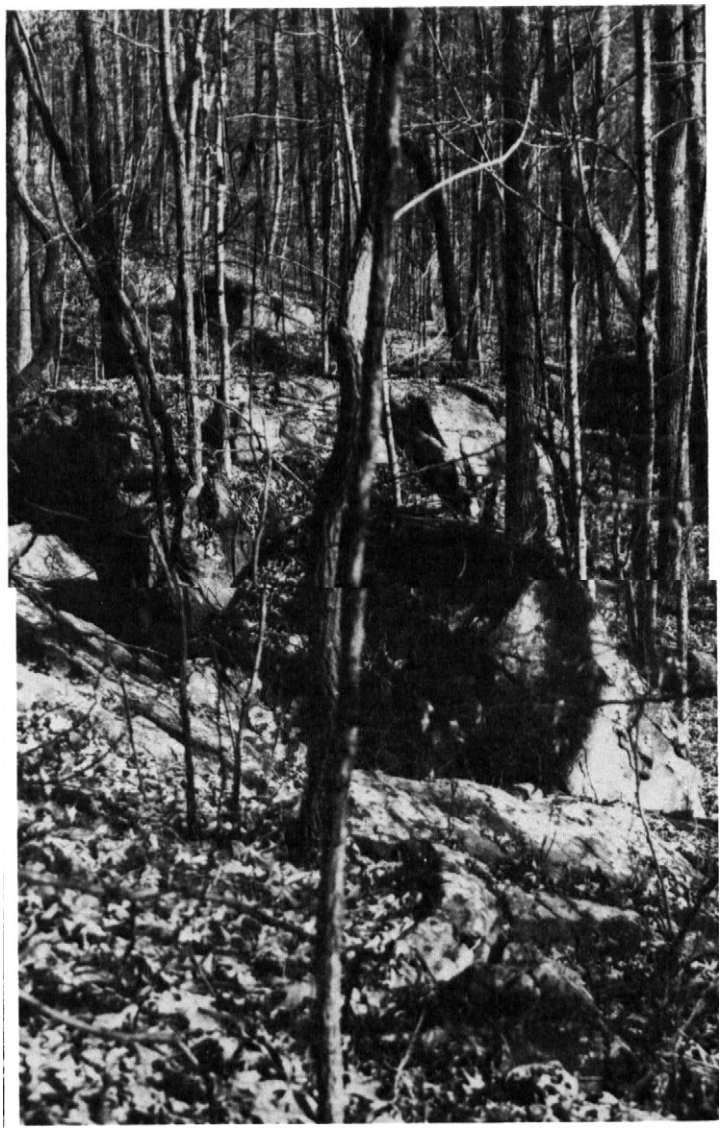


Figure 15.—Boulders from bedrock escarpments on Neotoma soils. Such boulders are common on these soils.

Figure 16.—A massive layer of sandstone. Westmore and Neotoma soils formed in material weathered from interbedded sandstone and shale.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	42.5	24.2	33.3	67	-4	35	3.13	1.64	4.35	6	3.8
February	47.0	27.6	37.3	71	1	82	3.28	1.80	4.48	6	3.4
March	55.6	35.0	45.3	79	13	247	4.59	2.39	6.38	7	3.0
April	68.5	46.8	57.7	86	26	531	4.47	2.64	6.09	8	.2
May	77.7	55.1	66.4	91	35	818	5.06	2.91	6.81	7	.0
June	86.4	63.6	75.0	99	48	1,050	4.11	2.35	5.55	6	.0
July	89.0	66.9	78.0	99	52	1,178	4.19	2.04	5.93	6	.0
August	88.1	65.2	76.6	99	51	1,135	3.48	2.10	4.71	5	.0
September	82.2	58.7	70.5	96	41	915	3.36	1.51	4.86	5	.0
October	71.6	47.5	59.6	89	27	608	2.43	.79	3.73	4	.0
November	56.6	36.4	46.5	78	13	218	3.83	1.87	5.42	6	.8
December	45.4	28.4	36.9	69	1	100	3.82	2.01	5.29	7	2.4
Year	67.6	46.3	56.9	101	-6	6,917	45.75	38.44	52.74	73	13.6

[1]Recorded in the period 1951-73 at Anna, Ill.

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

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 7	April 12	April 27
2 years in 10 later than--	April 1	April 8	April 21
5 years in 10 later than--	March 21	March 31	April 11
First freezing temperature in fall:			
1 year in 10 earlier than--	October 25	October 22	October 16
2 years in 10 earlier than--	October 30	October 27	October 19
5 years in 10 earlier than--	November 9	November 5	October 27

[1]Recorded in the period 1951-73 at Anna, Ill.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	209	198	182
8 years in 10	217	205	187
5 years in 10	232	218	198
2 years in 10	247	230	209
1 year in 10	255	237	214

[1]Recorded in the period 1951-73 at Anna, Ill.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent

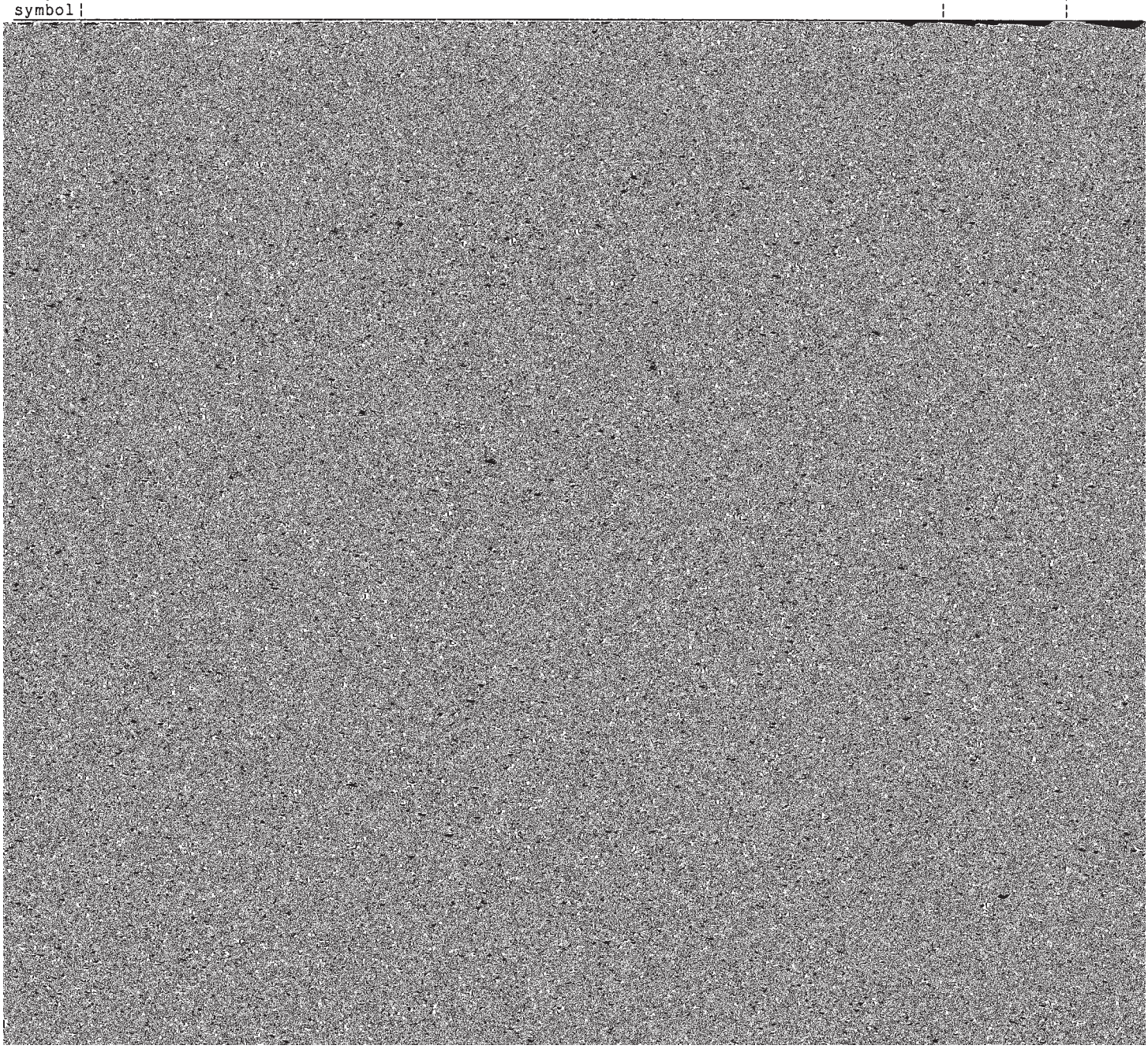


TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Grass-clover
	Bu	Bu	Bu	Cwt	Ton	AUM*
71---Darwin	80	38	30	45	3.0	4.5
75C---Drury	100	33	45	56	4.2	---
85---Jacob	55	23	24	50	2.0	3.3
92**---Sarpy	---	---	15	---	0.9	---
162---Gorham	118	40	47	66	4.5	7.5
164A---Stoy	97	32	45	55	4.1	7.0
180---Dupo	112	37	46	63	4.3	7.0
214B---Hosmer	95	33	43	53	3.1	---
214C2---Hosmer	85	30	38	48	2.8	---
214C3---Hosmer	75	26	34	42	2.5	---
214D2---Hosmer	70	24	32	40	2.3	---
214D3---Hosmer	---	---	27	---	2.0	---
214E---Hosmer	---	---	29	---	2.1	---
214E3---Hosmer	---	---	25	---	1.8	---
284A---Tice	128	41	52	72	5.1	8.0
308B2---Alford	110	40	45	62	4.0	---
308C2---Alford	100	36	42	56	3.6	---
308C3---Alford	85	32	38	48	3.4	---
308D2---Alford	85	33	38	48	3.1	---
308D3---Alford	---	---	---	---	3.0	---
308E---Alford	---	---	---	---	2.8	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Grass-clover
	Bu	Bu	Bu	Cwt	Ton	AUM*
308E3---------- Alford	---	---	---	---	2.6	---
331---------- Haymond	125	34	50	70	4.1	---
333---------- Wakeland	135	47	54	76	4.4	---
334---------- Birds	115	39	45	64	4.3	---
420---------- Piopolis	90	32	40	50	3.8	6.0
422**---------- Cape	95	32	40	53	3.0	5.8
426---------- Karnak	84	29	32	47	2.8	3.5
427---------- Burnside	82	29	36	46	3.5	6.0
456---------- Ware	98	34	44	55	3.1	6.2
475---------- Elsah	85	28	38	48	3.5	4.2
589**---------- Bowdre	75	35	38	42	4.0	5.0
590---------- Cairo	90	30	34	50	3.8	4.8
682---------- Medway	130	50	50	73	5.5	---
787---------- Banlic	105	38	50	59	4.0	6.8
801B***, 802D***. Orthents						
852E---------- Alford-Wellston	---	---	---	---	3.2	---
864***. Pits						
930F---------- Alford-Goss	---	---	---	---	---	---
930G---------- Goss-Alford	---	---	---	---	---	---
940E---------- Zanesville-Westmore	---	---	---	---	---	---
954E---------- Alford-Baxter	---	---	---	---	---	---
977F---------- Wellston-Neotoma	---	---	---	---	---	---
1334---------- Birds	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Grass-clover
	Bu	Bu	Bu	Cwt	Ton	AUM*
1426. Karnak						
3071---------- Darwin	70	28	---	---	---	---
3092---------- Sarpy	---	---	15	---	0.9	---
3456---------- Ware	80	30	---	---	4.1	6.2
3590---------- Cairo	---	---	---	---	---	2.1
3682---------- Medway	100	35	---	---	5.5	---
4426---------- Karnak	---	---	---	---	---	---
5308D---------- Alford	85	33	38	48	3.1	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** Yields are for areas protected from flooding.
*** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
71---------- Darwin	3w	Slight	Severe	Severe	Slight	Pin oak---------- Swamp white oak----- Eastern cottonwood-- Green ash---------- American sycamore---	80 --- --- --- ---	Eastern cottonwood, American sycamore, red maple, green ash, pin oak.
75C---------- Drury	1o	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak---------- Northern red oak---- Sweetgum---------- Green ash----------	95 85 85 --- ---	Yellow-poplar, white oak, northern red oak, sweetgum, black walnut, eastern white pine, loblolly pine, shortleaf pine.
85---------- Jacob	3w	Slight	Severe	Severe	Moderate	Pin oak---------- Swamp white oak----- Eastern cottonwood-- American sycamore---	80 --- --- ---	Eastern cottonwood, pin oak, green ash, American sycamore.
92---------- Sarpy	5s	Slight	Slight	Severe	Slight	Eastern cottonwood--	60	Eastern cottonwood, black willow.
162---------- Gorham	2w	Slight	Moderate	Moderate	Slight	Pin oak---------- Eastern cottonwood-- Sweetgum---------- Cherrybark oak------ American sycamore---	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, pin oak, sweetgum.
164A---------- Stoy	3o	Slight	Slight	Slight	Slight	White oak---------- Southern red oak---- White ash---------- Bur oak----------	70 70 --- ---	Shortleaf pine, loblolly pine, eastern white pine, Scotch pine, eastern redcedar.
180---------- Dupo	---	---	---	---	---		---	Black walnut, American sycamore, eastern cottonwood, green ash, yellow-poplar, red maple, cherrybark oak.
214B, 214C2, 214C3- Hosmer	2o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Virginia pine------- Sugar maple---------	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
214D2, 214D3, 214E, 214E3---------- Hosmer	2r	Moderate	Moderate	Slight	Slight	White oak---------- Yellow-poplar------- Virginia pine------- Sugar maple---------	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash, Virginia pine.
284A---------- Tice	---	---	---	---	---		---	American sycamore, eastern cottonwood, green ash, yellow-poplar, red maple, cherrybark oak.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
308B2, 308C2, 308C3, 308D2, 308D3---------- Alford	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine,
						Yellow-poplar-------	98	Virginia pine,
						Sweetgum----------	76	black walnut,
								shortleaf pine,
								yellow-popular,
								white ash,
								loblolly pine,
								black locust.
308E, 308E3-------- Alford	1r	Moderate	Moderate	Slight	Slight	White oak----------	90	Eastern white pine,
						Yellow-poplar-------	98	Virginia pine,
						Sweetgum----------	76	black walnut,
								yellow-poplar,
								white ash,
								black locust,
								loblolly pine,
								shortleaf pine.
331---------- Haymond	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Black walnut,
						White oak----------	90	yellow-poplar,
						Black walnut--------	70	black locust.
333---------- Wakeland	2o	Slight	Slight	Slight	Slight	Pin oak----------	90	Baldcypress,
						Sweetgum----------	85	American sycamore,
						Yellow-poplar-------	90	red maple,
						Virginia pine-------	90	green ash.
334---------- Birds	2w	Slight	Severe	Moderate	Slight	Eastern cottonwood--	100	Eastern cottonwood,
						Pin oak----------	90	red maple,
						Sweetgum----------	---	American sycamore,
						Cherrybark oak------	---	baldcypress,
						American sycamore---	---	water tupelo.
420---------- Piopolis	2w	Slight	Severe	Moderate	Slight	Pin oak----------	90	Eastern cottonwood,
						Eastern cottonwood--	100	red maple,
						Sweetgum----------	---	American sycamore,
						Cherrybark oak------	---	sweetgum,
						American sycamore---	---	pin oak,
						Post oak----------	---	baldcypress.

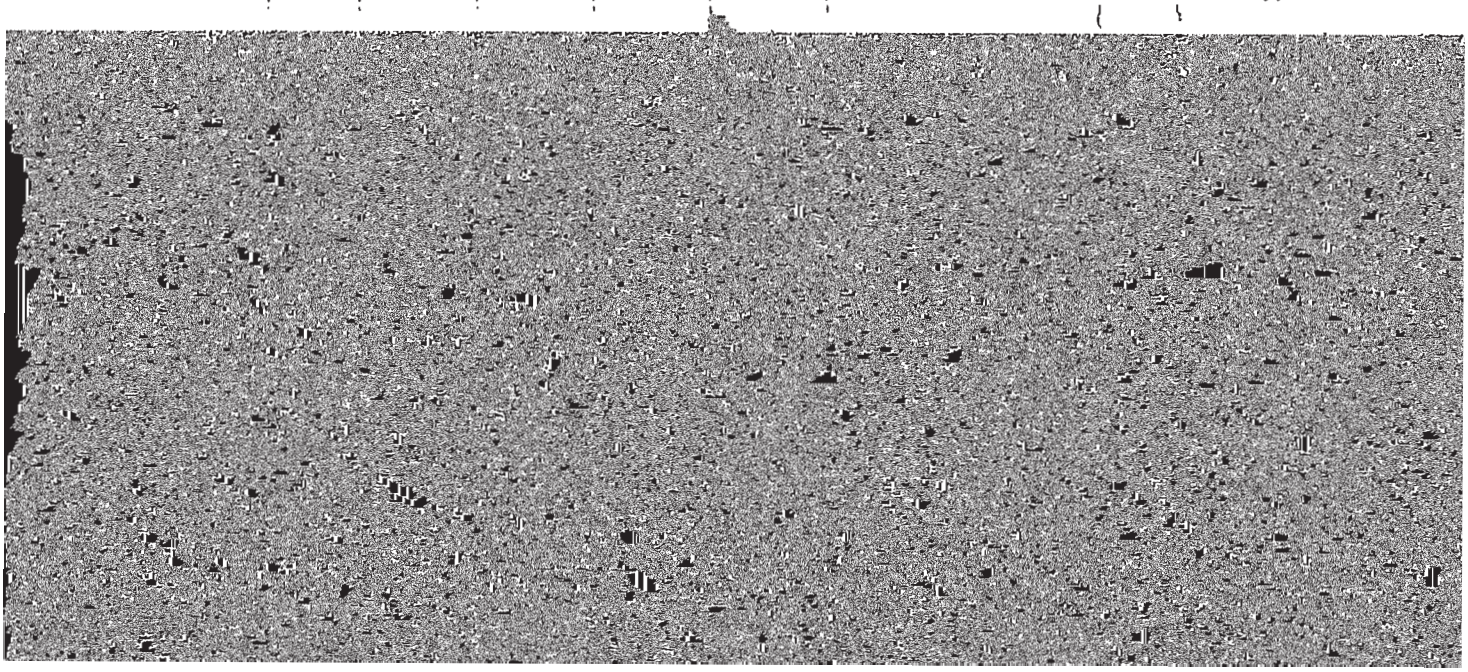


TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
475---------- Elsah	2f	Slight	Slight	Moderate	Slight	Eastern cottonwood-- American sycamore--- Sweetgum---------- Red maple----------	95 --- --- ---	Black walnut, yellow-poplar, green ash, sweetgum.
589---------- Bowdre	2w	Slight	Moderate	Moderate	Slight	Cherrybark oak------ Eastern cottonwood-- Sweetgum---------- Water oak----------	90 110 95 95	Eastern cottonwood, sweetgum, American sycamore.
590---------- Cairo	2w	Slight	Moderate	Severe	Slight	Pin oak---------- Baldcypress--------- Swamp white oak----- Eastern cottonwood-- Green ash----------	90 --- --- --- ---	Pin oak, baldcypress, eastern cottonwood, red maple, water tupelo.
682---------- Medway	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- Eastern cottonwood--	85 95 --- ---	Eastern white pine, yellow-poplar, black walnut, Norway spruce, baldcypress.
787---------- Banlic	2o	Slight	Slight	Slight	Slight	White oak---------- Pin oak---------- Southern red oak---- Yellow-poplar------- Black walnut--------	75 90 85 90 ---	Black walnut, sweetgum, white oak, yellow-poplar, American sycamore, green ash.
852E*: Alford----------	1r	Moderate	Moderate	Slight	Slight	White oak----------	90	Eastern white pine,

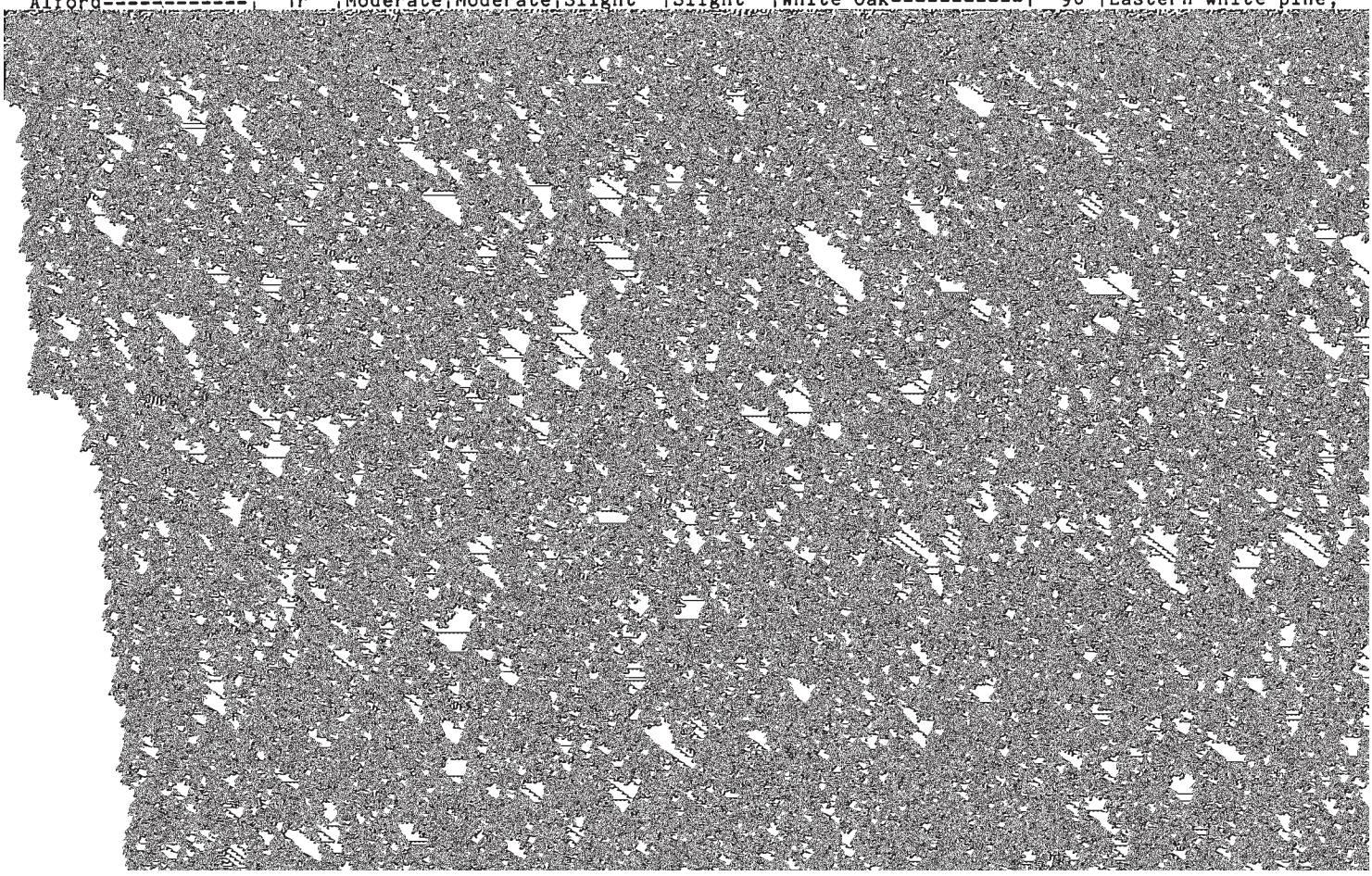


TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
940E*:								
Zanesville	3r	Slight	Moderate	Slight	Moderate	Northern red oak Virginia pine	68 70	Virginia pine, eastern white pine, shortleaf pine, loblolly pine, eastern redcedar.
Westmore.								
954E*:								
Alford	1r	Moderate	Moderate	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black locust, Virginia pine.
Baxter	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	93 89	Eastern white pine, loblolly pine,

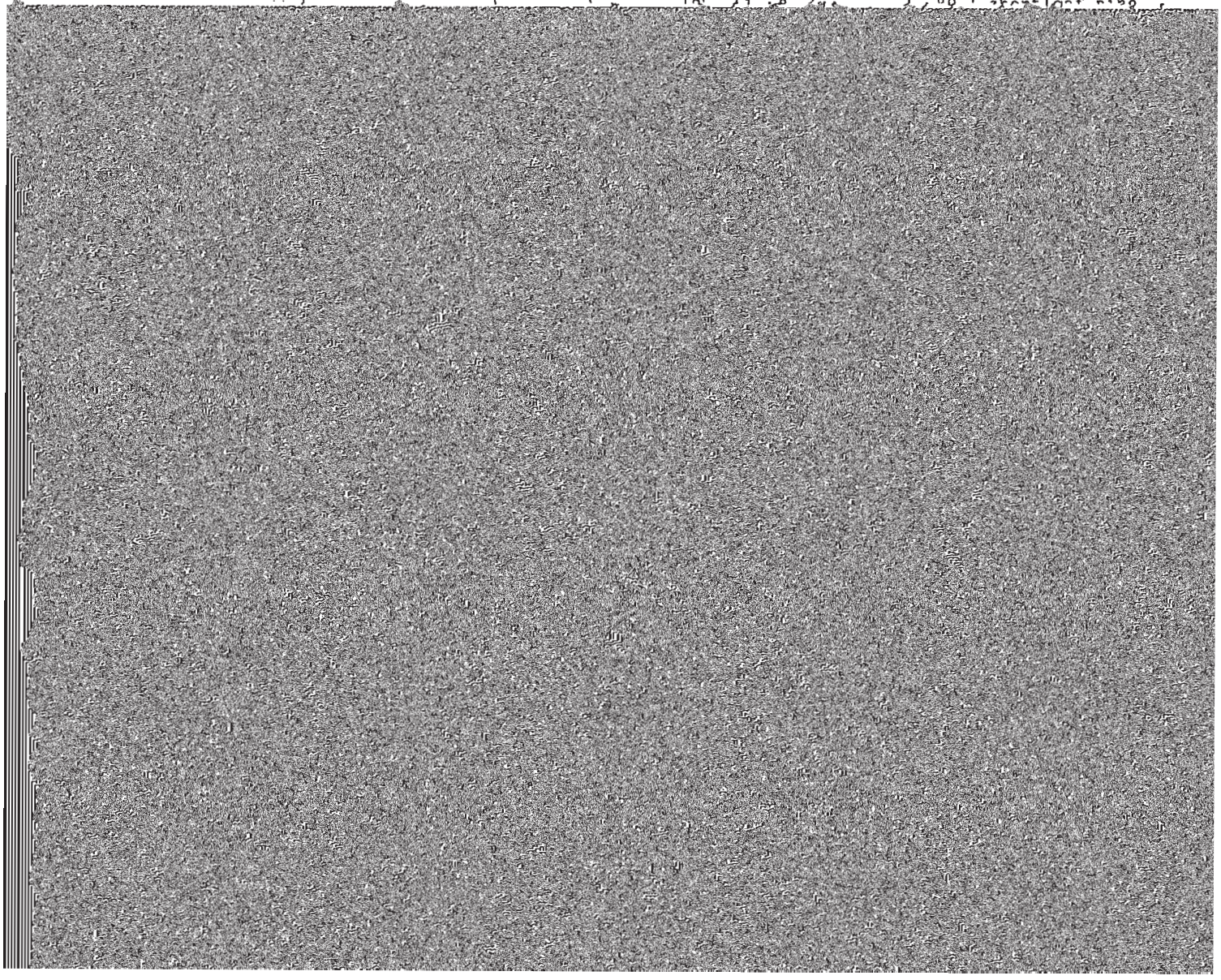


TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
71---------- Darwin	Redosier dogwood, forsythia.	Amur maple, silky dogwood, American cranberrybush.	Flowering dogwood, baldcypress, green ash.	Pin oak, red oak, sweetgum.	Eastern cottonwood.
75C---------- Drury	Redosier dogwood, gray dogwood, arrowwood.	Autumn-olive, silky dogwood.	Amur maple, Russian-olive.	Norway spruce, eastern redcedar, Douglas-fir.	Yellow-poplar, eastern cottonwood.
85---------- Jacob	Redosier dogwood, forsythia, common winterberry.	Silky dogwood-----	Amur maple, green ash, baldcypress.	Pin oak, sweetgum.	Eastern cottonwood, red maple.
92---------- Sarpy	Gray dogwood, common snowberry, indiancurrant coralberry.	Blackhaw, Russian-olive, autumnolive, mallow ninebark.	Black willow, flowering dogwood.	Eastern cottonwood.	---
162---------- Gorham	American cranberrybush, forsythia, redosier dogwood.	Amur maple, silky dogwood.	Baldcypress, green ash.	Pin oak, sweetgum.	Eastern cottonwood, red maple, American sycamore.
164A---------- Stoy	Gray dogwood, American cranberrybush.	Autumn-olive, forsythia.	Russian-olive, flowering dogwood, Amur maple.	Norway spruce, eastern white pine, Douglasfir.	Eastern cottonwood.
180---------- Dupo	American cranberrybush, redosier dogwood.	Russian-olive, autumn-olive, gray dogwood, forsythia.	Amur maple, baldcypress.	Green ash, black walnut.	Eastern cottonwood, yellow-poplar.
214B, 214C2, 214C3, 214D2, 214D3, 214E, 214E3---------- Hosmer	Cutleaf stag sumac, arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	White ash, flowering dogwood, eastern redcedar.	Norway spruce, white spruce, eastern white pine.	Eastern cottonwood.
284A---------- Tice	Gray dogwood, redosier dogwood.	Silky dogwood, autumn-olive.	Amur maple, flowering dogwood, Russian-olive.	Cherrybark oak, green ash.	Pin oak, eastern cottonwood, yellow-poplar.
308B2, 308C2, 308C3, 308D2, 308D3, 308E, 308E3---------- Alford	Arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	Flowering dogwood, baldcypress, Virginia pine.	Norway spruce, Douglas-fir, eastern white pine.	Eastern cottonwood, American sycamore.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
331---------- Haymond	Gray dogwood, arrowwood.	Late lilac, Amur honeysuckle, autumn-olive.	Amur maple, Russian-olive.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood, silver maple.
333---------- Wakeland	Gray dogwood, redosier dogwood, common winterberry.	Amur honeysuckle, silky dogwood.	Flowering dogwood, Amur maple, eastern redcedar.	Norway spruce, Douglas-fir, eastern white pine.	Eastern cottonwood.
334---------- Birds	Gray dogwood, redosier dogwood, common winterberry.	Silky dogwood, forsythia.	Amur maple, baldcypress.	Pin oak, green ash.	Eastern cottonwood, American sycamore, red maple.
420---------- Piopolis	Common winterberry, redosier dogwood.	Forsythia, silky dogwood, Amur honeysuckle.	Amur maple, baldcypress.	Green ash, pin oak.	Eastern cottonwood, American sycamore, red maple.
422---------- Cape	Redosier dogwood, common winterberry.	Silky dogwood, Amur honeysuckle, forsythia.	Amur maple, Russian-olive, baldcypress.	Green ash, pin oak.	Eastern cottonwood, American sycamore, silver maple.
426---------- Karnak	Gray dogwood, redosier dogwood, common winterberry.	Silky dogwood, forsythia.	Baldcypress, Amur maple.	Pin oak, green ash.	Eastern cottonwood, red maple, silver maple.
427---------- Burnside	Redosier dogwood, gray dogwood.	Autumn-olive, Amur honeysuckle, silky dogwood.	Amur maple, Russian-olive.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood, American sycamore.
456---------- Ware	American cranberrybush, Vanhoutte spirea.	Autumn-olive, silky dogwood.	Amur maple, Russian-olive, baldcypress.	Norway spruce, eastern white pine.	Eastern cottonwood, American sycamore, red maple.
475---------- Elsah	Gray dogwood, redosier dogwood.	Autumn-olive, silky dogwood.	Russian-olive, flowering dogwood, eastern redcedar.	Eastern white pine, Norway spruce.	Eastern cottonwood, American sycamore, red maple.
589---------- Bowdre	Redosier dogwood, gray dogwood.	Amur honeysuckle, silky dogwood.	Russian-olive, Amur maple.	Eastern white pine, Douglas-fir, Norway spruce.	Eastern cottonwood, American sycamore, red maple.
590---------- Cairo	Redosier dogwood, common winterberry.	Amur maple, silky dogwood.	Baldcypress, green ash.	Pin oak, sweetgum, water tupelo.	Eastern cottonwood, red maple, American sycamore.
682---------- Medway	Gray dogwood, redosier dogwood.	Silky dogwood, Amur honeysuckle, forsythia.	Eastern redcedar, autumn-olive.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood, yellow-poplar.

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
787---------- Banlic	Gray dogwood, redosier dogwood, arrowwood.	Autumn-olive, silky dogwood.	Amur maple, flowering dogwood, eastern redcedar.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood.
801B*, 802D* Orthents					
852E*:					
Alford----------	Arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	Flowering dogwood, baldcypress, Virginia pine.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood, American sycamore.
Wellston---------	Arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	Flowering dogwood, baldcypress, Virginia pine.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood, American sycamore.
864*. Pits					
930F*:					
Alford----------	Arrowwood, redosier dogwood.	Autumn-olive, Amur honeysuckle.	Flowering dogwood, Virginia pine, shortleaf pine, eastern redcedar.	Eastern white pine, loblolly pine, honeylocust.	Eastern cottonwood.
Goss----------	Gray dogwood, indiancurrant coralberry, arrowwood.	Eastern redbud, Amur honeysuckle, autumn-olive.	Eastern redcedar, Virginia pine, flowering dogwood.	---	---
930G*:					
Goss----------	Gray dogwood, indiancurrant coralberry, arrowwood.	Eastern redbud, Amur honeysuckle, autumn-olive.	Eastern redcedar, Virginia pine, flowering dogwood.	---	---
Alford----------	Arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	Flowering dogwood, Virginia pine, shortleaf pine, eastern redcedar.	Eastern white pine, loblolly pine, honeylocust.	Eastern cottonwood.
940E*:					

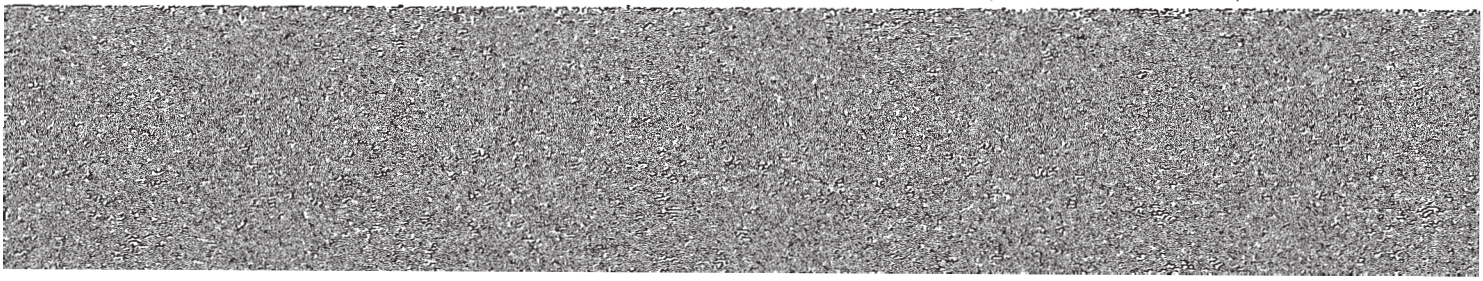


TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
954E*:					
Alford	Arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	Flowering dogwood, baldcypress, Virginia pine.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood, American sycamore.
Baxter	Gray dogwood, redosier dogwood, arrowwood.	Autumn-olive, silky dogwood.	Flowering dogwood, Amur maple, eastern redcedar.	Norway spruce, Douglas-fir, eastern white pine.	Eastern cottonwood.
977F*:					
Wellston	Arrowwood, redosier dogwood.	Amur honeysuckle, autumn-olive.	Flowering dogwood, baldcypress, Virginia pine.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood, American sycamore.
Neotoma	Gray dogwood	Autumn-olive	Flowering dogwood	Norway spruce	Eastern

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and	Shallow	Dwellings	Dwellings	Small	Local roads	Lawns and

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
308D2, 308D3, 308E, 308E3---- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope, low strength.	Severe: slope.
331---------- Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.	Slight.
333---------- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
334---------- Birds	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action, floods.	Severe: floods, wetness.
420---------- Piopolis	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action.	Severe: wetness, floods.
422---------- Cape	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, low strength.	Severe: wetness.
426---------- Karnak	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: too clayey, wetness.
427---------- Burnside	Severe: floods, large stones.	Severe: floods.	Severe: floods, depth to rock.	Severe: floods.	Severe: floods.	Moderate: floods, thin layer.
456---------- Ware	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength, frost action.	Slight.
475---------- Elsah	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods.
589---------- Bowdre	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: too clayey, wetness.
590---------- Cairo	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, low strength.	Severe: wetness, too clayey, floods.
682---------- Medway	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods.	Moderate: floods, too clayey.
787---------- Banlic	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: frost action.	Moderate: wetness.
801B*, 802D*. Orthents						
852E*: Alford----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope, low strength.	Severe: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
852E*: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
864*. Pits						
930F*: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope, low strength.	Severe: slope.
Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
930G*: Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope, low strength.	Severe: slope.
940E*: Zanesville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Westmore	Severe: slope.	Severe: slope, low strength, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: slope, low strength, frost action.	Severe: slope.
954E*: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope, low strength.	Severe: slope.
Baxter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
977F*: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Neotoma	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
1334 Birds	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action, floods.	Severe: floods, wetness.
1426 Karnak	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: too clayey, wetness, floods.
3071 Darwin	Severe: wetness, floods.	Severe: floods, shrink-swell,	Severe: floods, shrink-swell,	Severe: floods, shrink-swell,	Severe: wetness, shrink-swell,	Severe: too clayey, wetness,

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
3092--- Sarpy	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
3456--- Ware	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
3590--- Cairo	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, low strength.	Severe: too clayey, wetness, floods.
3682--- Medway	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
4426--- Karnak	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: too clayey, wetness, floods.
5308D*--- Alford	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
71--Darwin	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
75C--Drury	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
85--Jacob	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
92--Sarpy	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy

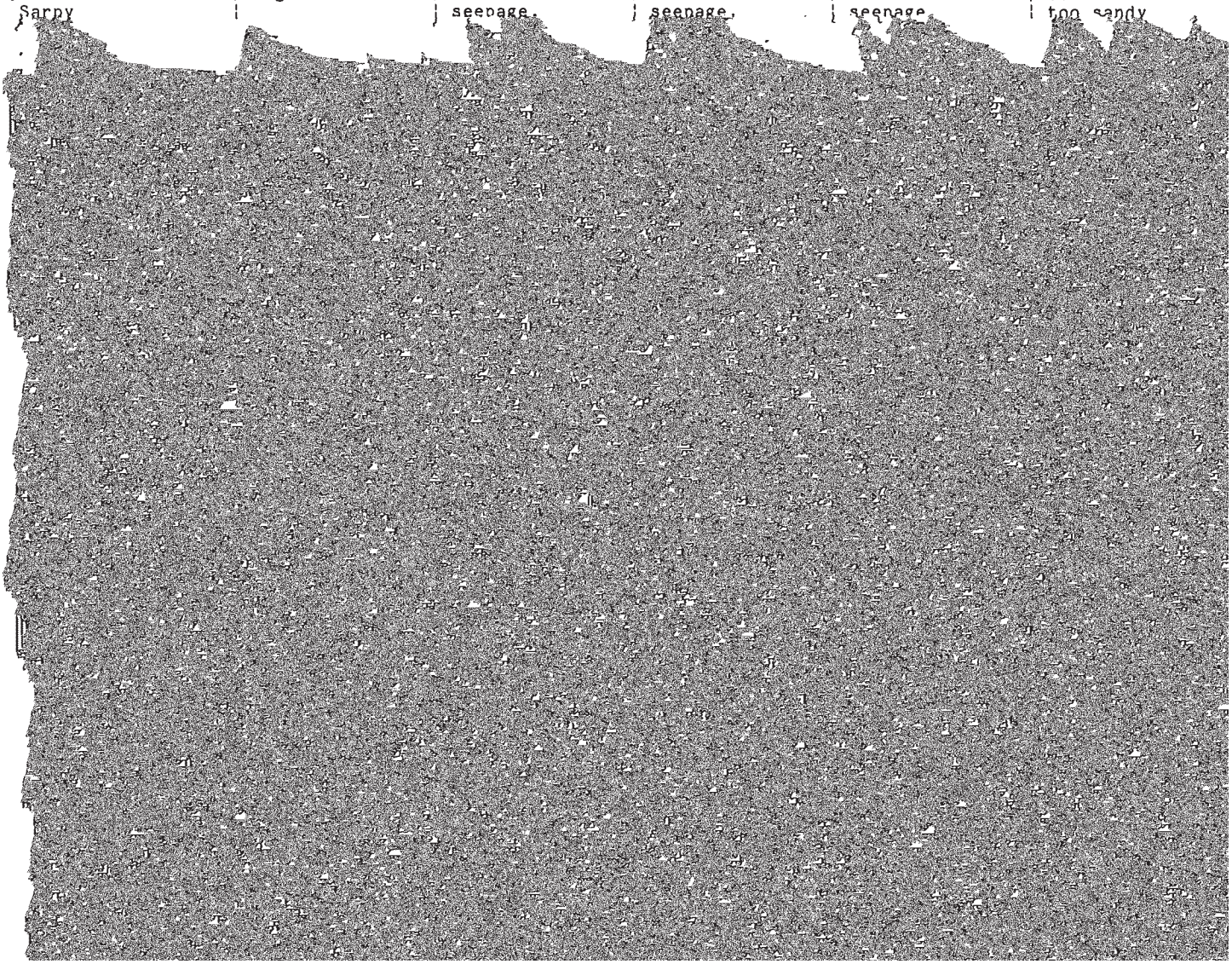


TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
334---------- Birds	Severe: wetness, floods, percs slowly.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
420	Severe:	Severe:	Severe:	Severe:	Poor:

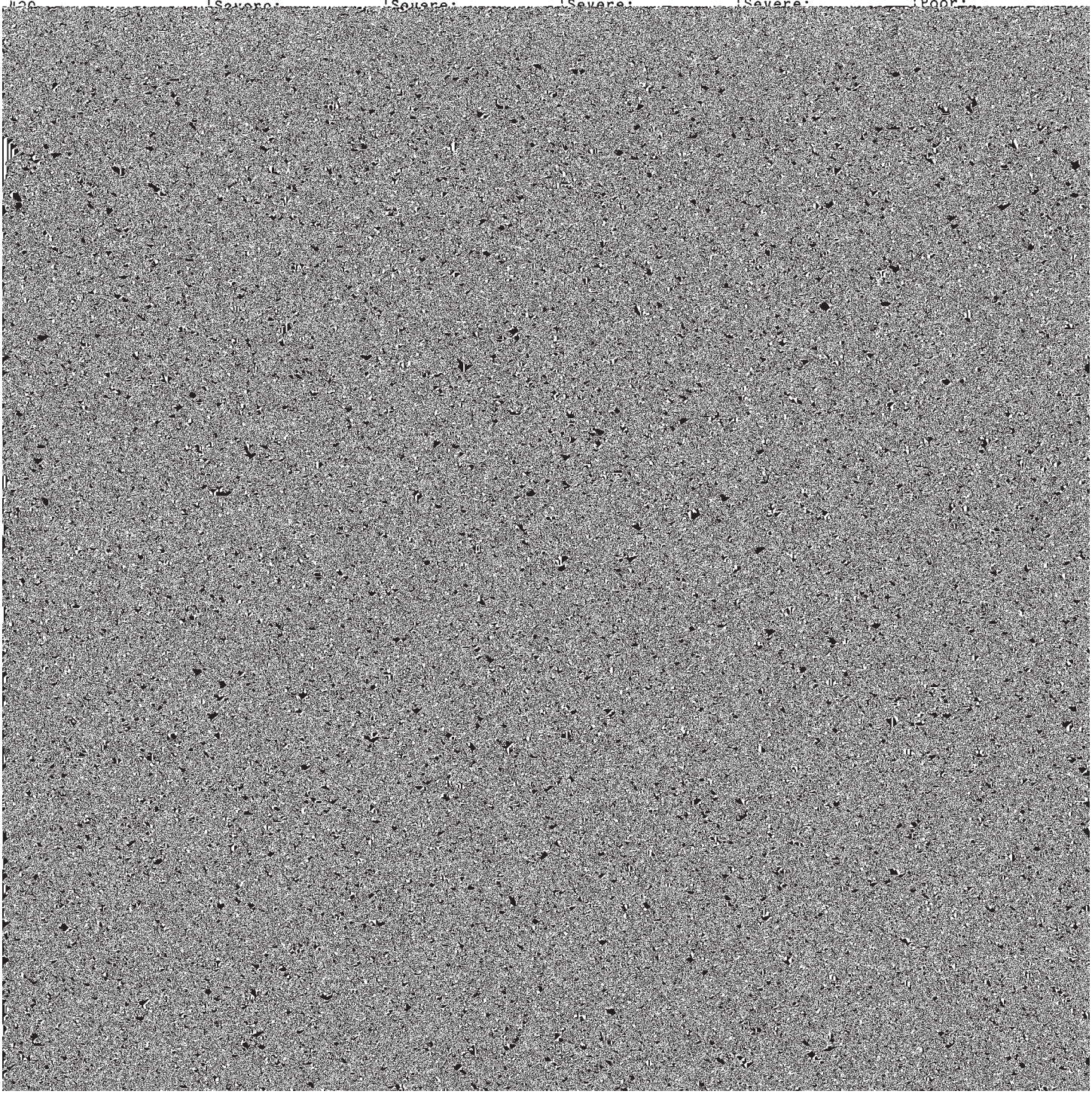


TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
930F*:					
Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
930G*:					
Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
940E*:					
Zanesville	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: depth to rock, wetness.	Severe: slope.	Poor: slope.
Westmore	Severe: slope, percs slowly.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope, too clayey.
954E*:					
Alford	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Baxter	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
977F*:					
Wellston	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Neotoma	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, slope, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
1334 Birds	Severe: wetness, floods, percs slowly.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
1426 Karnak	Severe: percs slowly, floods, wetness.	Severe: floods, wetness.	Severe: too clayey, wetness, floods.	Severe: floods, wetness.	Poor: wetness, too clayey.
3071 Darwin	Severe: percs slowly, wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, too clayey.	Severe: wetness, floods.	Poor: too clayey, wetness.
3092 Sarpy	Severe: floods.	Severe: seepage, floods.	Severe: seepage, floods.	Severe: seepage, floods.	Poor: too sandy, seepage.
3456 Ware	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: too sandy.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
3590---------- Cairo	Severe: percs slowly, wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
3682---------- Medway	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, wetness.	Fair: wetness.
4426---------- Karnak	Severe: percs slowly, floods, wetness.	Severe: floods, wetness.	Severe: too clayey, wetness, floods.	Severe: floods, wetness.	Poor: wetness, too clayey.

TABLE 10.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
71 Darwin	Poor: low strength, wetness, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
75C Drury	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
85 Jacob	Poor: low strength, wetness, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
92 Sarpy	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
162 Gorham	Poor: wetness, low strength.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness.
164A Stoy	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
180 Dupo	Poor: wetness, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
214B Hosmer	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
214C2 Hosmer	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
214C3 Hosmer	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope.
214D2, 214D3, 214E, 214E3 Hosmer	Fair: low strength, slope, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
284A Tice	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
308B2 Alford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
308C2 Alford	Fair: low strength	Unsuited: excess fines	Unsuited: excess fines	Fair: slope

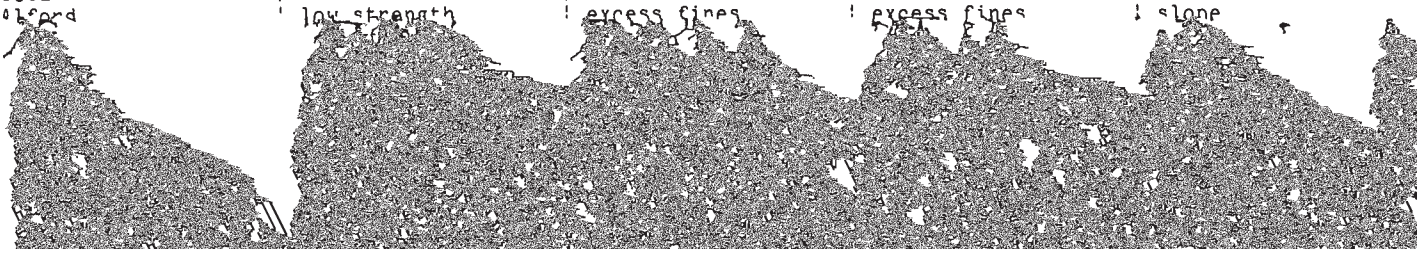


TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
331---------- Haymond	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
333---------- Wakeland	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
334---------- Birds	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

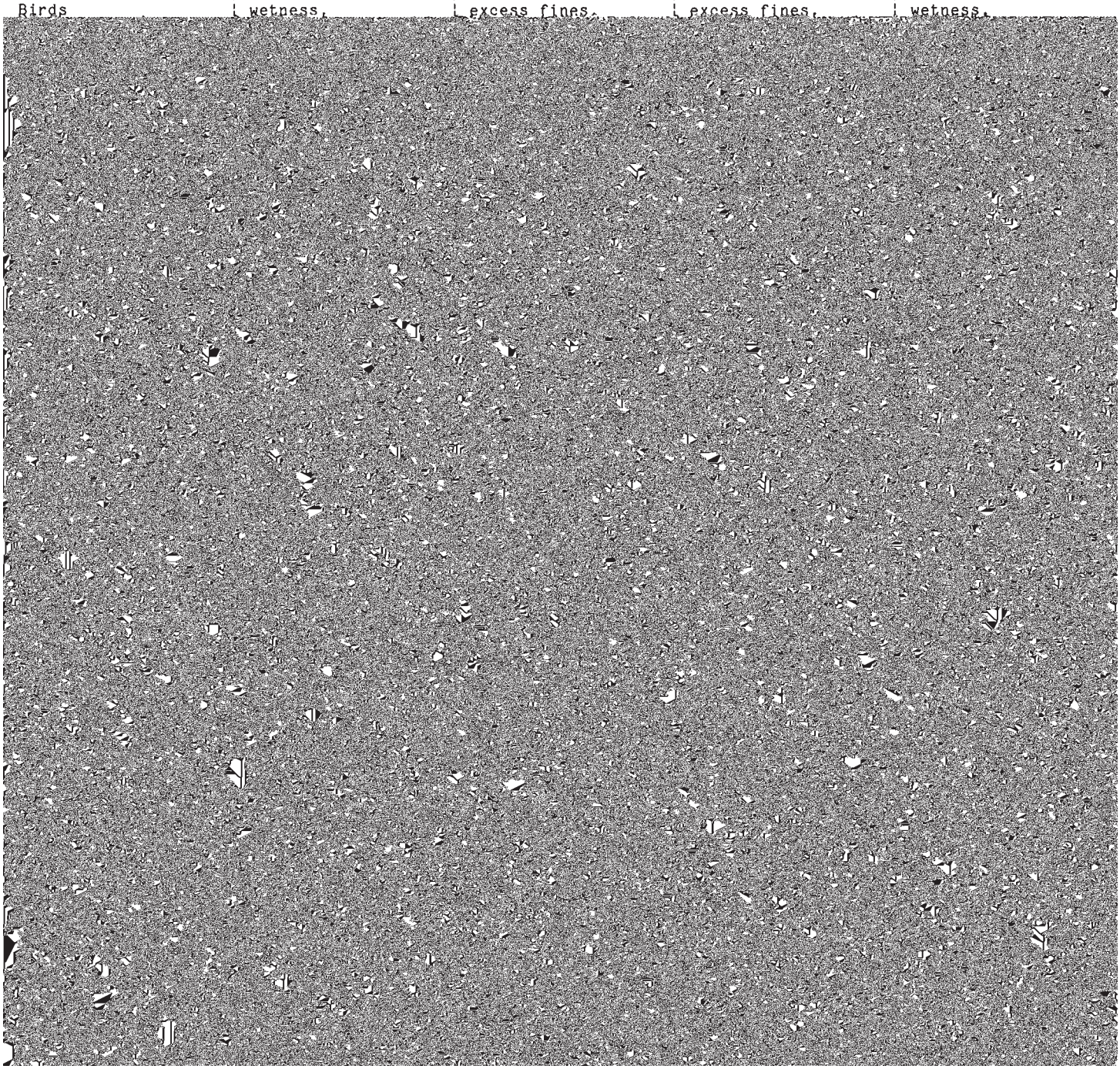


TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
930F*:				
Goss	Poor: slope.	Unsuited	Unsuited: excess fines.	Poor: small stones, slope.
930G*:				
Goss	Poor: slope.	Unsuited	Unsuited: excess fines.	Poor: small stones, slope.
Alford	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
940E*:				
Zanesville	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Westmore	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
954E*:				
Alford	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Baxter	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones, too clayey.
977F*:				
Wellston	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Neotoma	Poor: slope, thin layer, area reclaim.	Unsuited: large stones.	Unsuited: large stones.	Poor: slope, large stones.
1334 Birds	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
1426 Karnak	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
3071 Darwin	Poor: shrink-swell, wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
3092 Sarpy	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
[illegible]	Fair:	Poor:	Unsuited:	Good.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
4426---------- Karnak	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
5308D*---------- Alford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.

TABLE 11.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
71---------- Darwin	Favorable---------	Wetness----------	Percs slowly-----	Not needed-------	Wetness, percs slowly.
75C---------- Drury	Seepage, slope.	Piping----------	Not needed-------	Favorable--------	Erodes easily.
85---------- Jacob	Favorable---------	Wetness----------	Percs slowly-----	Not needed-------	Wetness, percs slowly.
92---------- Sarpy	Seepage----------	Piping, seepage.	Not needed-------	Not needed-------	Droughty.
162---------- Gorham	Seepage----------	Wetness----------	Floods, frost action.	Not needed-------	Wetness.
164A---------- Stoy	Favorable---------	Wetness----------	Percs slowly, frost action.	Not needed-------	Wetness, erodes easily.
180---------- Dupo	Favorable---------	Hard to pack, wetness.	Percs slowly, floods, frost action.	Not needed-------	Wetness, erodes easily, percs slowly.
214B---------- Hosmer	Favorable---------	Piping----------	Not needed-------	Rooting depth, erodes easily.	Erodes easily, rooting depth.
214C2, 214C3------ Hosmer	Favorable---------	Piping----------	Not needed-------	Rooting depth, erodes easily.	Slope, erodes easily, rooting depth.
214D2, 214D3, 214E, 214E3------ Hosmer	Favorable---------	Piping----------	Not needed-------	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
284A---------- Tice	Seepage----------	Wetness----------	Frost action-----	Not needed-------	Wetness.
308B2---------- Alford	Seepage----------	Favorable---------	Not needed-------	Favorable--------	Erodes easily.
308C2, 308C3------ Alford	Slope, seepage.	Favorable---------	Not needed-------	Favorable--------	Slope, erodes easily.
308D2, 308D3, 308E, 308E3------ Alford	Slope, seepage.	Favorable---------	Not needed-------	Slope----------	Slope, erodes easily.
331---------- Haymond	Seepage----------	Piping----------	Not needed-------	Not needed-------	Erodes easily.
333---------- Wakeland	Seepage----------	Piping, wetness.	Frost action, floods.	Not needed-------	Wetness, erodes easily.
334---------- Birds	Favorable---------	Wetness----------	Floods, frost action.	Not needed-------	Wetness, erodes easily.
420---------- Piopolis	Favorable---------	Wetness----------	Floods, frost action, percs slowly.	Not needed-------	Wetness, erodes easily, percs slowly.
422---------- Cape	Favorable---------	Wetness, hard to pack.	Percs slowly, frost action.	Not needed-------	Wetness, percs slowly.
426---------- Karnak	Favorable---------	Wetness----------	Percs slowly, frost action.	Not needed-------	Wetness, percs slowly.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
427---------- Burnside	Seepage, depth to rock.	Seepage----------	Not needed-------	Large stones, small stones.	Erodes easily, large stones, depth to rock.
456---------- Ware	Seepage----------	Piping, seepage.	Not needed-------	Too sandy--------	Favorable.
475---------- Elsah	Seepage----------	Large stones, seepage.	Not needed-------	Large stones-----	Large stones.
589---------- Bowdre	Severe: seepage.	Moderate: seepage, piping.	Wetness, percs slowly.	Percs slowly, wetness.	Percs slowly, wetness.
590---------- Cairo	Seepage----------	Hard to pack, wetness.	Floods, percs slowly.	Wetness, percs slowly, too sandy.	Wetness, percs slowly.
682---------- Medway	Seepage----------	Piping; wetness.	Frost action, floods.	Not needed-------	Favorable.
787---------- Banlic	Favorable---------	Piping, wetness.	Percs slowly, frost action.	Not needed-------	Wetness, percs slowly, erodes easily.
801B*, 802D*. Orthents					
852E*:					
Alford----------	Slope, seepage.	Favorable---------	Not needed-------	Slope----------	Slope, erodes easily.
Wellston---------	Slope, seepage, depth to rock.	Thin layer--------	Not needed-------	Slope----------	Erodes easily, slope.
864*. Pits					
930F*:					
Alford----------	Slope, seepage.	Favorable---------	Not needed-------	Slope----------	Slope, erodes easily.
Goss----------	Seepage, slope.	Large stones------	Not needed-------	Slope, large stones.	Slope, droughty, large stones.
930G*:					
Goss----------	Seepage, slope.	Large stones------	Not needed-------	Slope, large stones.	Slope, droughty, large stones.
Alford----------	Slope, seepage.	Favorable---------	Not needed-------	Slope----------	Slope, erodes easily.
940E*:					
Zanesville-------	Depth to rock, seepage.	Piping, thin layer, wetness.	Percs slowly, slope.	Slope, percs slowly, erodes easily.	Percs slowly, erodes easily, slope.
Westmore---------	Slope, depth to rock.	Hard to pack------	Not needed-------	Percs slowly, slope.	Slope, erodes easily, percs slowly.
954E*:					
Alford----------	Slope, seepage.	Favorable---------	Not needed-------	Slope----------	Slope, erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
954E*: Baxter	Favorable	Low strength, hard to pack.	Not needed	Slope, erodes easily.	Slope, erodes easily.
977F*:					

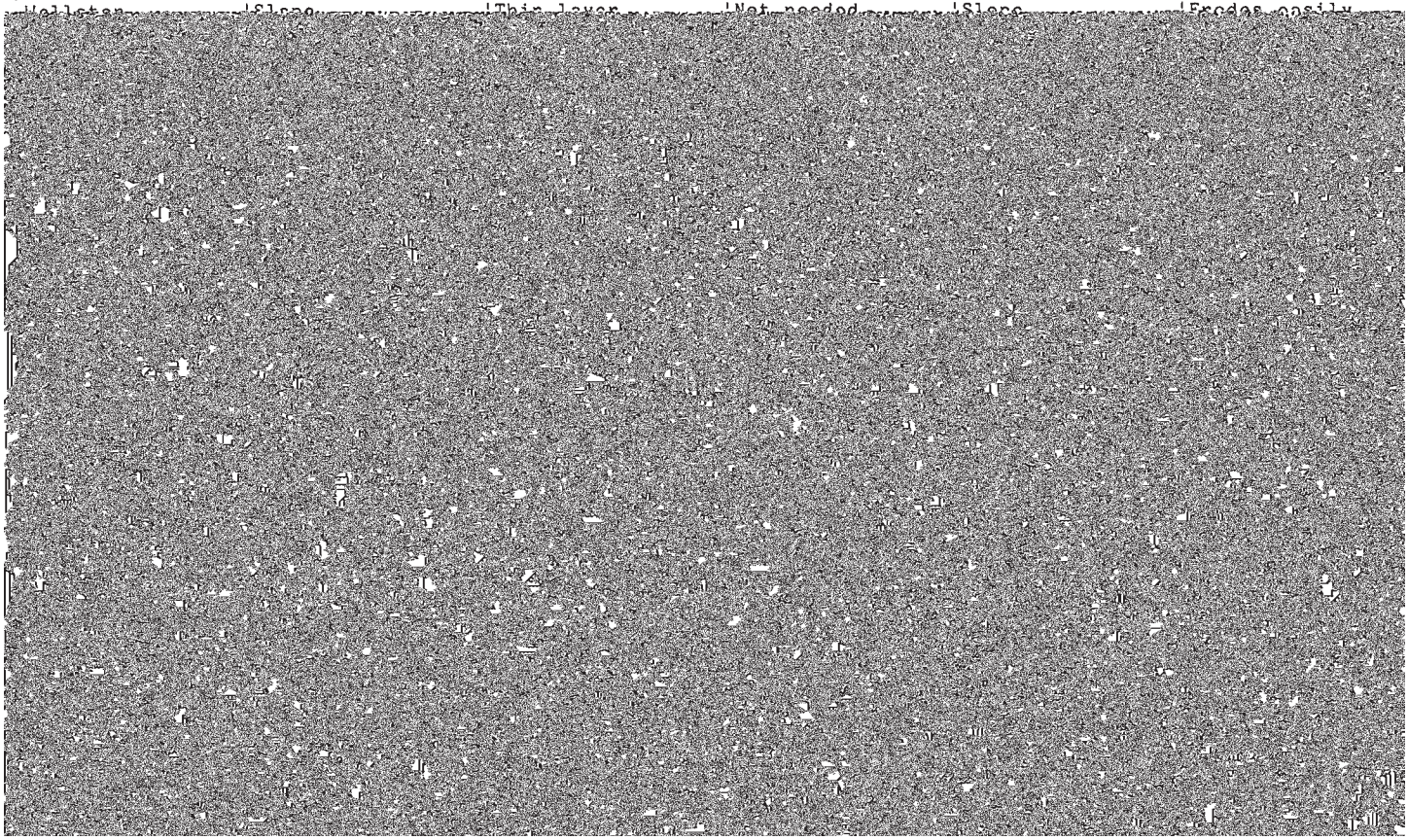


TABLE 12.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
71--- Darwin	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness.
75C--- Drury	Slight---	Slight---	Severe: slope.	Slight---	Slight.
85--- Jacob	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness.
92--- Sarpy	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
162--- Gorham	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
164A--- Stoy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
180--- Dupo	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods.
214B--- Hosmer	Severe: percs slowly.	Slight---	Severe: percs slowly.	Slight---	Slight.
214C2--- Hosmer	Severe: percs slowly.	Moderate: slope.	Severe: percs slowly, slope.	Slight---	Moderate: slope.
214C3--- Hosmer	Severe: percs slowly.	Moderate: slope, too clayey.	Severe: percs slowly, slope.	Moderate: too clayey.	Moderate: too clayey, slope.
214D2--- Hosmer	Severe: slope, percs slowly.	Severe: slope.	Severe: percs slowly, slope.	Moderate: slope.	Severe: slope.
214D3--- Hosmer	Severe: slope, percs slowly.	Severe: slope.	Severe: percs slowly, slope.	Moderate: too clayey, slope.	Severe: slope.
214E--- Hosmer	Severe: slope, percs slowly.	Severe: slope.	Severe: percs slowly, slope.	Moderate: slope.	Severe: slope.
214E3--- Hosmer	Severe: slope, percs slowly.	Severe: slope.	Severe: percs slowly, slope.	Moderate: too clayey, slope.	Severe: slope.
284A--- Tice	Severe: floods, wetness.	Moderate: wetness, too clayey.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: too clayey, wetness.
308B2--- Alford	Slight---	Slight---	Moderate: slope.	Slight---	Slight.
308C2--- Alford	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight---	Moderate: slope.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
308C3---------- Alford	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope.
308D2---------- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
308D3---------- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.
308E---------- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
308E3---------- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.
331---------- Haymond	Severe: floods.	Slight----------	Slight----------	Slight----------	Slight.
333---------- Wakeland	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods.
334---------- Birds	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: floods, wetness.
420---------- Piopolis	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
422---------- Cape	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
426---------- Karnak	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness.	Severe: too clayey, wetness.

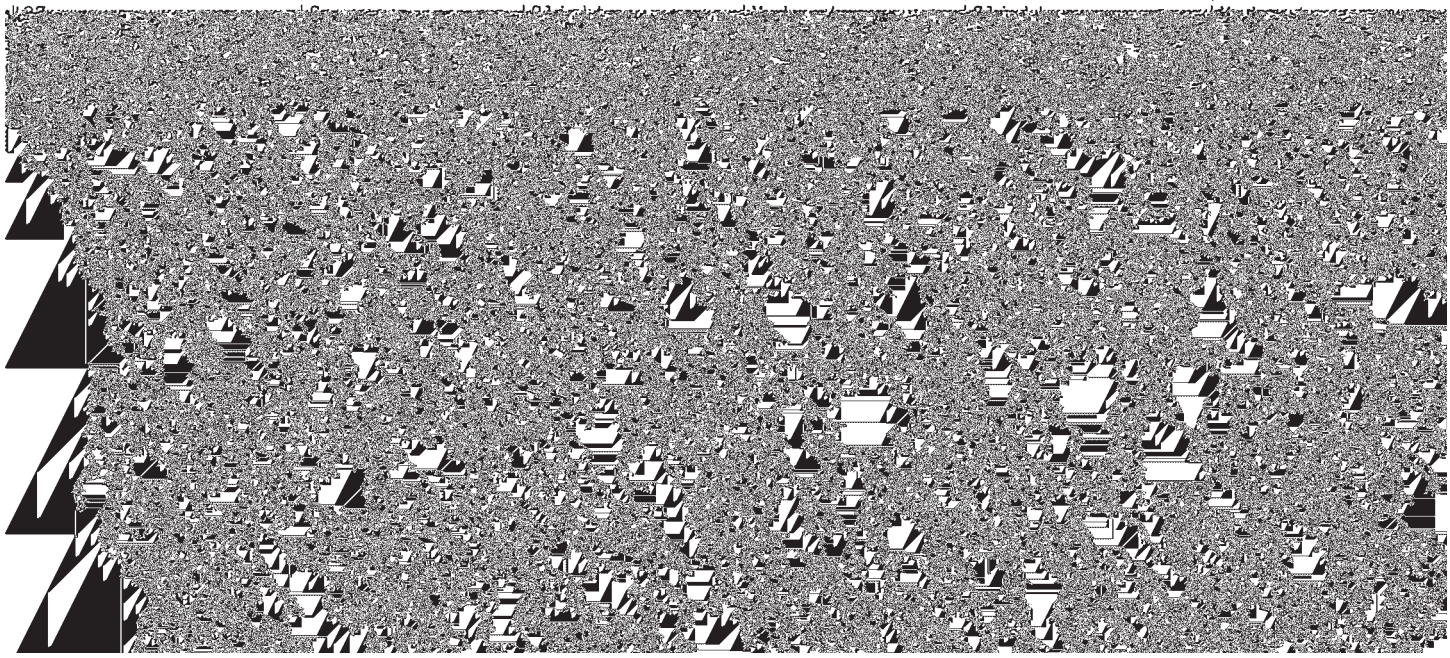


TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
801B*, 802D*. Orthents					
852E*: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
864*. Pits					
930F*: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
930G*: Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
940E*: Zanesville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Westmore	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
954E*: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Baxter	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
977F*: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Neotoma	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: small stones, slope.
1334 Birds	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: floods, wetness.
1426 Karnak	Severe: floods, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.
3071 Darwin	Severe: wetness, floods, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.
3092 Sarpy	Severe: floods.	Moderate: too sandy.	Severe: floods.	Moderate: too sandy.	Severe: floods.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
3456---------- Ware	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
3590---------- Cairo	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.
3682---------- Medway	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Moderate: too clayey, floods.	Severe: floods.
4426---------- Karnak	Severe: floods, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: too clayey, wetness, floods.
5308D*---------- Alford	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
71---------- Darwin	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
75C---------- Drury	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
85---------- Jacob	Poor	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair.
92---------- Sarpy	Poor	Poor	Fair	Poor	Very poor	Very poor	Poor	Poor	Very poor.
162---------- Gorham	Good	Fair	Good	Fair	Good	Fair	Good	Fair	Fair.
164A---------- Stoy	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
180---------- Dupo	Good	Good	Good	Good	Fair	Good	Good	Good	Fair.
214B---------- Hosmer	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
214C2, 214C3------- Hosmer	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
214D2, 214D3------- Hosmer	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
214E, 214F3-----	Very poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very

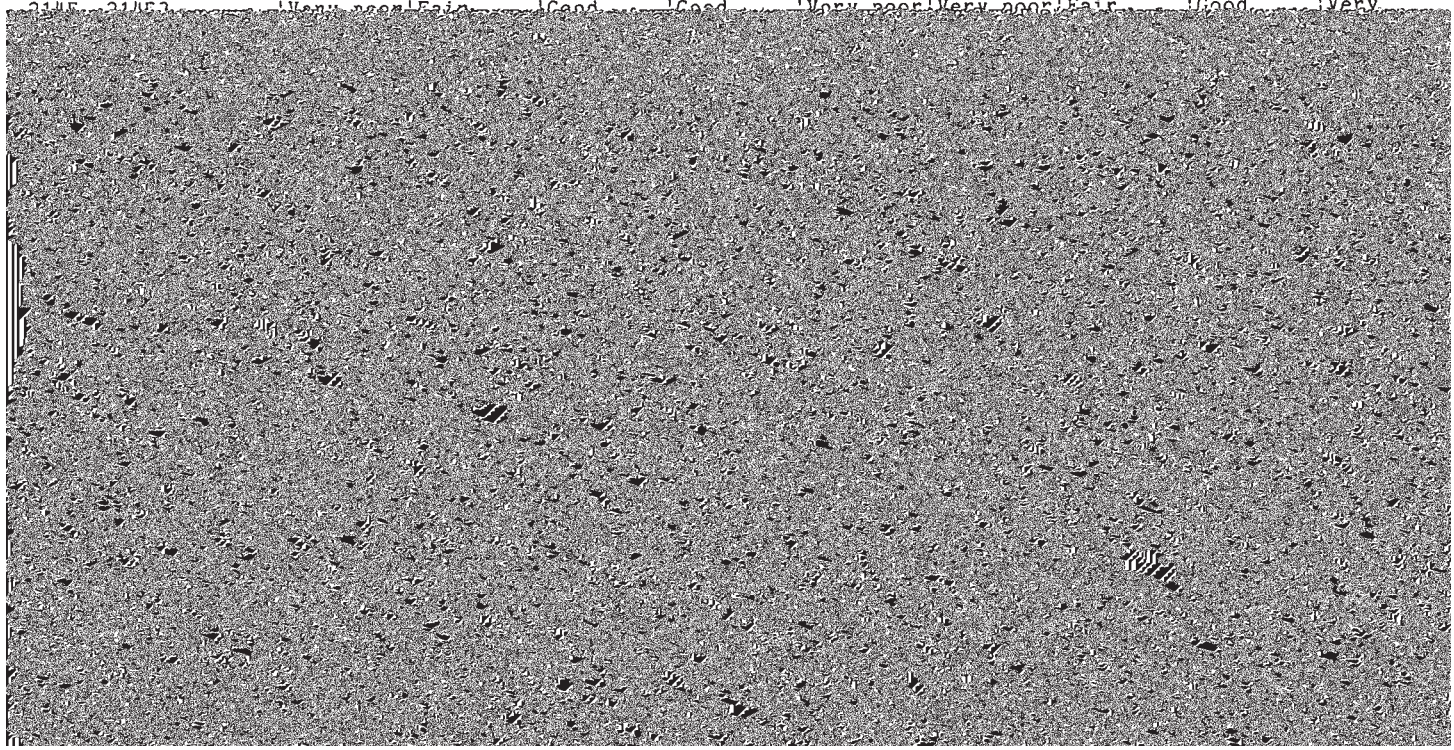


TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
427---------- Burnside	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor.
456---------- Ware	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
475---------- Elsah	Fair	Fair	Fair	Good	Poor	Poor	Fair	Good	Poor.
589---------- Bowdre	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Poor.
590---------- Cairo	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
682---------- Medway	Good	Good	Fair	Good	Poor	Poor	Good	Good	Poor.
787---------- Banlic	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
801B*, 802D*. Orthents									
852E*:									
Alford----------	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Wellston----------	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
864*. Pits									
930F*:									
Alford----------	Very poor	Poor	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
Goss----------	Very poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
930G*:									
Goss----------	Very poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Alford----------	Very poor	Poor	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
940E*:									
Zanesville--------	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Westmore----------	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
954E*:									
Alford----------	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Baxter----------	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
977F*:									
Wellston----------	Very poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
977F*:									
Neotoma	Very poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
1334 Birds	Poor	Fair	Good	Good	Good	Good	Fair	Good	Good.
1426	Very poor	Poor	Poor	Fair	Good	Good	Poor	Fair	Good

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

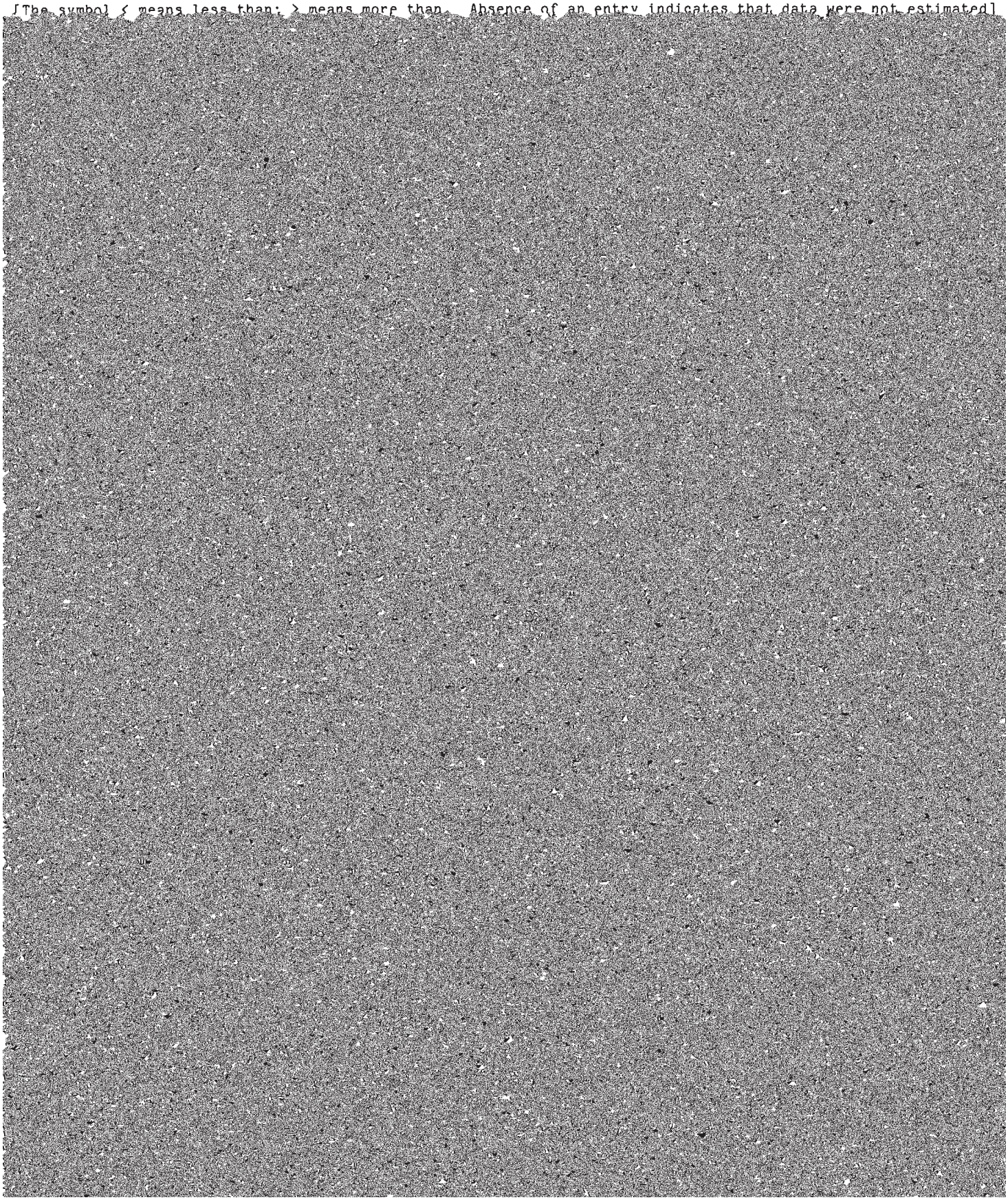


TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
214E3----------	0-5	Silty clay loam	CL	A-6	0	100	100	90-100	80-100	30-40	10-20
Hosmer	5-12	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	12-44	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	44-60	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
284A----------	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	92-100	70-95	32-45	12-22
Tice	11-60	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	92-100	70-95	35-45	12-22
308B2, 308C2-------	0-8	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Alford	8-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	48-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
308C3----------	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
Alford	3-45	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	45-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
308D2----------	0-8	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Alford	0-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	48-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
308D3----------	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
Alford	3-45	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	45-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
308E----------	0-8	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Alford	8-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	48-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
308E3----------	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
Alford	3-45	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	45-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
321	0-30	Silt loam	ML	A-4	0	100	100	90-100	80-90	23-36	4-10

TABLE 14--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
456---------- Ware	0-21	Loam, fine sandy loam.	ML, CL-ML, CL	A-4	0	100	100	95-100	50-70	20-36	2-10
	21-60	Stratified silt loam to sand.	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-90	10-60	<25	NP-6
475---------- Elsah	0-15	Silt loam-------	CL-ML, CL	A-4, A-6	0-15	100	95-100	95-100	85-100	22-32	4-12
	15-40	Cherty loam, very cherty loam, very cherty sand.	SM, ML, CL	A-2, A-4	15-60	80-90	70-85	60-80	30-70	<30	NP-8
	40-60	Very cherty loam, very cobbly loam.	GM, GP-GM	A-1	60-85	20-50	20-45	20-40	10-25	<30	NP-6
589---------- Bowdre	0-17	Silty clay------	CH	A-7	0	100	100	95-100	90-95	51-65	28-40
	17-23	Silt loam, loam	CL-ML, CL, ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-12
	23-60	Very fine sandy loam, silt loam, loam.	SC, CL, CL-ML, SM-SC	A-2, A-4	0	100	100	60-100	30-90	20-30	5-10
590---------- Cairo	0-39	Silty clay, clay loam.	CH, CL	A-7	0	100	100	95-100	90-100	45-80	25-55
	39-73	Sandy loam, loamy very fine sand, fine sand.	SM, SC, SM-SC	A-2, A-4	0	100	65-100	50-80	15-45	15-30	NP-10
682---------- Medway	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
	9-28	Loam, clay loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	80-95	75-90	70-90	20-48	4-20
	28-60	Loam, very fine sandy loam, loamy fine sand, loamy very fine sand.	ML, CL, SM, SC	A-4, A-2	0	80-95	70-90	40-70	30-60	15-30	NP-10
787---------- Banlic	0-13	Silt loam-------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-95	21-29	3-9
	13-22	Silt loam-------	ML, CL-ML, CL	A-4	0	100	95-100	90-100	80-95	22-32	3-10
	22-60	Silt loam, silt	ML, CL-ML, CL	A-4	0	100	95-100	90-100	80-95	22-32	3-10
801B*, 802D*. Orthents											
852E*:											
Alford----------	0-9	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	9-49	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	49-66	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Wellston----------	0-13	Silt loam-------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	13-39	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	39-62	Silt loam, loam, channery loam, channery silty clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-20	65-90	65-90	60-90	40-65	20-35	5-15
864*. Pits											
930F*:											
Alford----------	0-6	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	6-92	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
930F*:											
Goss	0-7	Silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	7-48	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	48-72	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
930G*:											

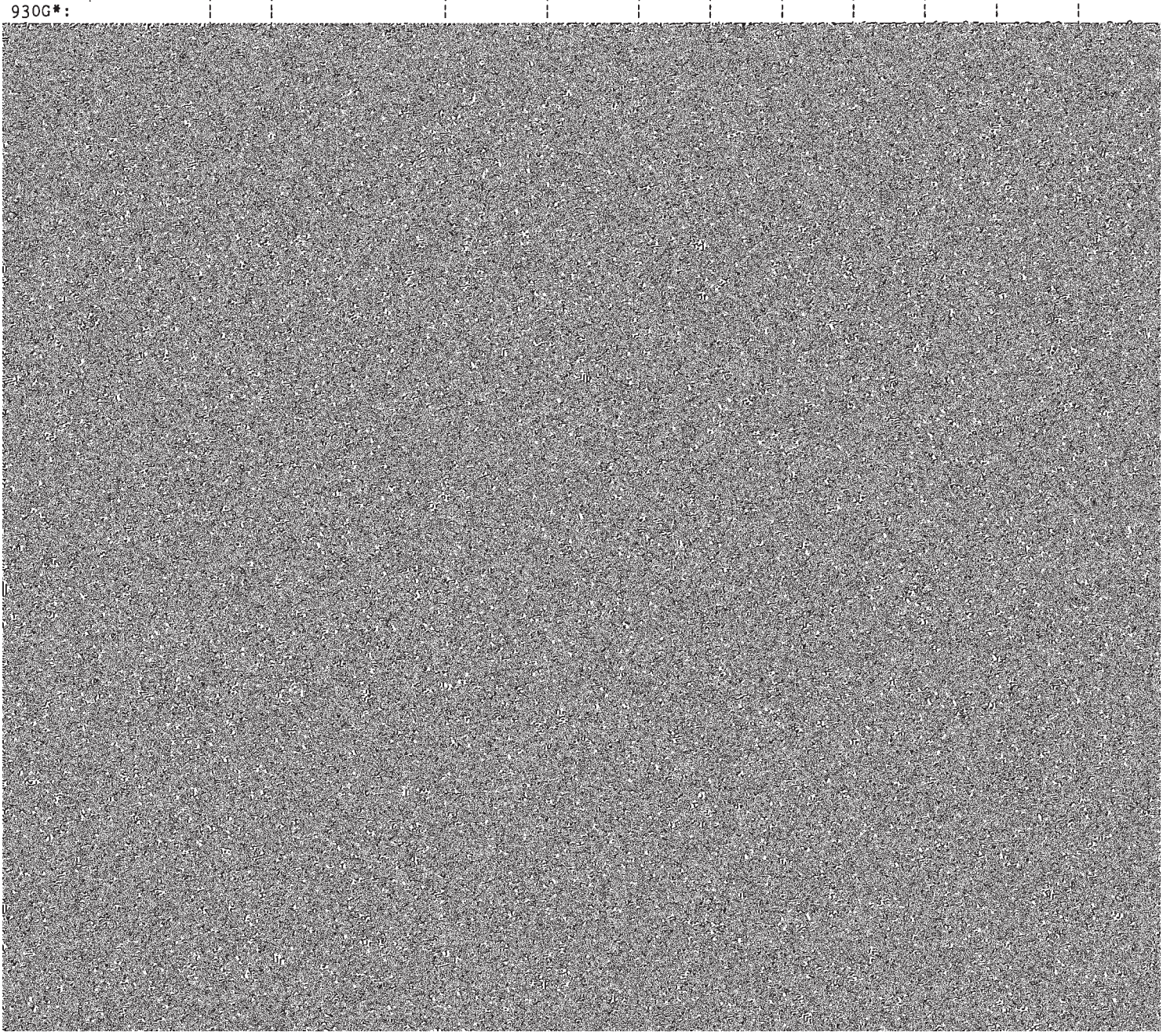


TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
977F*:											
Wellston	0-9	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	9-30	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	30-60	Very channery silty clay loam, very channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	15-90	65-90	65-90	60-90	40-65	20-35	5-15
Neotoma	0-10	Stony silt loam	ML, GM, SM	A-4	10-30	55-80	50-75	40-70	40-65	22-35	3-10
	10-48	Very flaggy loam, flaggy silt loam, very channery loam.	GM	A-2, A-4	40-85	40-65	35-60	30-50	25-45	<35	NP-8
	48-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
1334	0-6	Silt loam	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
Birds	6-60	Silt loam	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
1426	0-8	Silty clay	CH, CL, MH, ML	A-7	0	100	100	95-100	95-100	45-80	20-40
Karnak	8-60	Silty clay, clay	CH, MH, CL, ML	A-7	0	100	100	95-100	95-100	45-80	20-40
3071	0-27	Silty clay	CH	A-7	0	100	100	100	95-100	50-85	30-55
Darwin	27-63	Silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	95-100	90-100	35-70	20-45
3092	0-4	Loamy fine sand	SM	A-2	0	100	100	60-80	15-35	---	NP
Sarpy	4-60	Loamy fine sand, fine sand.	SM	A-2	0	100	100	60-80	15-35	---	NP
3456	0-16	Fine sandy loam	ML, CL-ML, CL	A-4	0	100	100	95-100	50-70	20-36	2-10
Ware	16-60	Stratified silt loam to sand.	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-90	10-60	<25	NP-6
3590	0-32	Silty clay	CH	A-7	0	100	100	95-100	90-100	51-80	31-55
Cairo	32-68	Stratified very fine sandy loam to silty clay loam.	CL, CL-ML, ML	A-7, A-6, A-4	0	100	100	85-100	50-100	15-50	8-30
3682	0-27	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-95	30-45	10-20
Medway	27-35	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	80-95	75-90	70-90	20-48	4-20
	35-60	Loam, sandy loam, gravelly loam.	ML, CL, SM, SC	A-4, A-2	0	80-95	70-90	40-70	30-60	15-30	NP-10
4426	0-48	Clay	CH, CL, MH, ML	A-7	0	100	100	95-100	95-100	45-80	20-40
Karnak	48-60	Silty clay, clay	CH, MH, CL, ML	A-7	0	100	100	95-100	95-100	45-80	20-40
5308D*	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Alford	7-43	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	43-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Organic matter is for the surface layer. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
71----------	0-10	<0.06	0.11-0.14	6.1-7.8	High----------	0.28	3	3-4
Darwin	10-62	<0.06	0.11-0.19	6.1-7.8	High----------	0.28		
75C----------	0-6	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	1-2
Drury	6-68	0.6-2.0	0.20-0.22	5.6-7.8	Low----------	0.37		
85----------	0-9	0.06-0.2	0.11-0.13	5.1-6.5	Very high------	0.28	3	1-2
Jacob	9-60	<0.06	0.09-0.13	3.6-5.5	Very high------	0.28		
92----------	0-14	>6.0	0.05-0.09	6.6-8.4	Low----------	0.15	5	0.5-1
Sarpy	14-60	>6.0	0.05-0.09	7.4-8.4	Low----------	0.15		
162----------	0-11	0.2-0.6	0.21-0.23	6.1-7.8	Moderate-------	0.32	5	3-4
Gorham	11-43	0.2-0.6	0.13-0.20	6.1-7.8	Moderate-------	0.32		
	43-60	2.0-20	0.05-0.13	6.1-7.8	Low----------	0.32		
164A----------	0-10	0.2-0.6	0.22-0.24	4.5-6.0	Low----------	0.43	3	1-2
Stoy	10-32	0.06-0.2	0.18-0.20	4.5-5.5	Moderate-------	0.43		
	32-50	0.06-0.2	0.09-0.12	4.5-5.5	Moderate-------	0.43		
	50-60	0.06-0.2	0.10-0.15	4.5-6.0	Low----------	0.43		
180----------	0-10	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	1-2
Dupo	10-24	0.2-0.6	0.20-0.22	5.6-8.4	Low----------	0.37		
	24-65	0.06-0.2	0.08-0.19	6.6-7.8	High----------	0.37		
214B, 214C2------	0-7	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.43	4	1-2
Hosmer	7-28	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	28-55	<0.06	0.06-0.08	4.5-5.0	Low----------	0.43		
	55-73	0.2-0.6	0.06-0.08	5.6-6.0	Low----------	0.43		
214C3----------	0-5	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.43	3	0.5-1
Hosmer	5-12	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	12-44	<0.06	0.06-0.08	4.5-5.0	Low----------	0.43		
	44-60	0.2-0.6	0.06-0.08	5.6-6.0	Low----------	0.43		
214D2----------	0-7	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.43	4	1-2
Hosmer	7-28	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	28-55	<0.06	0.06-0.08	4.5-5.0	Low----------	0.43		
	55-73	0.2-0.6	0.06-0.08	5.6-6.0	Low----------	0.43		
214D3----------	0-5	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.43	3	0.5-1
Hosmer	5-12	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	12-44	<0.06	0.06-0.08	4.5-5.0	Low----------	0.43		
	44-60	0.2-0.6	0.06-0.08	5.6-6.0	Low----------	0.43		
214E----------	0-7	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.43	4	1-2
Hosmer	7-28	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	28-55	<0.06	0.06-0.08	4.5-5.0	Low----------	0.43		
	55-73	0.2-0.6	0.06-0.08	5.6-6.0	Low----------	0.43		
214E3----------	0-5	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.43	3	0.5-1
Hosmer	5-12	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43		
	12-44	<0.06	0.06-0.08	4.5-5.0	Low----------	0.43		

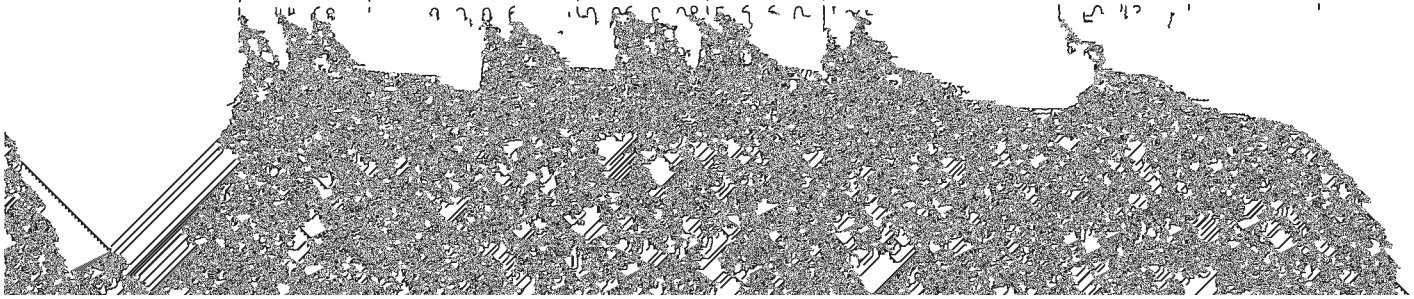


TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
308D2----------	0-8	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	1-2
Alford	0-48	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-------	0.37		
	48-70	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		
308D3----------	0-3	0.6-2.0	0.21-0.23	4.5-6.5	Moderate-------	0.37	4	0.5-1
Alford	3-45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-------	0.37		
	45-60	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		
308E----------	0-8	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	1-2
Alford	8-48	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-------	0.37		
	48-70	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		
308E3----------	0-3	0.6-2.0	0.21-0.23	4.5-6.5	Moderate-------	0.37	4	0.5-1
Alford	3-45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-------	0.37		
	45-60	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		
331----------	0-20	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	1-2
Haymond	20-62	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37		
333----------	0-7	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	1-2
Wakeland	7-60	0.6-2.0	0.20-0.22	6.6-7.3	Low----------	0.37		
334----------	0-11	0.2-0.6	0.22-0.24	5.6-7.8	Low----------	0.43	5	1-2
Birds	11-60	0.2-0.6	0.20-0.22	5.1-7.8	Low----------	0.43		
420----------	0-7	0.06-0.2	0.21-0.23	5.1-5.5	Moderate-------	0.43	4	1-2
Piopolis	7-45	0.06-0.2	0.18-0.20	5.1-5.5	Moderate-------	0.43		
	45-60	0.06-0.2	0.18-0.20	6.6-7.3	Moderate-------	0.43		
422----------	0-12	0.06-0.2	0.18-0.21	4.5-7.3	Moderate-------	0.32	3	1-2
Cape	12-47	<0.06	0.10-0.13	3.6-5.5	High----------	0.32		
	47-60	0.06-0.2	0.15-0.20	3.6-5.5	Moderate-------	0.32		
426----------	0-6	0.06-0.2	0.11-0.14	5.6-6.0	High----------	0.32	3	1-2
Karnak	6-75	<0.2	0.09-0.13	5.6-7.3	High----------	0.32		
427----------	0-14	0.6-2.0	0.22-0.24	4.5-6.0	Low----------	0.37	4	1-2
Burnside	14-63	0.6-2.0	0.10-0.16	4.5-5.5	Low----------	0.37		
	63-69	---	---	---	----------	---		
456----------	0-21	0.6-2.0	0.16-0.24	5.6-8.4	Low----------	0.28	3	2-3
Ware	21-60	2.0-6.0	0.07-0.19	6.1-7.8	Very low-------	0.24		
475----------	0-15	0.6-2.0	0.17-0.24	5.6-7.3	Low----------	0.24	4	1-2
Elsah	15-40	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17		
	40-60	2.0-6.0	0.06-0.11	5.6-7.3	Low----------	0.17		
589----------	0-17	0.06-0.2	0.15-0.20	5.6-7.3	High----------	0.37	3	2-3
Bowdre	17-23	0.2-0.6	0.19-0.22	6.1-8.4	Low----------	0.32		
	23-60	0.6-2.0	0.15-0.22	6.1-8.4	Low----------	0.32		
590----------	0-39	<0.06	0.09-0.17	6.1-7.8	High----------	0.28	4	3-4
Cairo	39-73	6.0-20	0.08-0.18	6.1-7.8	Low----------	0.17		
682----------	0-9	0.6-2.0	0.16-0.20	6.1-8.4	Low----------	0.32	5	3-5
Medway	9-28	0.6-2.0	0.14-0.18	6.1-8.4	Low----------	---		
	28-60	0.6-2.0	0.08-0.15	6.6-8.4	Low----------	---		
787----------	0-13	0.2-0.6	0.22-0.24	4.5-6.5	Low----------	0.43	3	1-2
Banlic	13-22	0.06-0.2	0.20-0.22	4.5-6.0	Low----------	0.43		
	22-60	0.06-0.2	0.11-0.12	4.5-6.0	Low----------	0.43		
801B*, 802D*. Orthents								
852E*:								
Alford----------	0-9	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	1-2
	9-49	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-------	0.37		
	49-66	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

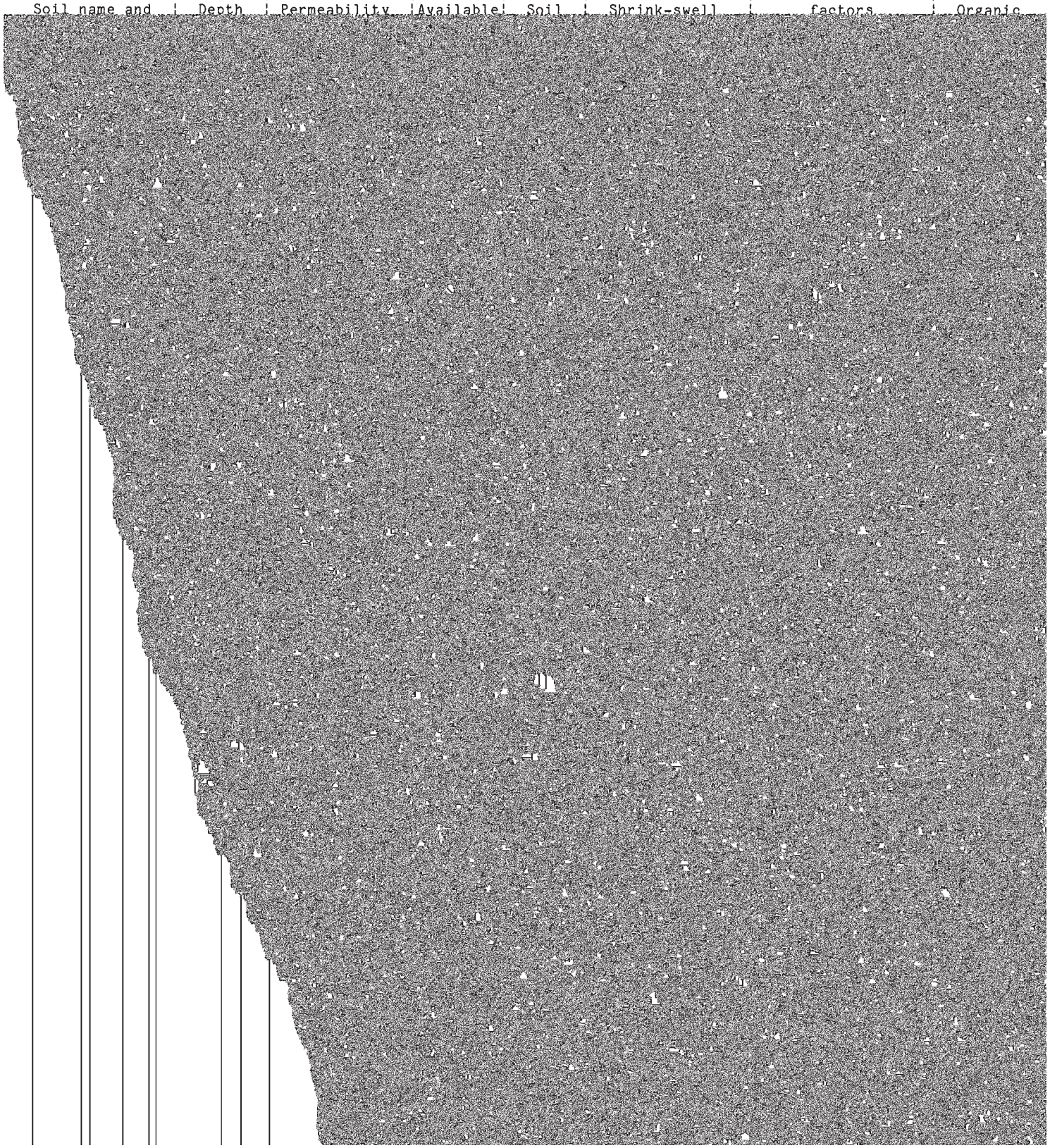


TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
3590----------	0-32	<0.06	0.11-0.14	7.4-7.8	High----------	0.28	4	3-4
Cairo	32-68	0.2-2.0	0.15-0.20	7.9-8.4	Low----------	0.28		
3682----------	0-27	0.6-2.0	0.16-0.20	6.1-8.4	Low----------	0.32	5	3-5
Medway	27-35	0.6-2.0	0.14-0.18	6.1-8.4	Low----------	---		
	35-60	0.6-2.0	0.08-0.15	6.6-8.4	Low----------	---		
4426----------	0-48	0.06-0.2	0.11-0.14	5.6-6.0	High----------	0.32	5	5-7
Karnak	48-60	<0.2	0.09-0.13	5.6-7.3	High----------	0.32		
5308D*----------	0-7	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	1-2
Alford	7-43	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-------	0.37		
	43-60	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES--Continued

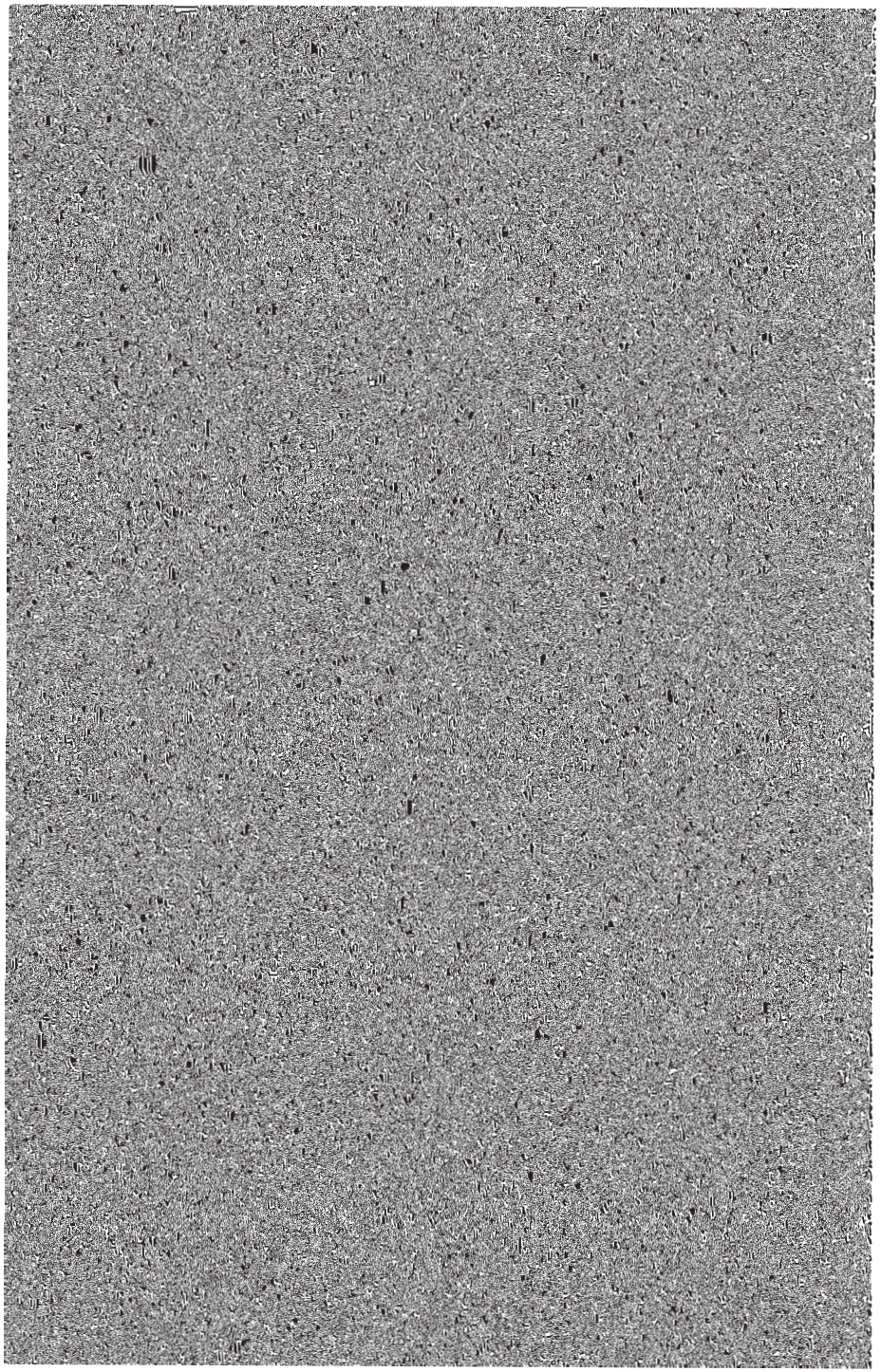
Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
426---------- Karnak	D	Rare--------	---	---	0-3.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Moderate.
427---------- Burnside	B	Occasional	Brief-----	Mar-Jun	3.0-5.0	Apparent	Feb-Jun	29-65	Hard	Moderate	Low------	High.
456---------- Ware	B	Rare--------	---	---	4.0-6.0	Apparent	Apr-Jun	>60	---	Moderate	Low------	Low.
475---------- Elsah	B	Frequent----	Brief-----	Dec-May	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
589---------- Bowdre	C	Rare--------	---	---	1.5-2.0	Perched	Jan-Apr	>60	---	---	High-----	Low.
590---------- Cairo	D	Common------	Brief-----	Nov-Jun	0-2.0	Apparent	Nov-Jun	>60	---	Moderate	High-----	Moderate.
682---------- Medway	B	Common------	Very brief	Nov-Jun	1.5-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
787---------- Banlic	C	Rare--------	---	---	1.0-3.0	Perched	Jan-Jun	>60	---	High-----	High-----	High.
801B*, 802D*. Orthents												
852E*:												
Alford-------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Wellston-----	B	None--------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
864*. Pits												
930F*:												
Alford-------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Goss---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
930G*:												
Goss---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Alford-------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
940E*:												
Zanesville---	C	None--------	---	---	2.0-3.0	Perched	Dec-Apr	40-80	Hard	---	Moderate	High.
Westmore-----	B	None--------	---	---	>6.0	---	---	>48	Hard	High-----	High-----	Moderate.
954E*:												
Alford-------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Baxter-------	B	None--------	---	---	>6.0	---	---	>60	---	---	High-----	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
977F*: Wellston	B	None	---	---	>6.0	---	---	>40	Hard	High	Moderate	High.
Neotoma	B	None	---	---	>6.0	---	---	40-80	Hard	Low	Low	Moderate.
1334 Birds	C/D	Frequent	Long	Mar-Jun	0-1.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
1426 Karnak	D	Frequent	Long	Mar-May	0-3.0	Apparent	Apr-Jun	>60	---	High	High	Moderate.
3071 Darwin	D	Frequent	Long	Jan-Jun	0-2.0	Apparent	Jan-Jun	>60	---	Moderate	High	Low.
3092 Sarpy	A	Frequent	Brief to long.	Nov-Jun	>6.0	---	---	>60	---	Low	Low	Low.
3456 Ware	B	Common	Brief	Oct-Jun	4.0-6.0	Apparent	Apr-Jun	>60	---	Moderate	Low	Low.
3590 Cairo	D	Frequent	Long	Nov-Jun	0-2.0	Apparent	Nov-Jun	>60	---	Moderate	High	Low.
3682 Medway	B	Common	Very brief	Nov-Jun	1.5-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
4426 Karnak	D	Frequent	Long	Mar-May	0-3.0	Apparent	Apr-Jun	>60	---	High	High	Moderate.
5308D* Alford	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.

* See description of the map unit for composition and behavior characteristics of the map unit.



DATA

Percentage passing sieve--		Percentage smaller than--				Liquid limit	Plasticity index	Classification	
No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	Unified
						Pct			
97.9	96.3	89.3	54.4	21.0	15.5	28.9	6.7	A-4(6)	CL-ML
100	99.5	95.5	84.2	52.6	40.0	55.7	34.1	A-7-6 (38)	CH
100	80.9	69.5	32.6	14.6	13.6	---	NP	A-4(0)	ML
100	96.2	93.4	74.2	50.2	41.3	51.8	30.7	A-7-6 (33)	CH
100	80.1	74.2	58.3	34.6	27.5	39.8	21.3	A-6(16)	CL
99.9	2.5	1.3	1.2	1.1	1.0	---	NP	A-3(0)	SP
99.4	89.5	79.7	31.6	12.6	9.2	27.7	4.4	A-4(3)	ML

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report number 75-IL-091	Depth	Moisture density		Percentage passing sieve--				Percentage smaller than--				Liquid limit	Plasticity index	Classification	
				Maximum dry density	Optimum moisture	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	Unified
			In	lb/cu ft	Pct									Pct			
Hosmer silt loam:																	
Union County, 1,200 feet north and 400 feet west of the southeast corner SW1/4 sec. 16, T. 11 S., R. 1 E. (Modal)	Loess.	5-1	7-18	102.5	20.1	100	100	99.3	97.6	91.2	64.3	30.2	22.9	41.2	19.2	A-7-6 (20)	CL
		5-2	28-41	101.1	21.0	100	100	99.5	98.1	92.9	62.3	30.2	25.8	43.9	24.5	A-7-6 (26)	CL
Jacob silty clay:																	
Union County, 100 feet west and 700 feet south of the center of sec. 33, T. 11 S., R. 3 W. (Modal)	Clay.	1-1	0-60	85.2	30.5	100	100	99.8	98.9	97.2	90.2	68.6	62.3	87.4	58.4	A-7-6 (57)	CH
Medway silty clay loam:																	
Union County, 320 feet west and 740 feet south of the northeast corner of sec. 8, T. 12 S., R. 3 W. (Modal)	Alluvium.	8-1	9-19	104.6	19.1	100	100	100	80.0	72.5	52.6	30.6	24.8	38.3	19.2	A-6(14)	CL
		8-2	28-36	103.8	15.0	100	100	100	15.5	14.8	8.4	5.1	4.9	---	NP	A-2-4 (0)	SM
		8-3	45-58	96.7	17.0	100	100	99.9	5.0	3.2	2.0	1.1	1.0	---	NP	A-3(0)	SP
Tice silty clay loam:																	
Union County, 460 feet west and 40 feet south of the center of sec. 10, T. 12 S., R. 3 W. (Modal)	Loamy alluvium	10-1	14-24	101.7	18.4	100	100	99.9	75.3	45.4	32.7	25.0	23.5	39.5	16.4	A-6(12)	CL
		10-2	37-48	100.6	19.8	100	100	99.9	81.2	66.3	53.5	38.6	34.3	42.0	19.9	A-7-6 (16)	CL

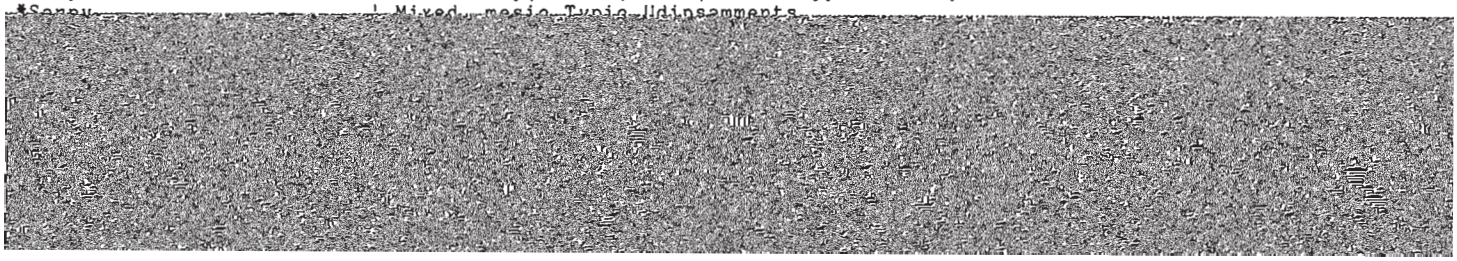
TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report number 75-IL-091	Depth	Moisture density		Percentage passing sieve--				Percentage smaller than--				Liquid limit	Plasticity index	Classification	
				Maximum dry density	Optimum moisture	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	Unified
			In	lb/cu ft	Pct									Pct			
akeland silt oam: Union County, 1,550 feet east and 1,550 feet north of the southwest corner of fractional sec. 7, T. 12 S., R. 1 E. (Modal)	Silty alluvium	2-1	0-60	104.5	18.0	100	100	99.8	98.6	91.7	78.4	26.6	19.5	27.8	6.4	A-4(6)	CL-ML
are loam: Union County, 2,400 feet west and 250 feet south of the northeast corner of sec. 16, T. 12 S., R. 3 W. (Modal)	Loamy alluvium	7-1	12-21	101.6	17.7	100	100	100	59.1	37.4	14.6	9.0	8.1	---	NP	A-4(0)	ML
		7-2	21-28	98.9	18.2	100	100	100	45.5	28.4	9.6	5.5	4.9	---	NP	A-4(0)	SM
		7-3	48-55	104.9	15.8	100	100	97.1	7.0	6.2	4.1	1.3	1.2	---	NP	A-3(0)	SP-SM

TABLE 18.--CLASSIFICATION OF THE SOILS

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

Soil name	Family or higher taxonomic class
Alford	Fine-silty, mixed, mesic Typic Hapludalfs
Banlic	Coarse-silty, mixed, nonacid, mesic Aeric Haplaquepts
Baxter	Fine, mixed, mesic Typic Paleudalfs
Birds	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Bowdre	Clayey over loamy, montmorillonitic, thermic Fluvaquentic Hapludolls
Burnside	Loamy-skeletal, mixed, acid, mesic Typic Udifluvents
*Cairo	Clayey over sandy or sandy-skeletal, montmorillonitic, thermic Vertic Haplaquolls
Cape	Fine, montmorillonitic, acid, mesic Typic Fluvaquents
Darwin	Fine, montmorillonitic, mesic Vertic Haplaquolls
Drury	Fine-silty, mixed, mesic Dystric Eutrochrepts
Dupo	Coarse-silty over clayey, mixed, nonacid, mesic Aquic Udifluvents
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Gorham	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs
Jacob	Very-fine, montmorillonitic, acid, mesic Vertic Haplaquepts
Karnak	Fine, montmorillonitic, nonacid, mesic Vertic Haplaquepts
Medway	Fine-loamy, mixed, mesic Fluvaquentic Hapludolls
Neotoma	Loamy-skeletal, mixed, mesic Ultic Hapludalfs
Piopolis	Fine-silty, mixed, acid, mesic Typic Fluvaquents
*Sarpy	Mixed, mesic Typic Udipsamments



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