United States
Department of
Agriculture

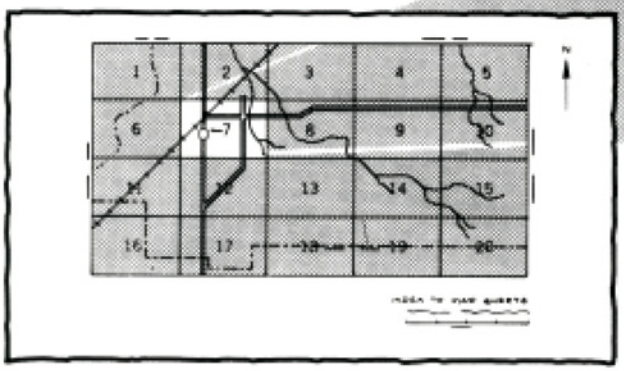
Soil
Conservation
Service

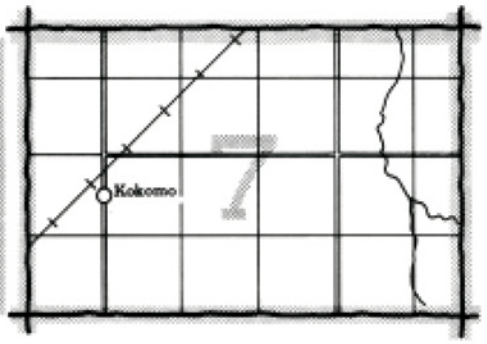
In Cooperation with
The Pennsylvania
State University
College of Agriculture
Pennsylvania Department of
Environmental Resources
State Conservation
Commission

Soil Survey of Wayne County Pennsylvania

HOW TO USE

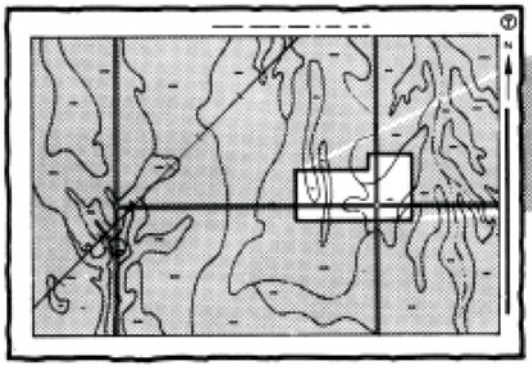
1. Locate your area of interest on the "Index to Map Sheets"

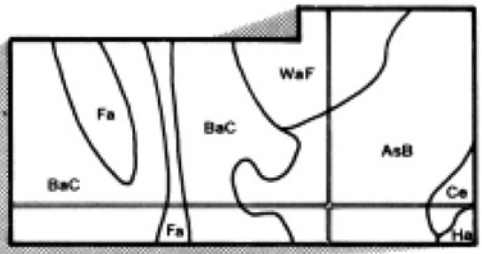




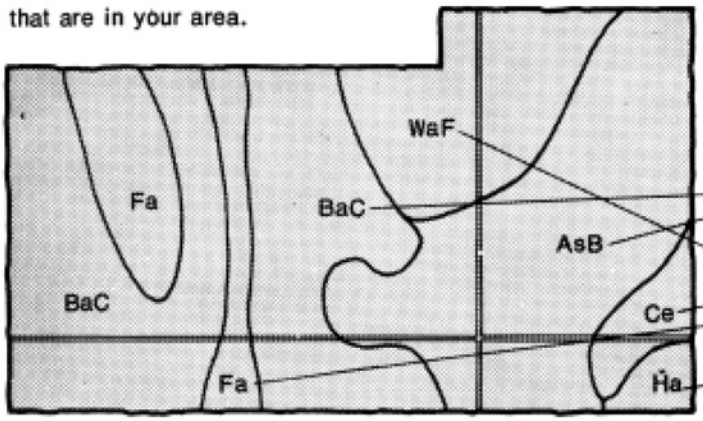
2. Note the number of the map sheet and turn to that sheet.

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





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



Symbols

AsB
BaC
Ce
Fa
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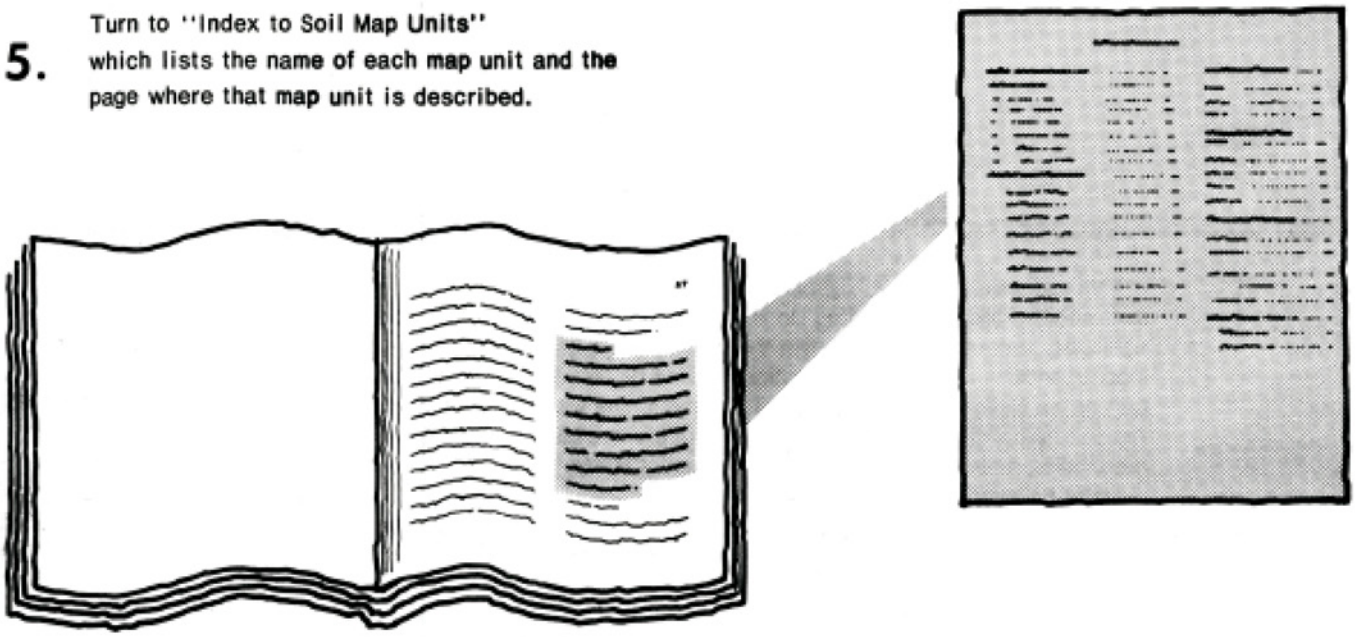
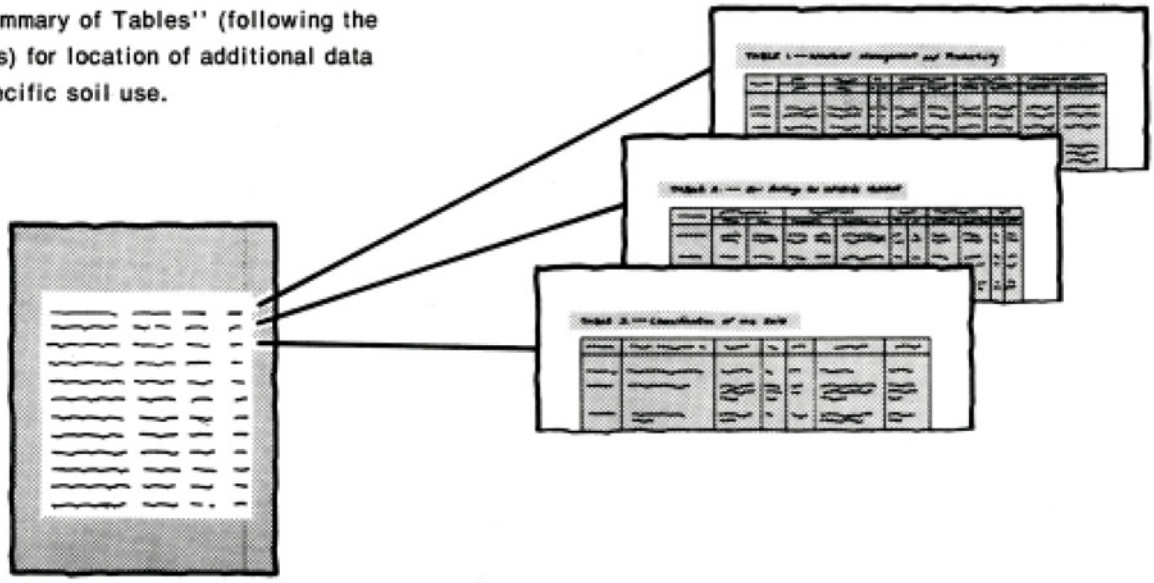
THIS SOIL SURVEY

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 performed in the period 1967 to 1976. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service and the Pennsylvania Department of Environmental Resources, State Conservation Commission, The Pennsylvania State University, College of Agriculture. It is part of the technical assistance furnished to the Wayne Conservation District. Financial assistance was provided by the Wayne County Board of Commissioners.

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

Cover: Diversions and contour stripcropping are used to reduce erosion on Morris channery loam and Wellsboro channery loam. These soils have slopes of 3 to 8 percent.

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Issued September 1985

Index to map units

Summary of tables

Summary of tables—Continued

Foreword

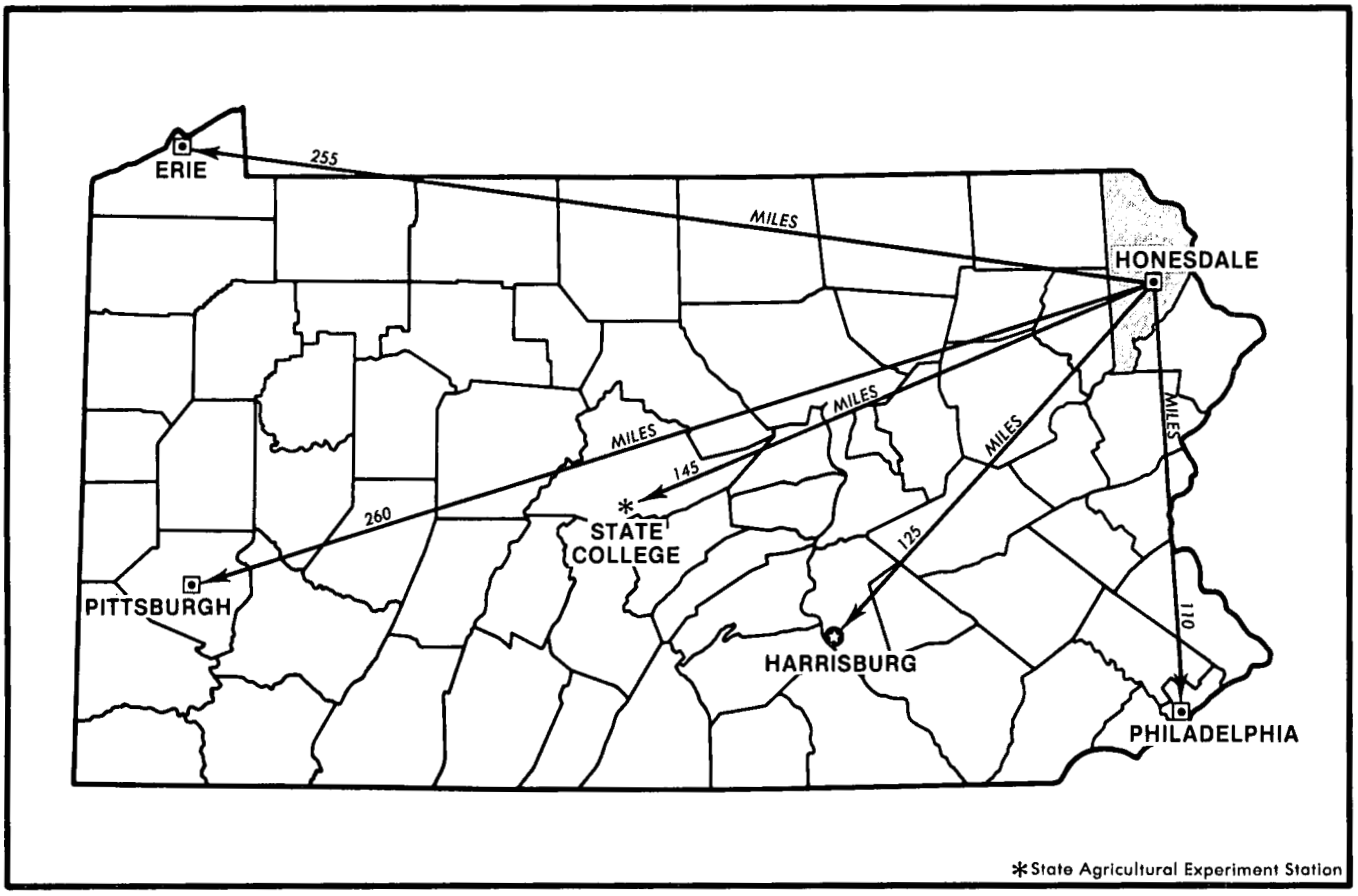
This soil survey contains much information useful in land-planning programs in Wayne County, Pennsylvania. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome 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, ranchers, 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 home buyers 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 use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each 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.

Graham T. Munkittrick
State Conservationist
Soil Conservation Service



Location of Wayne County in Pennsylvania.

soil survey of

Wayne County, Pennsylvania

by George D. Martin, Soil Conservation Service

Fieldwork by George D. Martin, Charles A. Dennis, and Robert C. Malmgren, Soil Conservation Service

United States Department of Agriculture
Soil Conservation Service
in cooperation with

The Pennsylvania State University, College of Agriculture
Pennsylvania Department of Environmental Resources,
State Conservation Commission

Wayne County is located in the extreme northeastern part of Pennsylvania. It borders New York state to the north, the Delaware River to the east, Pike and Monroe Counties to the south, and Susquehanna and Lackawanna Counties to the west. The total land area in Wayne County is 744 square miles, or 476,160 acres. In 1970, according to the census of that year, the population of the county was 29,581. Honesdale, the county seat, is the largest borough. In 1970, it had a population of 5,224, and Hawley, the second largest borough, had a population of 1,331.

Because of the many lakes and streams and the rural character of Wayne County, many visitors are attracted to the area on weekends and for vacations. Many summer camps, which attract children mainly from the New York-New Jersey urban areas, are located around the lakes.

Wayne County has 28 municipalities—6 boroughs and 22 townships. About 82.5 percent of the county is farmland and woodland. According to the Wayne County Planning Data Reference, 31,310 acres, or approximately 7 percent of the total land area, is "unused space." "Unused space" refers mainly to land that has been taken from other uses and surveyed into individual building lots for future sale. It also includes vacant industrial sites.

Agriculture and its related industries have always been important to the economy of Wayne County. Since 1949, the number of farms and the number of acres in farms have consistently been decreasing. In 1949, there were 2,299 farms, and farmland comprised 299,332 acres. In 1969 there were 919 farms, and 173,469 acres was farmland.

On more than half of the land in Wayne County, the soils have a seasonal high water table and other wetness-related problems. Shallowness or moderate depth to bedrock is a limitation on many of the other soils.

General nature of the county

In this section, general information is given concerning

the physiography and geology and the climate of Wayne County.

Physiography and geology

Joseph N. Van, geologist, Soil Conservation Service, helped prepare this section.

Wayne County is in two physiographic provinces (*4*)—the Appalachian Plateaus Province and the Valley and Ridge Province. These two physiographic provinces are subdivisions of the Appalachian Highlands. The area of Wayne County that is in the Valley and Ridge Province is along the western border of the county. This area is the northeastern extension of the Lackawanna Syncline, which contains valuable anthracite coalbeds (*6*).

The only structurally well defined fold is the Lackawanna Syncline, which is along the western border of Wayne County. There are a few slight rolls throughout the rest of the county. Most of the county slopes gently east and southeast. The Delaware River drains the northern part of the county, and the Lackawaxen River drains the southern part. Tributaries of the Susquehanna River drain the extreme northwestern part of the county.

The highest peaks in Wayne County are in the Moosic Mountains along the western boundary. Mount Ararat has an elevation of 2,654 feet, and Sugarloaf Mountain has an elevation of 2,541 feet. The lowest elevation, 600 feet, is where the Delaware River crosses the Pike County line. The greatest relief is along the deeply incised valleys of the Delaware River and its tributaries which, in some places, are more than 500 feet deep.

Wayne County was last covered with ice during the Wisconsin glacial stage of the Pleistocene Epoch. As the glacier retreated, it left deposits of glacial drift more than 200 feet thick. This glacial drift is made up of glacial till and glaciofluvial material. Glacial till consists of nonstratified clay and silt and a varying amount of sand, gravel, and cobbles. Glaciofluvial material consists of stratified or layered material deposited by glacial streams flowing on or under the ice; it is made up mainly of sand and gravel and has a varying amount of silt and clay and some boulders. Other glacial material in Wayne County includes the fine-grained lacustrine sediment deposited in glacial lakes. The alluvium in stream channels and on terraces is made up of the glaciofluvial material. The underground water in this material is sufficient for domestic use. The thick deposits of sand and gravel are excavated for commercial use. The numerous ponds and small lakes in Wayne County are of glacial origin.

The youngest bedrock in Wayne County is in the small area of the Lackawanna Syncline, which is in the western part of the county. The Pottsville and Post Pottsville bedrock formations are of Lower Pennsylvanian age and consist of coarse sandstone, conglomerate, some irregular beds of shale, and a few thin seams of anthracite coal. The Mauch Chunk formation underlies the Pottsville formation and consists mainly of red and green shales and some green sandstone. It is underlain by the Pocono formation, which consists mainly of thick beds of coarse-grained sandstone and conglomerate and some red shale. The Mauch Chunk and Pocono formations are Mississippian in age. The bedrock formations of the Lackawanna Syncline contain supplies of underground water.

The Catskill continental group, which is Upper Devonian in age, is the oldest bedrock underlying glacial drift throughout about 95 percent of Wayne County. It consists chiefly of red to brown sandstone and shale (fig. 1) and includes tongues of gray and green sandstone of the Elk Mountain, Honesdale, and Shohola formations and of the Delaware River formation in the eastern part of Wayne County. The Catskill sandstone is used commercially as building stone (*3*).

The Catskill formation is the most important source of ground water in Wayne County. More wells have been drilled into this formation than into any other bedrock formation (*5*). These wells supply water for several of the small towns in the county. Most of the water for industrial use is supplied by ground water. Honesdale, the largest town in Wayne County, is supplied by surface water from small glacial lakes.

Climate

In Wayne County, winters are cold. Summers are moderately warm, and there are occasional hot spells. Temperatures are markedly cooler in the mountains than in the main agricultural areas on the lowlands. Precipitation is well distributed throughout the year and commonly is adequate for all crops. Winter snowstorms occur frequently, occasionally as blizzards.

Table 1 gives temperature and precipitation data for Wayne County, as recorded at Hawley in the period 1958 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 25 degrees F, and the average daily minimum temperature is 14 degrees. The lowest temperature on record, which occurred at Hawley on January 22, 1961, is −27 degrees. In summer, the average temperature is 65 degrees, and the average daily maximum temperature is 78 degrees. The highest recorded temperature, which occurred on June 14, 1961, is 96 degrees.

Growing degree days, given in table 1, are equivalent to "heat units." Each month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 21 inches, or 55 percent, usually falls in April through September, which in-

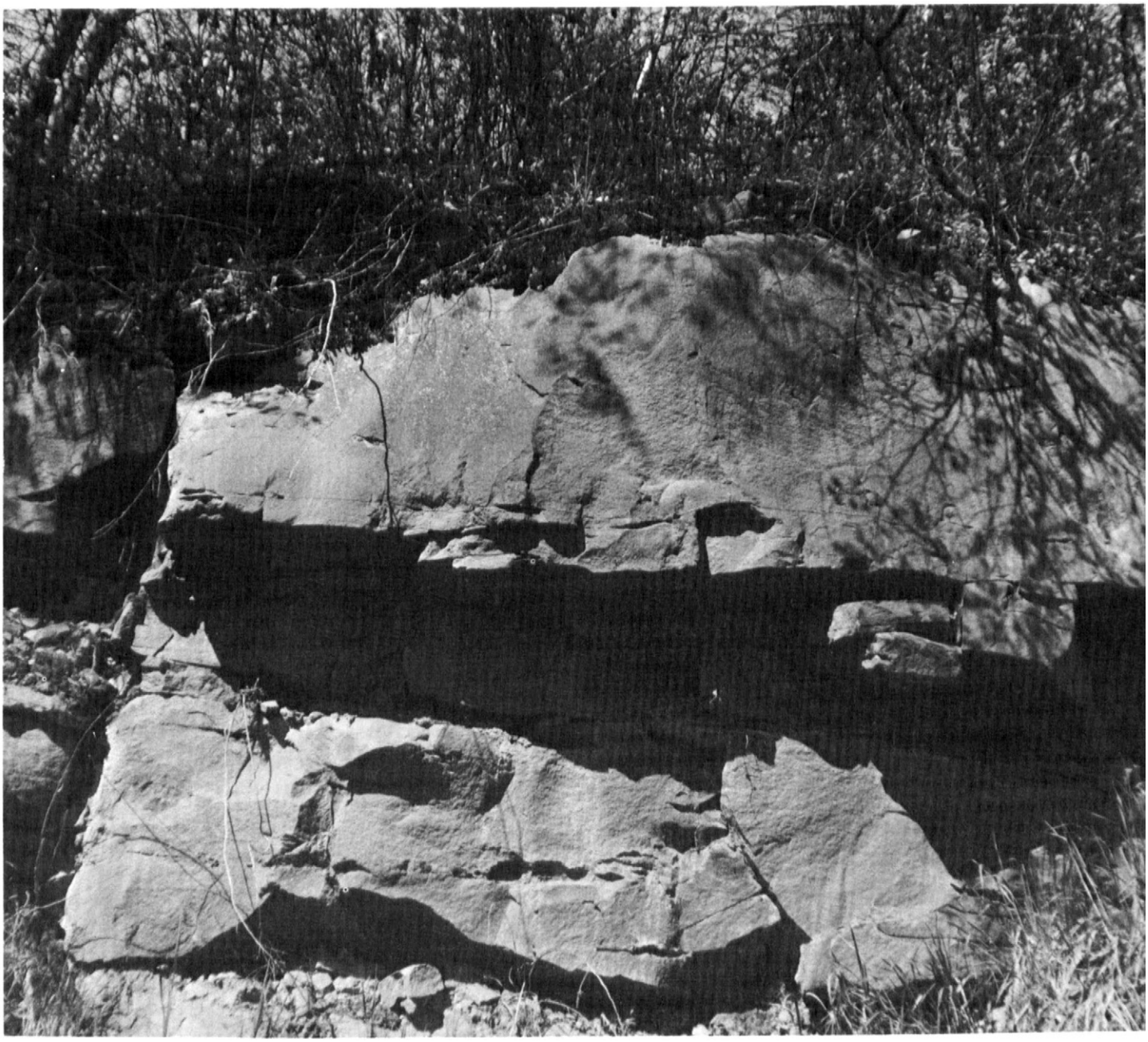


Figure 1.—An outcropping of sandstone bedrock of the Catskill formation.

cludes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 3.96 inches at Hawley on June 29, 1973. Thunderstorms occur on about 30 days each year, mainly in summer.

The average seasonal snowfall is 57 inches. The greatest snow depth at any one time during the period of record was 36 inches. On the average, 52 days have at least 1 inch of snow on the ground; however, the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average humidity at dawn is about 80 percent. The percentage of possible sunshine is 60 in summer and 40 in winter. Winds are from the southwest. The average windspeed is highest, 10 miles per hour, in April.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

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 classifying and naming the soils, 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 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 described in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, soil associations that have a distinct pattern of soils, relief, and drainage. Each association is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map provides a broad perspective of the soils and landscape in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one soil association differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The boundaries of the soil associations on the general soil map of Wayne County do not necessarily match those of adjoining counties. Discrepancies exist because of changes in the concept of individual series and different proportions of the same series in different counties. However, adjacent areas in the individual counties join similar kinds of soils.

Descriptions of soil associations

1. Oquaga-Wellsboro-Arnot association

Shallow to deep, sloping to steep, somewhat excessively drained to somewhat poorly drained soils that formed in reddish glacial till

This soil association makes up about 28 percent of the county. It is in plateau areas that are dissected by rivers and streams. This association consists mainly of sloping to steep soils on knobs and valley walls. Some areas of gently sloping soils are on the top of the plateaus.

This association is about 30 percent Oquaga soils, 20 percent Wellsboro soils, 15 percent Arnot soils, and 35 percent minor soils (fig. 2). Oquaga soils are moderately deep and well drained. Wellsboro soils are deep and are moderately well drained and somewhat poorly drained; they have a fragipan and a seasonal high water table. Arnot soils are shallow and are somewhat excessively drained to well drained.

The minor soils in this association are the Lordstown, Morris, Norwich, and Wyoming soils on uplands. Also of minor extent in the association are areas of Rock outcrop on uplands and Fluvents and Fluvaquents along streams and drainageways.

Most of this association is woodland. The soils are used for farming only in a few areas. In a few areas, the less sloping soils are used as sites for houses.

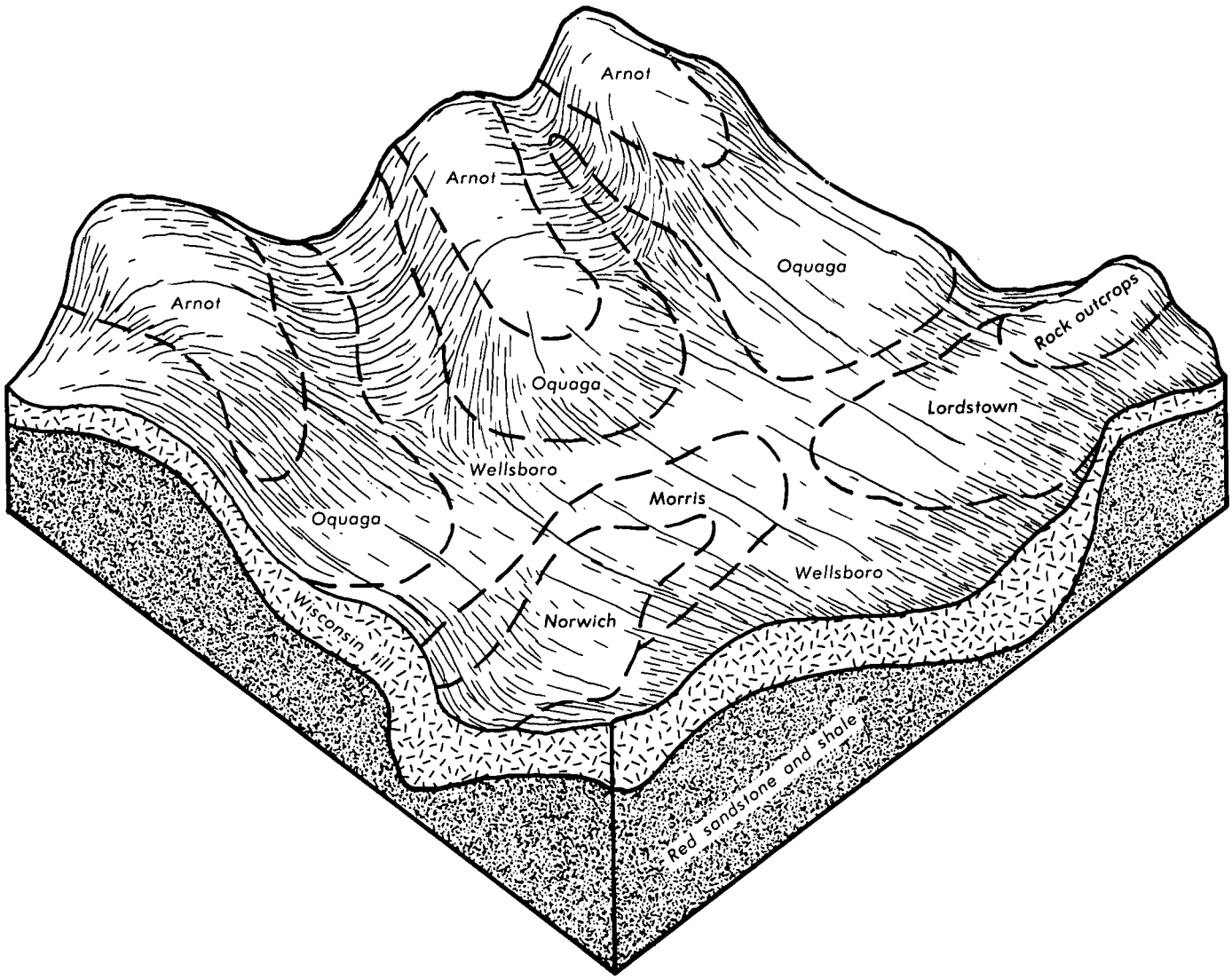


Figure 2.—Typical pattern of soils and underlying material in the Oquaga-Wellsboro-Arnot association.

The potential of these soils for use as woodland is high to low. Harvesting trees is difficult because of the steep slopes and the extremely stony surface. These soils are too steep and too stony for use as pasture and for cultivated crops. They are limited for most nonfarm uses by the steep slopes, the extremely stony surface, the shallowness or moderate depth to bedrock, and the outcrops of bedrock. These soils have potential for the development of wildlife habitat and for recreation uses.

2. Morris-Wellsboro association

Deep, nearly level and gently sloping, somewhat poorly drained and moderately well drained soils that formed in reddish glacial till

This soil association makes up about 26 percent of the county. It is on broad plateaus that are dissected by drainageways. The soils are dominantly nearly level and gently sloping. There are some steeper soils on side slopes.

This association is about 40 percent Morris soils, 32 percent Wellsboro soils, and 28 percent minor soils. Morris soils are deep and somewhat poorly drained; they have a fragipan and a seasonal high water table. Wellsboro soils are deep and are moderately well drained and somewhat poorly drained; they also have a fragipan and a seasonal high water table.

The minor soils in this association are the Oquaga and Norwich soils on uplands, the Basher and Holly soils on flood plains, and Medihemists and Medifibrists in swamps.

Much of this association has been cleared of trees and stones and is used as farmland (fig. 3). Most of the farmland is used for dairy farming. In cleared areas, the soils have medium to high potential for cultivated crops and for use as pasture; the seasonal high water table is a limitation to these uses. In noncleared areas, the soils have an extremely stony surface; these soils have low potential for cultivated crops and for use as pasture. The soils in this association have moderately high and high potential for use as woodland. They are limited for nonfarm uses by the seasonal high water table, the slow and very slow permeability, and, in some areas, by the extremely stony surface.

3. Wellsboro-Morris-Oquaga association

Deep and moderately deep, nearly level to sloping, somewhat poorly drained to well drained soils that formed in reddish glacial till

This association makes up about 17 percent of the county. It is on rounded hills and dissected plateaus. This association consists mainly of nearly level to sloping soils on rounded hills. It includes some areas of steeper soils on side slopes. Small lakes are common in areas where the soils are more level.

This association is about 36 percent Wellsboro soils, 28 percent Morris soils, 18 percent Oquaga soils, and 18 percent minor soils. Wellsboro soils are deep and are moderately well drained and somewhat poorly drained; they have a fragipan and a seasonal high water table. Morris soils are deep and somewhat poorly drained; they also have a fragipan and a seasonal high water table. Oquaga soils are moderately deep and well drained.

The minor soils in this association are the Arnot, Norwich, and Chippewa soils on uplands; the Barbour and Basher soils on flood plains; and Medihemists and Medifibrists in swamps.

In this association, about half of the acreage is woodland and half is farmland. In areas that have been cleared of trees and stones, the soils have medium to high potential for cultivated crops and for use as pasture; the seasonal high water table and the moderate depth to bedrock are limitations to these uses. In noncleared areas, the soils have an extremely stony surface; these soils have low potential for cultivated crops and for use as pasture. The soils in this association have moderately high and high potential for use as woodland. They are limited for nonfarm uses by the moderate depth to bedrock, the seasonal high water table, the slow and very slow permeability, and the extremely stony surface. However these soils have potential for the development of wildlife habitat and for recreation uses.

4. Mardin-Volusia-Lordstown association

Deep and moderately deep, nearly level to sloping, somewhat poorly drained to well drained soils that formed in grayish and brownish glacial till

This soil association makes up about 11 percent of the county. It is on broad plateaus that are dissected by drainageways and on rounded hills. The soils are dominantly nearly level to sloping. Some steeper soils are on side slopes.

This association is about 40 percent Mardin soils, 30 percent Volusia soils, 20 percent Lordstown soils, and 10 percent minor soils. Mardin soils are deep and moderately well drained; they have a fragipan and a seasonal high water table. Volusia soils are deep and somewhat poorly drained; they also have a fragipan and a seasonal high water table. Lordstown soils are moderately deep and well drained.

The minor soils in this association are the Arnot, Norwich, and Chippewa soils on uplands; the Barbour and Basher soils on flood plains; and Medihemists and Medifibrists in swamps.

In this association, about half of the acreage is woodland and half is farmland. Many farms are idle or are used as permanent hayland. In a few areas near lakes, the soils are used as sites for houses.

In areas that have been cleared of trees and stones, the soils have medium to high potential for cultivated crops and for use as pasture; the seasonal high water table and the moderate depth to bedrock are limitations to these uses. In noncleared areas, the soils have an

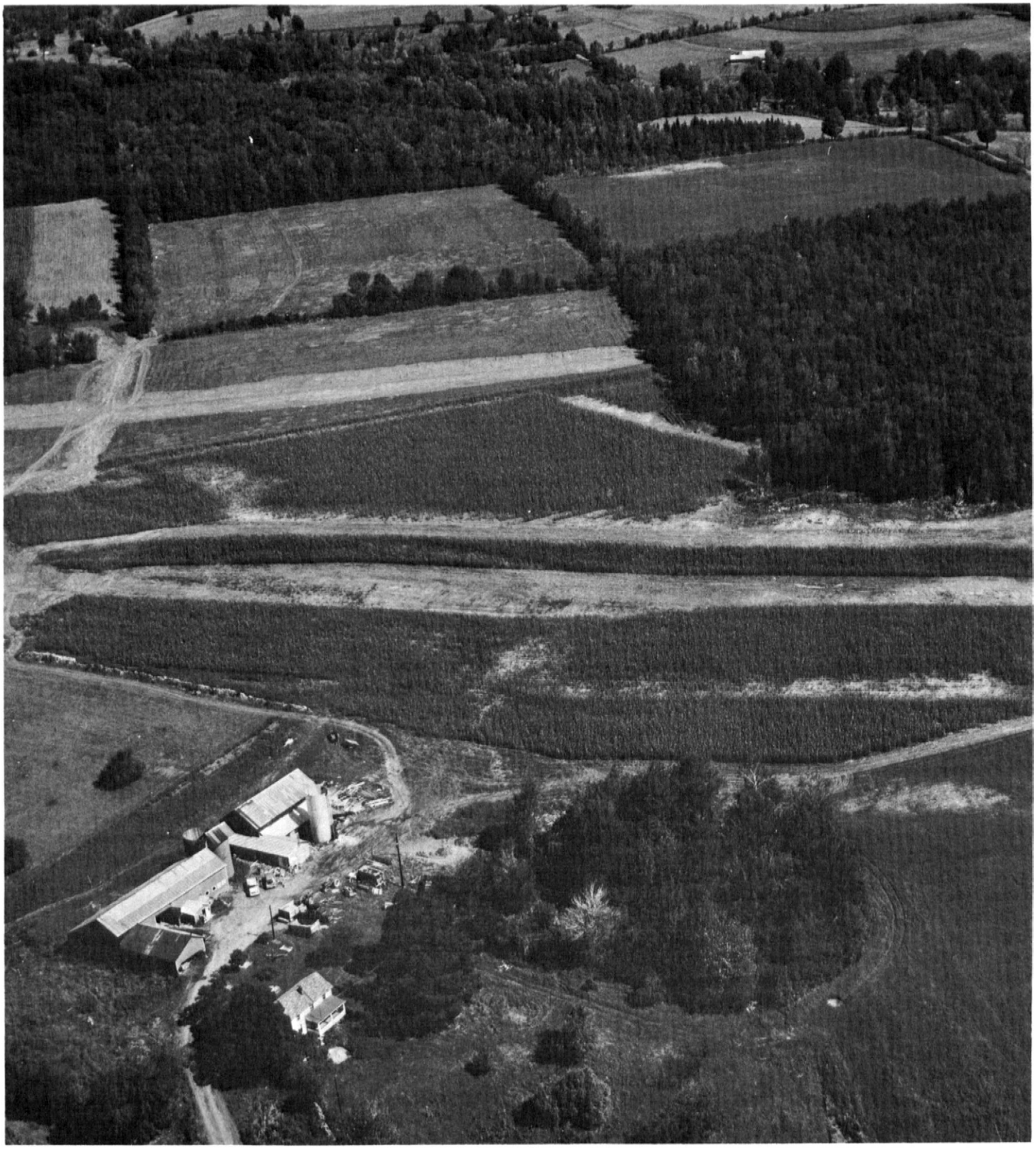


Figure 3.—Typical landscape in the Morris-Wellsboro association.

extremely stony surface; these soils have low potential for cultivated crops and for use as pasture. The soils in this association have moderately high to high potential for use as woodland. They are limited for nonfarm uses by the moderate depth to bedrock, the seasonal high water table, the slow and very slow permeability, and the extremely stony surface. However, these soils have potential for the development of wildlife habitat and for recreation uses.

5. Holly-Basher-Wyoming association

Deep, nearly level to sloping, very poorly drained to somewhat excessively drained soils that formed in alluvium and glacial outwash

This soil association makes up about 10 percent of the county. It is on flood plains and terraces adjacent to creeks and rivers. The soils on flood plains are dominantly nearly level, and the soils on terraces are dominantly gently sloping and sloping. Some soils on side slopes are moderately steep to very steep.

This association is about 15 percent Holly soils, 12 percent Basher soils, 10 percent Wyoming soils, and 63 percent minor soils (fig. 4). Holly soils are deep and are poorly drained and very poorly drained; they have a high water table most of the year. Basher soils are deep and are moderately well drained and somewhat poorly drained; they have a seasonal high water table. Wyoming soils are deep and somewhat excessively drained.

The minor soils in this association are the Linden and Barbour soils on flood plains and the Morris, Wellsboro, Norwich, Chippewa, and Rexford soils on uplands. Also

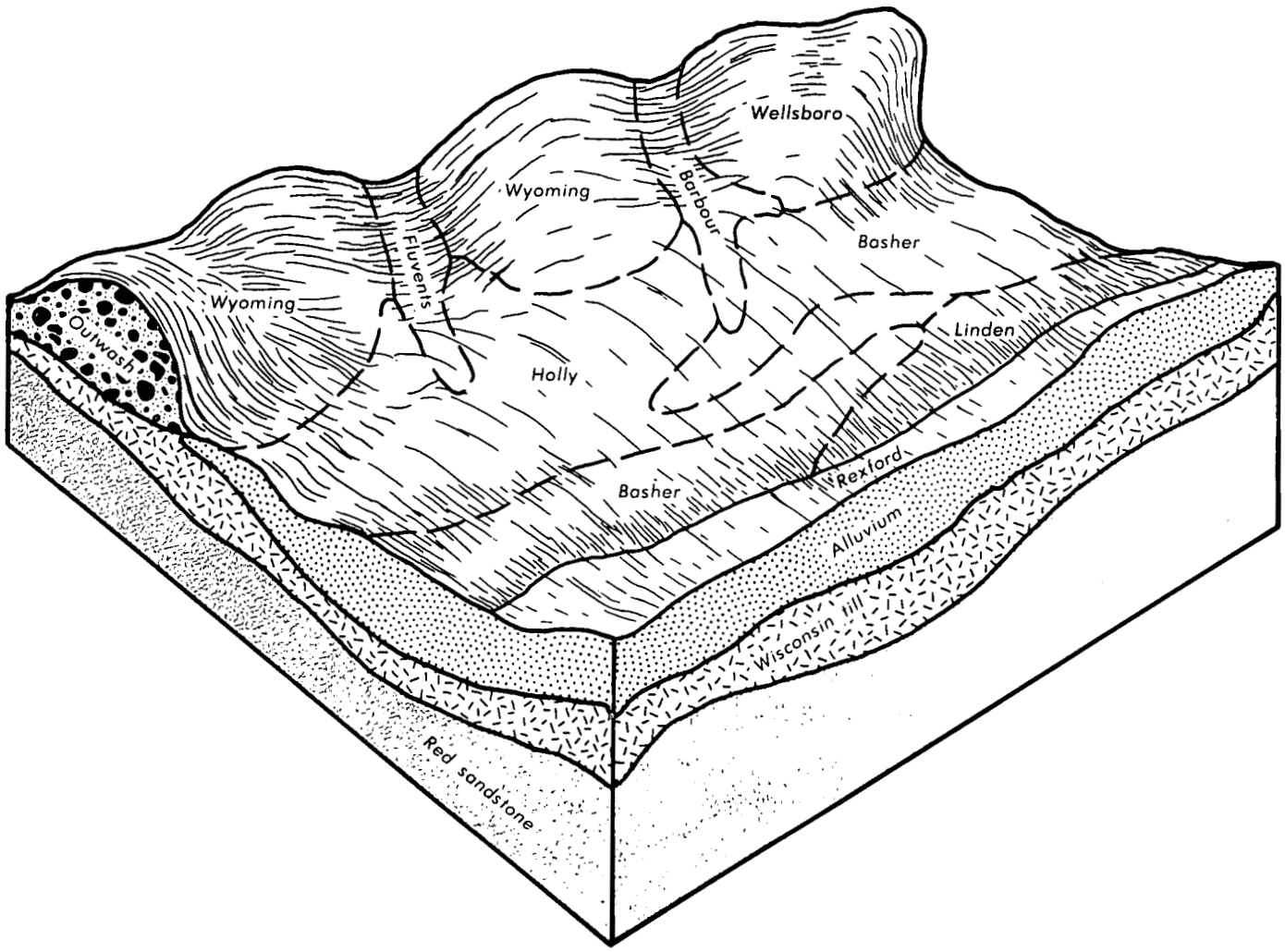


Figure 4.—Typical pattern of soils and underlying material in the Holly-Basher-Wyoming association.

of minor extent in this association are areas of Fluvents and Fluvaquents on flood plains.

Many areas of this association are idle. Some areas are farmland, and a few areas are woodland. Some of the better drained soils at higher elevations are used as sites for summer cottages.

The soils on flood plains that are rarely flooded have high potential for cultivated crops and for use as pasture. The soils on terraces that have low and very low available water capacity have low to medium potential for crops and for use as pasture. In this association, the potential of the soils for cultivated crops and for use as woodland varies widely depending on the drainage and available water capacity of the soils and on the frequency of flooding. The soils are limited for nonfarm uses by the high water table, the moderately slow permeability, and the hazard of flooding. However, they have potential for the development of wildlife habitat and for recreation uses.

6. Lordstown-Mardin-Volusia association

Moderately deep and deep, gently sloping to moderately steep, well drained to somewhat poorly drained soils that formed in grayish and brownish glacial till

This association makes up about 6 percent of the county. It is on ridges and rounded hills that are dissected by drainageways. This association consists mainly of gently sloping to moderately steep soils on ridges and hilltops. It includes some areas of steeper soils on side slopes. Small lakes are common in areas where the soils are more level.

This association is about 40 percent Lordstown soils, 35 percent Mardin soils, 10 percent Volusia soils, and 15 percent minor soils (fig. 5). Lordstown soils are moderately deep and well drained. Mardin soils are deep and moderately well drained; they have a fragipan and a seasonal high water table. Volusia soils are deep and somewhat poorly drained; they also have a fragipan and a seasonal high water table.

The minor soils in this association are the Arnot, Oquaga, Norwich, and Chippewa soils on uplands; the Barbour and Basher soils on flood plains; and Medihemists and Medifibrists in swamps.

Most of this association is woodland. The rest is mainly idle farmland. In areas that have been cleared of trees and stones, the soils have only medium potential for cultivated crops and for use as pasture because of the moderate depth to bedrock and the seasonal high water table. In noncleared areas, the soils have an extremely stony surface; these soils have low potential for crops and for use as pasture. The soils in this association have moderately high to high potential for use as woodland. They are limited for nonfarm uses by the moderate depth to bedrock, the seasonal high water table, the slow and very slow permeability, and the extremely stony surface. However, they have potential for the development of wildlife habitat and for recreation uses.

7. Mardin-Swartswood-Volusia association

Deep, nearly level to moderately steep, well drained to somewhat poorly drained soils that formed in grayish and brownish glacial till

This association makes up about 2 percent of the county. It is on broad plateaus. The soils are dominantly gently sloping to sloping. Some steeper soils are on side slopes.

This association is about 25 percent Mardin soils, 30 percent Swartswood soils, 20 percent Volusia soils, and 15 percent minor soils. Mardin soils are deep and moderately well drained. Swartswood soils are deep and are well drained and moderately well drained. Volusia soils are deep and somewhat poorly drained. All of these soils have a fragipan and a seasonal high water table.

The minor soils in this association are the Arnot, Lordstown, Norwich, and Chippewa soils on uplands; the Barbour, Basher, and Holly soils on flood plains; and Medihemists and Medifibrists in swamps.

Most of this association is woodland. The soils are used for farming only in a few areas. Most of the soils are extremely stony. In this association, the soils are a few hundred feet higher in elevation than those in the main farmland areas, temperatures are a few degrees cooler, and the growing season is shorter.

The soils in this association have low potential for farming because of the extremely stony surface. Woodland production is moderately high and high. These soils are limited for nonfarm uses by the seasonal high water table, the slow and very slow permeability, and the extremely stony surface. However, they have potential for the development of wildlife habitat and for recreation uses.

Soil maps for detailed planning

The map units on the detailed soil maps at the back of this survey 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 that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description,

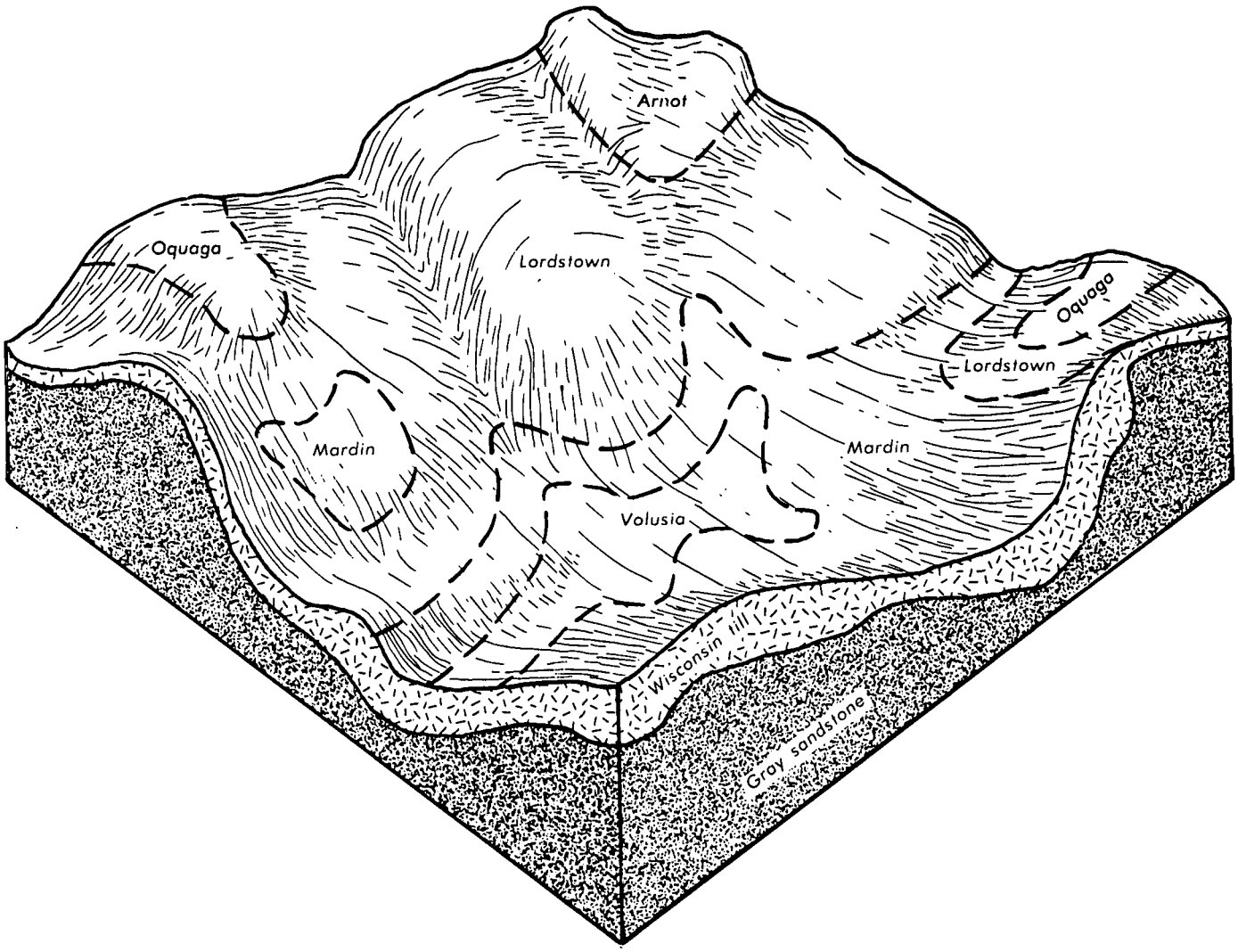


Figure 5.—Typical pattern of soils and underlying material in the Lordstown-Mardin-Volusia association.

the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Wellsboro series, for example, was named for the town of Wellsboro in Tioga County, Pennsylvania.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Wellsboro extremely stony loam, 3 to 8 percent slopes, is one of several phases within the Wellsboro series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they

cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Rock outcrop-Arnot complex, 3 to 25 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Wellsboro and Mardin extremely stony loams, 25 to 50 percent slopes, is an undifferentiated group in this survey area.

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 strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Quarries is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions

ArB—Arnot channery loam, very rocky, 3 to 8 percent slopes. This is a gently sloping, somewhat excessively drained and well drained soil on knobs, ridges, and benches. Slopes are complex. The areas are irregular in shape and range from 6 to 20 acres. Rock outcrops make up 2 to 5 percent of the surface.

Typically, the surface layer is dark brown channery loam about 6 inches thick. The subsoil is reddish brown channery loam about 8 inches thick. The substratum is reddish brown very channery loam about 3 inches thick. Interbedded red shale and gray sandstone bedrock is at a depth of 17 inches.

Included in mapping and making up 10 to 15 percent of this map unit are small areas of Oquaga soils.

Permeability is moderate, and the available water capacity is very low. Unless this soil has been limed, it is medium acid to extremely acid throughout. Runoff is rapid. The root zone is restricted by the shallowness to bedrock.

This soil is used mainly as woodland. It has very low potential for cultivated crops and for use as pasture and low potential for use as woodland. This soil is limited for most nonfarm uses by the shallowness to bedrock, coarse fragments, rock outcrops, and very low available water capacity.

This soil is very poorly suited to cultivated crops or to use as pasture because of the shallowness to bedrock, the hazard of erosion, the very low available water capacity, and the rock outcrops. Erosion can further reduce the depth of the root zone and lower the available water capacity.

In most areas, this soil is in woodland. The potential productivity for trees is low because the root zone is restricted by the shallowness to bedrock. Seedling mortality due to the very low available water capacity is a major management concern. The rock outcrops restrict the use of some machinery. Machine planting is not practical.

This soil is limited for nonfarm uses by shallowness to bedrock, coarse fragments, rock outcrops, and very low available water capacity. Shallowness to bedrock is a severe limitation to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 5d.

ArC—Arnot channery loam, very rocky, 8 to 15 percent slopes. This is a sloping, somewhat excessively drained and well drained soil on ridges and benches. Slopes are complex. The areas are irregular in shape and range from 4 to 25 acres in size. Rock outcrops make up about 2 to 5 percent of the surface.

Typically, the surface layer is dark brown channery loam about 6 inches thick. The subsoil is reddish brown channery loam about 8 inches thick. The substratum is reddish brown very channery loam about 3 inches thick. Interbedded red shale and gray sandstone bedrock is at a depth of 17 inches.

Included in mapping and making up 10 to 15 percent of this map unit are small areas of Oquaga soils.

Permeability is moderate, and the available water capacity is very low. Unless this soil has been limed, it is medium acid to extremely acid throughout. Runoff is very rapid. The root zone is restricted by the shallowness to bedrock.

This soil is used mainly as woodland (fig. 6) and as pasture. It has low potential for use as woodland and very low potential for farming. This soil is limited for most nonfarm uses by the shallowness to bedrock, the steepness of slopes, coarse fragments, rock outcrops, and the very low available water capacity.

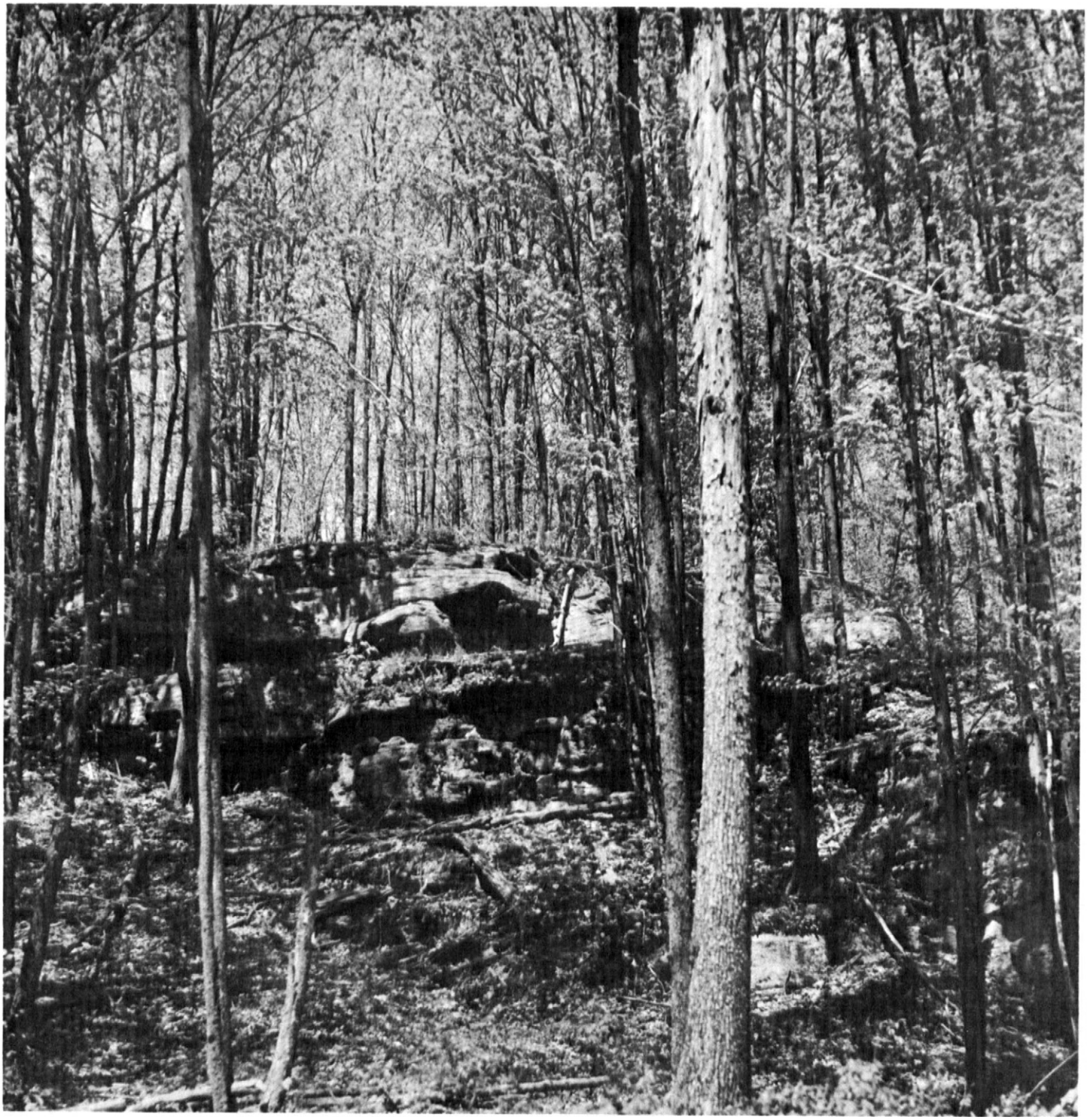


Figure 6.—An area of Arnot channery loam, very rocky, 8 to 15 percent slopes, in woodland. The outcrops of bedrock severely limit this soil for most uses.

This soil is very poorly suited to cultivated crops or to use as pasture because of the shallowness to bedrock, the severe hazard of erosion, the very low available water capacity, and the rock outcrops. Erosion can further reduce the depth of the root zone and lower the available water capacity.

In most areas, this soil is in woodland. The potential productivity for trees is low because the root zone is restricted by the shallowness to bedrock. Seedling mortality due to the very low available water capacity is a major management concern. The rock outcrops restrict the use of some machinery. Machine planting is not practical.

This soil is limited for nonfarm uses by shallowness to bedrock, coarse fragments, rock outcrops, and very low available water capacity. Shallowness to bedrock is a severe limitation to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 5d.

ArD—Arnot channery loam, very rocky, 15 to 25 percent slopes. This is a moderately steep, somewhat excessively drained and well drained soil on side slopes. Slopes are long and narrow. The areas generally range from 8 to 35 acres in size. Rock outcrops make up about 2 to 5 percent of the surface.

Typically, the surface layer is dark brown channery loam about 6 inches thick. The subsoil is reddish brown channery loam about 8 inches thick. The substratum is reddish brown very channery loam about 3 inches thick. Interbedded red shale and gray sandstone bedrock is at a depth of 17 inches.

Included in mapping and making up 2 to 8 percent of this map unit are small areas of Oquaga soils.

Permeability is moderate, and the available water capacity is very low. Unless this soil has been limed, it is medium acid to extremely acid throughout. Runoff is very rapid. The root zone is restricted by the shallowness to bedrock.

This soil is used mainly as woodland. It has very low potential for farming. This soil is limited for most nonfarm uses by the shallowness to bedrock, the steepness of slopes, coarse fragments, rock outcrops, and the very low available water capacity.

This soil is very poorly suited to cultivated crops or to use as pasture because of the steepness of slopes, the shallowness to bedrock, the severe hazard of erosion, the very low available water capacity, and the rock outcrops. Erosion can further reduce the depth of the root zone and lower the available water capacity.

In most areas, this soil is in woodland. The potential productivity for trees is low because the root zone is restricted by shallowness to bedrock. Seedling mortality due to the very low available water capacity is a major management concern. The rock outcrops and the steepness of slopes restrict the use of some machinery. Machine planting is not practical.

This soil is limited for nonfarm uses by shallowness to bedrock, coarse fragments, rock outcrops, and very low available water capacity. The steepness of slopes and the shallowness to bedrock are severe limitations to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 5d.

Ba—Barbour loam. This is a nearly level, well drained soil on alluvial flood plains that are higher than the normal level of flooding. Slopes are smooth and generally are long and narrow. The areas range from 4 to 20 acres in size. Flooding is occasional to rare.

Typically, the surface layer is very dark grayish brown loam about 6 inches thick. The subsoil is dark brown loam and gravelly loam about 22 inches thick. The substratum, to a depth of 60 inches, is dark reddish brown very gravelly loamy sand.

Included in mapping and making up 20 to 25 percent of this map unit are a few small areas of soils that are frequently flooded. Also included and making up 15 to 20 percent of the unit are a few small areas of Linden soils. Less than 2 percent of this unit is made up of soils that are slightly acid to neutral in the lower part of the profile.

Permeability is moderately rapid and rapid, and the available water capacity is moderate. Runoff is slow. The root zone extends to a depth of more than 28 inches. Unless this soil has been limed, it is very strongly acid to medium acid in the surface layer and subsoil.

This soil is used mainly as cropland and for urban development. It has high potential for cultivated crops and for use as pasture or woodland. It is limited for most urban uses by the hazard of flooding and the rapid and moderately rapid permeability.

If row crops are continuously grown on this soil, the content of organic matter needs to be maintained at an adequate level. Returning crop residue to the soil, using cover crops, and including grasses and legumes in the cropping system help to maintain tilth and the organic matter content. Flooding can cause severe crop damage or loss.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. The potential productivity for trees is high. In large areas of

woodland, machine planting generally is practical. Flooding can hinder harvesting for a short period.

This soil is limited for many nonfarm uses by the hazard of flooding and the moderately rapid and rapid permeability. The flooding and the permeability are severe limitations to the use of this soil for onsite waste disposal. Flooding is a severe hazard for homesites. Unstable material can be a problem for deep excavations. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability class I, woodland ordination symbol 2o.

Bh—Basher silt loam. This is a nearly level, moderately well drained and somewhat poorly drained soil on flood plains. Slopes are smooth and generally are long and narrow. The areas are irregular in shape and are 4 to 20 acres in size. Flooding is occasional to rare.

Typically, the surface layer is dark brown silt loam about 14 inches thick. The subsoil is brown and dark brown fine sandy loam and silt loam about 26 inches thick; it has mottles below a depth of 18 inches. The substratum, to a depth of 70 inches, is mottled, dark brown and reddish brown gravelly loam.

Included in mapping and making up 10 to 15 percent of this map unit are a few small areas of soils that are similar to this Basher soil and are frequently flooded. Also included and making up less than 2 percent of the unit are a few small areas of soils that are less acid in the lower part of the profile.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Most areas of this soil are flooded less than once every two years. The root zone extends to a depth of more than 40 inches. Unless this soil has been limed, it is extremely acid to medium acid in the surface layer and subsoil and very strongly acid to slightly acid in the substratum.

This soil is used mainly for cultivated crops. In some areas, it is used as pasture or as woodland. This soil has high potential for cultivated crops, but flooding is a hazard. It has high potential for use as pasture or woodland. This soil is limited for most nonfarm uses by the hazard of flooding and the seasonal high water table.

In many areas, this soil is used for cultivated crops. Flooding can cause crop loss or damage. Growing early-maturing crops reduces the hazard of damage by flooding. Excess surface water can be drained by keeping the natural drainageways open. Where outlets are available, surface and subsurface drains can be used to improve drainage.

In a few areas, this soil is used as pasture. If pasture is grazed when the soil is wet, the surface layer compacts. Stocking at the proper rate to maintain key plant species, rotating pasture, deferring grazing, and restricting grazing in wet periods help to maintain or improve pasture.

In a few areas, this soil is used as woodland. The potential for production of trees is high, but in some areas, the root zone is restricted by a seasonal high water table. In large areas of woodland, machine planting generally is practical. This soil is best suited to trees that can tolerate some wetness. The seasonal high water table and flooding can delay harvesting in wet periods.

This soil is limited for most nonfarm uses because of the hazard of flooding and the seasonal high water table. The flooding and the water table are severe limitations to the use of the soil as sites for houses and for onsite waste disposal. Unstable material can be a problem for deep excavations. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIw, woodland ordination symbol 2o.

FF—Fluvents and Fluvaquents, cobbly. These are nearly level, excessively drained to poorly drained soils on flood plains (fig. 7). These soils formed in stratified recent alluvium. Slopes are undulating and are long and narrow. The areas range from 4 to 20 acres in size. These soils were not separated in mapping because they are similar in use and management and are in adjacent positions on the landscape. The areas of this map unit consist of either Fluvents or Fluvaquents or both. Fluvents make up 70 percent of the unit, and Fluvaquents make up about 20 percent.

Typically, the surface layer of Fluvents is dominantly dark brown to brown. It ranges from silt loam to loamy sand and the gravelly or very gravelly analogs. The substratum has variegated and mottled colors and ranges from loam to sand and the gravelly, very gravelly, cobbly, or very cobbly analogs.

Typically, the surface layer of Fluvaquents is very dark brown to brown. It ranges from sandy loam to silt loam and the gravelly or cobbly analogs. The substratum has variegated and mottled colors and ranges from loam to sand and the gravelly, very gravelly, cobbly, or very cobbly analogs.

Included in mapping are a few small areas of Barbour, Basher, and Holly soils. Barbour soils make up 6 percent of this map unit; Basher soils, 2 percent; and Holly soils, 2 percent.

These soils are flooded frequently, and the coarse of the main channel is constantly changing. These soils have very little profile development because of the frequent deposition and erosion of soil material. The content of gravel and cobbles in the individual layers ranges from 0 to 80 percent. Permeability and the available water capacity are variable. These soils are strongly acid to extremely acid throughout.

Most areas of Fluvents and Fluvaquents are idle because of the frequent flooding and the very low available water capacity. These soils are very poorly suited to cultivated crops and to use as pasture. They have low potential for use as woodland. These soils are limited for most nonfarm uses by the hazard of flooding. However, they can be used in watershed protection and for the

development of wildlife habitat. Wildlife habitat plantings can help stabilize streambanks.

Capability subclass and woodland ordination symbol not assigned.

Ho—Holly silt loam. This is a nearly level, poorly drained and very poorly drained soil on flood plains of the major creeks and rivers in Wayne County. Slopes are slightly concave to smooth. The areas are elliptical and range from 4 to 12 acres in size. This soil is flooded at least once annually.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil extends to a depth of 28 inches. The upper part of the subsoil is mottled, dark gray silt loam 4 inches thick, the next part is mottled, dark gray loam 5 inches thick, and the lower part is mottled, gray sandy loam 16 inches thick. The substratum, to a depth of 60 inches, is mottled, gray sandy loam and dark gray fine sand.

Included in mapping and making up 10 to 15 percent of this map unit are a few small areas of Basher and Barbour soils and a few small areas of a soil that is similar to this Holly soil except that it is coarser textured in the subsoil.

Permeability is moderate to moderately slow, and the available water capacity is high. Runoff is slow. A water table is at or near the surface of this soil throughout much of the year, and many areas are ponded. In many areas, water is impounded by beaver dams. Unless this soil has been limed, it is neutral to strongly acid.

This soil is used mainly for wildlife habitat. It has fair suitability for cultivated crops if adequate drainage is provided; however, flooding can severely damage crops. This soil has medium potential for use as pasture and high potential for use as woodland. It is limited for most urban uses mainly by the hazard of flooding and the high water table.

Only a small acreage of this soil is used for crops. If this soil is properly drained, it can occasionally be used for row crops. Because of the excess water, this soil warms slowly in spring. The excess surface water can be drained by keeping the natural drainageways open. Where outlets are available, surface drains can be used to improve drainage.

In a few areas, this soil is used as pasture. If pasture is grazed when the soil is wet, the surface compacts. Stocking at the proper rate to maintain key plant species, rotating pasture, deferring grazing, and restricting grazing in wet periods help to maintain or improve pasture.

In a few areas, this soil is used as woodland. It is suited to moisture-tolerant trees. The potential productiv-

Figure 7.—Typical area of Fluvents and Fluvaquents, cobbly.

Figure 8.—An area of Holly silt loam. This soil is limited for most nonfarm uses because it is subject to flooding and has a high water table.

ity is high, but the root zone is restricted by the high water table. The use of equipment is restricted throughout much of the year by the high water table and occasionally by flooding. In some areas, machine planting is restricted by the high water table.

This soil is limited for nonfarm uses by flooding and the high water table (fig. 8). The flooding and the water table are severe limitations to the use of this soil as sites for houses and for onsite waste disposal.

Capability subclass IIIw, woodland ordination symbol 2w.

La—Linden fine sandy loam, rarely flooded. This is a nearly level, well drained soil on alluvial flood plains that are higher than the normal level of flooding. Slopes are smooth and generally are long and narrow. The areas range from 4 to 20 acres in size. Flooding is rare because reservoirs have been constructed upstream on the Delaware River, and flood-control structures are on some of the feeder streams (fig. 9).

Typically, the surface layer is dark brown fine sandy loam about 6 inches thick. The subsoil extends to a depth of 48 inches. It is reddish brown and brown fine sandy loam, silt loam, and gravelly sandy loam. The substratum, to a depth of 65 inches, is stratified brown, dark brown, and reddish brown gravelly loamy sand.

Included in mapping and making up 15 to 20 percent of this map unit are a few small areas of Barbour soils. Also included and making up less than 2 percent of the unit are a few small areas of a soil that is similar to this Linden soil except that it is slightly acid to neutral in the lower part of the profile.

Permeability is moderately rapid, and the available water capacity is high. Runoff is slow. The root zone extends to a depth of more than 48 inches. Unless this soil has been limed, it is extremely acid to medium acid.

This soil is used mainly as cropland and for urban development. It has high potential for cultivated crops and for use as pasture and very high potential for use as woodland. It is limited for many nonfarm uses mainly by the hazard of rare flooding.

In most areas, this soil is used for cultivated crops. The hazard of erosion is slight. If row crops are continuously grown on this soil, the content of organic matter needs to be maintained at an adequate level. Returning crop residue to the soil, using cover crops, and including grasses and legumes in the cropping system help to maintain tilth and the organic matter content.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. The potential productivity for trees is very high. In large areas of woodland, machine planting generally is practical.

This soil is limited for nonfarm uses by the hazard of rare flooding. The flooding is a limitation to the use of this soil as sites for houses and for onsite waste disposal. Unstable material can be a problem in deep excavations. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability class I, woodland ordination symbol 1o.

LdB—Lordstown channery loam, 3 to 8 percent slopes. This is a gently sloping, well drained soil on ridgetops, plateaus, and benches. Slopes are complex. The areas are irregular in shape and range from 4 to 15 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 4 inches thick. The subsoil is yellowish brown and light olive brown channery loam about 20 inches thick. Fractured gray sandstone bedrock is at a depth of 24 inches.

Included in mapping and making up about 6 percent of this map unit are a few small areas of Arnot soils.

Permeability is moderate, and the available water capacity is low to moderate. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium. The root zone is restricted by the moderate depth to bedrock.

In most areas, this soil is used as hayland. This soil has medium potential for crops. It has a high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the moderate depth to bedrock and the channery surface layer.

If this soil is used for cultivated crops, erosion is a moderate hazard. Erosion can further reduce the depth of the root zone and lower the available water capacity. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. In places, the moderate depth to bedrock hinders the construction of diversions. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low to moderate available water capacity is a major management concern. In large areas of woodland, machine planting generally is practical.

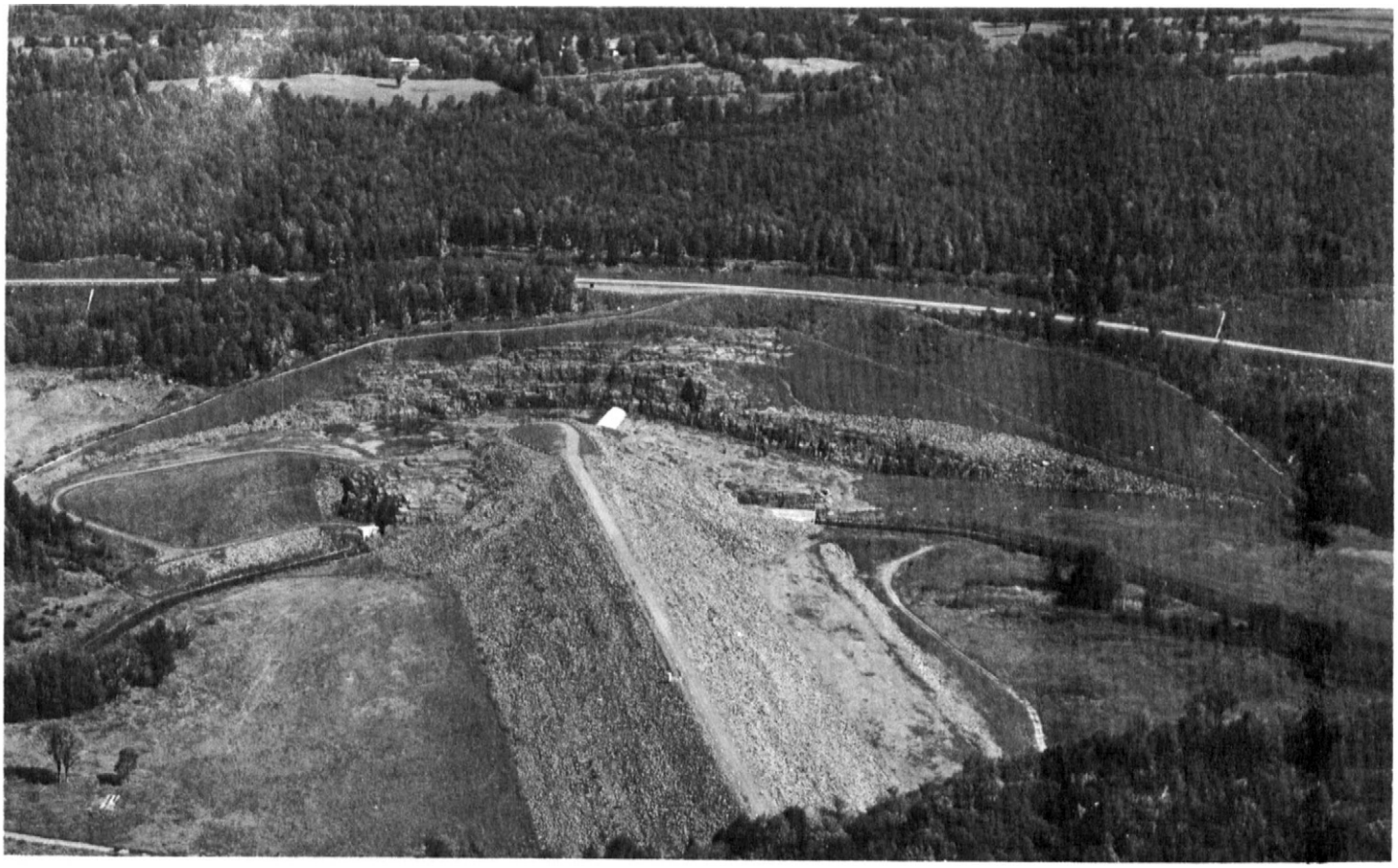


Figure 9.—This flood-control structure on a tributary of the Delaware River helps to prevent flooding on Linden fine sandy loam.

This soil is limited for nonfarm uses by the moderate depth to bedrock and the channery surface layer. The moderate depth to bedrock is a severe limitation to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIe, woodland ordination symbol 3f.

LdC—Lordstown channery loam, 8 to 15 percent slopes. This is a sloping, well drained soil on dissected ridges and benches. The areas are irregular in shape and range from 4 to 20 acres.

Typically, the surface layer is very dark grayish brown channery loam about 4 inches thick. The subsoil is yellowish brown and light olive brown channery loam about 20 inches thick. Fractured gray sandstone bedrock is at a depth of 24 inches.

Included in mapping and making up about 6 percent of this map unit are a few small areas of Arnot soils.

Permeability is moderate, and the available water capacity is low to moderate. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium to rapid. The root zone is restricted by the moderate depth to bedrock.

In most areas, this soil is used as hayland. This soil has medium potential for crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the moderate depth to bedrock, the channery surface layer, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a severe hazard. Erosion can further reduce the depth of the root zone and lower the available water capacity. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. In places, the moderate depth to bedrock hinders the construction of diversions. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low to moderate available water capacity is a major management concern. In large areas of woodland, machine planting generally is practical.

This soil is limited for nonfarm uses by the moderate depth to bedrock, the channery surface layer, and the steepness of slopes. The moderate depth to bedrock is a severe limitation to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 3f.

LdD—Lordstown channery loam, 15 to 25 percent slopes. This is a moderately steep, well drained soil on the side slopes of ridges. Slopes are complex. The areas are long and narrow and range from 4 to 35 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 4 inches thick. The subsoil is yellowish brown and light olive brown channery loam about 20 inches thick. Fractured gray sandstone bedrock is at a depth of 24 inches.

Included in mapping and making up about 6 percent of this map unit are a few small areas of Arnot soils.

Permeability is moderate, and the available water capacity is low to moderate. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is rapid. The root zone is restricted by the moderate depth to bedrock.

In most areas, this soil is used as hayland. This soil has medium potential for crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for nonfarm uses by the moderate depth to bedrock and the steepness of slopes.

In a few areas, this soil is used for cultivated crops. On cropland, erosion is a very severe hazard. Erosion can further reduce the depth of the root zone and lower the available water capacity. Minimum tillage, diversions, the use of cover crops, and including long-term grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. In places, the moderate depth to bedrock hinders the construction of diversions. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic application of nutrients.

In a few areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low to moderate available water capacity is a major management concern. Machine planting and harvesting are restricted by the steepness of slopes.

This soil is limited for nonfarm uses by the moderate depth to bedrock, the moderately steep slopes, and the channery surface layer. The depth to bedrock and the slopes are severe limitations to the use of this soil for onsite waste disposal. In some areas, excavating for

building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IVe, woodland ordination symbol 3r.

LxB—Lordstown extremely stony loam, 3 to 8 percent slopes. This is a gently sloping, well drained soil on ridgetops, plateaus, and benches. Slopes are complex. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 4 inches thick. The subsoil is yellowish brown and light olive brown channery loam about 20 inches thick. Fractured gray sandstone bedrock is at a depth of 24 inches.

Included in mapping and making up 2 to 10 percent of this map unit are small narrow areas of Arnot soils and Rock outcrop. Also included and making up about 4 percent of the unit are a few small areas of Mardin soils, mainly at the base of the steeper slopes.

Permeability is moderate, and the available water capacity is low to moderate. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium. The root zone is restricted by the moderate depth to bedrock.

This soil is poorly suited to crops and to use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the moderate depth to bedrock and the many surface stones.

This soil is not used for cultivated crops because of the many surface stones. In a few small areas, it is used as pasture. It is not feasible to remove the stones and trees for cultivation.

In most areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low to moderate available water capacity is a major management concern. The use of equipment is restricted by the many surface stones. Machine planting generally is impractical in large areas of woodland.

This soil is limited for nonfarm uses by the moderate depth to bedrock and the many surface stones. The depth to bedrock and the surface stones are severe limitations to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

LxC—Lordstown extremely stony loam, 8 to 25 percent slopes. This is a sloping and moderately steep, well drained soil on ridgetops, plateaus, and benches. Slopes are complex. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 4 inches thick. The subsoil is yellowish brown and light olive brown channery loam about 20 inches thick. Fractured gray sandstone bedrock is at a depth of 24 inches.

Included in mapping and making up 2 to 10 percent of this map unit are small narrow areas of Arnot soils and Rock outcrop. Also included and making up about 2 percent of the unit are a few small areas of Mardin soils, mainly at the base of the steeper slopes.

Permeability is moderate, and the available water capacity is low to moderate. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium to rapid. The root zone is restricted by the moderate depth to bedrock.

This soil is poorly suited to crops and to use as pasture because of the many surface stones. The potential productivity for woodland is moderately high. This soil is limited for most nonfarm uses by the moderate depth to bedrock, the steepness of slopes, and the many surface stones.

This soil is not used for cultivated crops because of the many surface stones. In a few areas it is used as pasture. It is not feasible to remove the surface stones and the trees for cultivation.

In most areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low to moderate available water capacity is a major management concern. The use of equipment is restricted by the many surface stones and, in places, by the steepness of slopes. Machine planting generally is impractical in large areas of woodland.

This soil is limited for nonfarm uses by the moderate depth to bedrock, the steepness of slopes, and the many surface stones. The depth to bedrock, the slopes, and the surface stones are severe limitations to the use of this soil for onsite waste disposal. In some places, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

MaB—Mardin channery loam, 3 to 8 percent slopes. This is a gently sloping, moderately well drained soil on ridgetops, plateaus, and benches. Slopes are slightly concave to smooth. The areas are irregular in shape and range from 4 to 35 acres in size.

Typically, the surface layer is dark yellowish brown channery loam about 6 inches thick. The subsoil extends to a depth of 49 inches. The upper part of the subsoil is yellowish brown and light yellowish brown channery loam about 16 inches thick; mottles are in the lower 5 inches. Below that, at a depth of 22 inches, the subsoil is a

mottled, dark yellowish brown and yellowish brown channery loam fragipan about 27 inches thick. The substratum, to a depth of 63 inches, is yellowish brown and dark brown channery fine sandy loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of well drained soils.

Permeability is moderate above the fragipan and slow and very slow in the fragipan. The available water capacity is low and very low. Runoff is slow. In wet periods, this soil has a water table within a depth of 12 to 26 inches. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and slightly acid to strongly acid in the fragipan.

In most areas, this soil is used for crops. It has medium potential for crops, high potential for use as pasture, and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a moderate hazard. Minimum tillage, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Diversions and subsurface drains are needed to help remove excess water and to allow for timely tillage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, the fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted briefly in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses by the slow and very slow permeability and the seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIw, woodland ordination symbol 3o.

MaC—Mardin channery loam, 8 to 15 percent slopes. This is a sloping, moderately well drained soil on the side slopes of ridges and benches. Slopes are concave to smooth. The areas are irregular in shape and range from 4 to 20 acres.

Typically, the surface layer is dark yellowish brown channery loam about 6 inches thick. The subsoil extends to a depth of 49 inches. The upper part of the subsoil is yellowish brown and light yellowish brown channery loam about 16 inches thick; mottles are in the lower 5 inches. Below that, at a depth of 22 inches, the subsoil is a mottled, dark yellowish brown and yellowish brown channery loam fragipan about 27 inches thick. The substratum, to a depth of 63 inches, is yellowish brown and dark brown channery fine sandy loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of well drained soils.

Permeability is moderate above the fragipan and slow and very slow in the fragipan. The available water capacity is low and very low. Runoff is medium. In wet periods, this soil has a water table within a depth of 12 to 26 inches. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and slightly acid to strongly acid in the fragipan.

In most areas, this soil is used for crops. It has medium potential for crops, high potential for use as pasture, and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability, the seasonal high water table, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a severe hazard. Minimum tillage, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Diversions and subsurface drains are needed to help remove excess water and to allow for timely tillage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If the soil is used as pasture, stocking at the proper rate, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted briefly in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses by the slow and very slow permeability and the seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 3o.

MaD—Mardin channery loam, 15 to 25 percent slopes. This is a moderately steep, moderately well drained soil on the side slopes of ridges. Slopes are smooth to rolling. The areas are long and narrow and range from 4 to 35 acres.

Typically, the surface layer is dark yellowish brown channery loam about 6 inches thick. The subsoil extends to a depth of 49 inches. The upper part of the subsoil is yellowish brown and light yellowish brown channery loam about 16 inches thick; mottles are in the lower 5 inches. Below that, at a depth of 22 inches, the subsoil is a mottled, dark yellowish brown and yellowish brown channery loam fragipan about 27 inches thick. The substratum, to a depth of 63 inches, is yellowish brown and dark brown channery fine sandy loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of well drained soils.

Permeability is moderate above the fragipan and slow and very slow in the fragipan. The available water capacity is low and very low. Runoff is rapid. In wet periods, this soil has a water table within a depth of 12 to 26 inches. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and slightly acid to strongly acid in the fragipan.

In most areas, this soil is used for crops. It has medium potential for crops, high potential for use as pasture, and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability, the seasonal high water table, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a very severe hazard because of the moderately steep slopes. Minimum tillage, diversions, the use of cover crops, and including long-term grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, the fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted briefly in wet periods by the seasonal high water table. The use of some equipment is restricted by the moderately steep slopes.

This soil is limited for most nonfarm uses by the moderately steep slopes, the slow and very slow permeability, and the seasonal high water table. The slopes, permeability, and water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IVe, woodland ordination symbol 3r.

MdB—Mardin extremely stony loam, 3 to 8 percent slopes. This is a gently sloping, moderately well drained soil on ridgetops, plateaus, and benches. Slopes are concave to smooth. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 50 percent of the surface.

Typically, the surface layer is dark yellowish brown channery loam about 6 inches thick. The subsoil extends to a depth of 49 inches. The upper part of the subsoil is yellowish brown and light yellowish brown channery loam about 16 inches thick; mottles are in the lower 5 inches. Below that, at a depth of 22 inches, the subsoil is a mottled, dark yellowish brown and yellowish brown channery loam fragipan about 27 inches thick. The substratum, to a depth of 63 inches, is yellowish brown and dark brown channery fine sandy loam.

Included in mapping and making up about 8 to 10 percent of this map unit are a few small areas of well drained soils.

Permeability is moderate above the fragipan and slow and very slow in the fragipan. The available water capacity is low and very low. Runoff is slow. In wet periods, this soil has a water table within a depth of 12 to 26 inches. The root zone is restricted by the fragipan and the seasonal high water table. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and slightly acid to strongly acid in the fragipan.

In most areas, this soil is used as woodland. This soil has very low potential for crops and for use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the surface stones, the slow and very slow permeability, and the seasonal high water table.

This soil is not suited to crops or to use as pasture because of the many surface stones. It is not feasible to remove the stones and trees for these uses.

In most areas, this soil is used as woodland. The potential productivity for trees is moderately high. Pruning undesired species helps to increase the production of wood crops. The use of equipment is restricted briefly in wet periods because of the seasonal high water table. The use of some equipment is restricted by the many surface stones. Machine planting of trees is not practical.

This soil is limited for most nonfarm uses by the slow and very slow permeability, the seasonal high water table, and the many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

MdD—Mardin extremely stony loam, 8 to 25 percent slopes. This is a sloping and moderately steep, moderately well drained soil on the side slopes of ridges. Slopes are smooth to rolling. The areas are long and narrow and range from 4 to 35 acres in size. Large stones cover about 15 to 50 percent of the surface.

Typically, the surface layer is dark yellowish brown channery loam about 6 inches thick. The subsoil extends to a depth of 49 inches. The upper part of the subsoil is yellowish brown and light yellowish brown channery loam about 16 inches thick; mottles are in the lower 5 inches. Below that, at a depth of 22 inches, the subsoil is a mottled, dark yellowish brown and yellowish brown channery loam fragipan about 27 inches thick. The substratum, to a depth of 63 inches, is yellowish brown and dark brown channery fine sandy loam.

Included in mapping and making up about 15 to 20 percent of this map unit are a few small areas of well drained soils.

Permeability is moderate above the fragipan and slow and very slow in the fragipan. The available water capacity is low and very low. Runoff is medium to rapid. In wet periods, this soil has a water table within a depth of 12 to 26 inches. The root zone is restricted by the fragipan and the seasonal high water table. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and slightly acid to strongly acid in the fragipan.

In most areas, this soil is used as woodland. This soil has very low potential for crops and for use as pasture because of the many surface stones and the steepness of slopes. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the steepness of slopes, the many surface stones, the slow and very slow permeability, and the seasonal high water table.

This soil is too stony for cultivated crops and for use as pasture. It is not feasible to remove the stones and trees for these uses.

In most areas, this soil is used as woodland. Pruning undesired species helps to increase the production of wood crops. The use of equipment is restricted briefly in wet periods by the seasonal high water table. Machine planting and the use of some equipment are restricted by the many surface stones.

This soil is limited for most nonfarm uses by the steepness of slopes, the slow and very slow permeability, the seasonal high water table, and the many surface stones. The slopes, permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

ME—Medihemists and Medifibrists. This map unit consists of nearly level, deep, very poorly drained organic soils in swamps and bogs. Slopes are hummocky. The areas are irregular in shape and range from 4 to 20 acres in size. These soils formed in organic material in old lakes, ponds, and depressions.

Medihemists make up 60 percent of this map unit. Typically, the surface layer is black mucky peat about 15 inches thick. Below that, organic material that is dominantly dark grayish brown to dark reddish brown extends to a depth of 55 inches. Gray mineral soil material is below a depth of 55 inches.

Medifibrists make up 30 percent of this unit. Typically, the surface layer is black peat about 20 inches thick. Below that, organic material that is dominantly dark brown and reddish brown extends to a depth of 60 inches. Gray mineral soil material is below a depth of 60 inches.

Included in mapping and making up 8 percent of this map unit are a few small areas of organic soils that have mineral soil material at a depth of less than 32 inches. Also included and making up 6 percent of the unit are a few small areas of Norwich and Chippewa soils near the boundary of the mapped areas.

These soils commonly are ponded. They mainly are in swamps of poor quality trees, brush, and grass where beavers build dams. In some areas, these soils have been drained and are used as a source of commercial peat. They have low potential for farming and for use as pasture or woodland. They have potential for the development of habitat for wetland wildlife. These soils are not suitable for most nonfarm uses.

Because of the high water table and the organic material, it is not feasible to develop these soils for crops or for use as pasture or woodland.

These soils are limited for nonfarm uses by the high water table and the organic material. The water table and organic material are severe limitations to the use of these soils as sites for houses and for onsite waste disposal.

Capability class VIII, woodland ordination symbol not assigned.

MoA—Morris channery loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on plateaus and the lower benches. Slopes are smooth to slightly concave. The areas are irregular in shape and range from 4 to 15 acres in size.

Typically, the surface layer is dark reddish gray channery loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is brown channery loam 2 inches thick, and the next part is mottled, reddish gray channery loam 4 inches thick. Below that, at a depth of 14 inches, the subsoil is a mottled, reddish brown channery loam fragipan 36 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 2 to 6 percent of this map unit are a few small areas of soils that are similar to this Morris soil except that they have a subsoil of sandy loam.

Permeability is slow or very slow, and the available water capacity is low to moderate. Runoff is slow. In wet periods, this soil has a water table above the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and in the upper part of the fragipan, and it is slightly acid to strongly acid in the lower part of the fragipan and in the substratum.

In most areas, this soil is used for crops. It has medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a slight hazard. Because of the seasonal high water table, this soil warms slowly in spring. Crops can be damaged by ponded water after an intensive rainfall. Keeping the natural drainageways open helps to drain excess water. Where outlets are available, surface drains and subsurface drains can be used to improve drainage. The channery surface layer can hinder the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content.

This soil has high potential for use as permanent pasture. If pasture is grazed when the soil is wet, the surface layer compacts. Stocking at the proper rate to maintain key plant species, rotating pasture, deferring grazing, and restricting grazing in wet periods help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. It has moderately high potential for trees. The root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is severely limited for most nonfarm uses because it has slow and very slow permeability and a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIw, woodland ordination symbol 3w.

MoB—Morris channery loam, 3 to 8 percent slopes. This is a gently sloping, somewhat poorly drained soil on plateaus and low benches. Slopes are slightly concave to undulating. The areas are irregular in shape and range from 4 to 35 acres.

Typically, the surface layer is dark reddish gray channery loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is brown channery loam 2 inches thick, and the next part is mottled, reddish gray channery loam 4 inches thick. Below that, at a depth of 14 inches, the subsoil is a mottled, reddish brown channery loam fragipan 36 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 2 to 6 percent of this map unit are a few small areas of soils that are similar to this Morris soil except that they have a subsoil of sandy loam.

Permeability is slow or very slow, and the available water capacity is low to moderate. Runoff is medium. In wet periods, this soil has a water table above the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and in the upper part of the fragipan, and it is slightly acid to strongly acid in the lower part of the fragipan and in the substratum.

In most areas, this soil is used for crops. It has medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a moderate hazard. Because of the excess water, this soil warms slowly in spring. Minimum tillage, the use of cover crops, diversions, stripcropping, and including grasses and legumes in the cropping system help to control erosion. Keeping the natural drainageways open helps to remove excess water. Where outlets are available, surface drains and subsurface drains can be used to improve drainage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

This soil has high potential for use as permanent pasture. Stocking at the proper rate to maintain key plant species, deferring grazing, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, the fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. It has moderately high potential for trees. The root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is severely limited for most nonfarm uses because it has slow to very slow permeability and a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for

construction, erosion and sedimentation need to be controlled.

Capability subclass IIIw, woodland ordination symbol 3w.

MoC—Morris channery loam, 8 to 15 percent slopes. This is a sloping, somewhat poorly drained soil on low benches and on the side slopes of ridges. Slopes are concave to rolling. The areas are irregular in shape and range from 4 to 10 acres in size.

Typically, the surface layer is dark reddish gray channery loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is brown channery loam 2 inches thick, and the next part is mottled, reddish gray channery loam 4 inches thick. Below that, at a depth of 14 inches, the subsoil is a mottled, reddish brown channery loam fragipan 36 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 2 to 6 percent of this map unit are a few small areas of soils that are similar to this Morris soil except that they have a subsoil of sandy loam. Also included and making up about 2 percent of the unit are a few small areas of moderately steep soils, mainly on the lower part of slopes.

Permeability is slow or very slow, and the available water capacity is low to moderate. Runoff is rapid. In wet periods, this soil has a water table above the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and in the upper part of the fragipan, and it is slightly acid to strongly acid in the lower part of the fragipan and in the substratum.

In most areas, this soil is used for crops. This soil has medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability, the seasonal high water table, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a severe hazard. Because of the excess water, this soil warms slowly in spring. Minimum tillage, the use of cover crops, diversions, stripcropping, and including grasses and legumes in the cropping system help to control erosion. Where outlets are available, surface and subsurface drains can be used to improve drainage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

This soil has high potential for use as permanent pasture. Stocking pasture at the proper rate to maintain key plant species, rotating pastures, deferring grazing, and restricting grazing in wet periods help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. It has moderately high potential for trees. The root zone is restricted by the seasonal high water table and the fragipan. In wet periods, the use of equipment is restricted by the seasonal high water table. Machine planting is practical in the larger areas of woodland. During harvesting, the soil needs to be protected from erosion.

This soil is severely limited for most nonfarm uses because it has slow to very slow permeability and a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 3w.

MxB—Morris extremely stony loam, 0 to 8 percent slopes. This is a nearly level and gently sloping, somewhat poorly drained soil on plateaus and low benches. Slopes are slightly undulating to undulating. The areas are irregular in shape and range from 4 to 15 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is dark reddish gray channery loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is brown channery loam about 2 inches thick, and the next part is mottled, reddish gray channery loam 4 inches thick. Below that, at a depth of 14 inches, the subsoil is a mottled, reddish brown channery loam fragipan 36 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up 2 to 6 percent of this map unit are a few small areas of soils that are similar to this Morris soil except that they have a subsoil of sandy loam.

Permeability is slow or very slow, and the available water capacity is low to moderate. Runoff is slow. In wet periods, this soil has a water table above the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and in the upper part of the fragipan, and it is slightly acid to strongly acid in the lower part of the fragipan and in the substratum.

In most areas, this soil is used as woodland. It has very low potential for cultivated crops and for use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the many surface stones, the slow and very slow permeability, and the seasonal high water table.

This soil is not used for cultivated crops or as pasture because of the seasonal high water table and the many surface stones. It is not economically feasible to remove the surface stones and trees or to lower the water table for these uses.

In most areas, this soil is used as woodland. Woodland productivity is moderately high. The root zone is restricted by the seasonal high water table and the fragipan. Pruning undesirable species helps to increase the production of wood crops. In wet periods, the use of equipment is restricted by the seasonal high water table. Machine planting in large areas and the use of some equipment is restricted because of the many surface stones.

This soil is severely limited for most nonfarm uses because it has slow and very slow permeability, a seasonal high water table, and many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

MxC—Morris extremely stony loam, 8 to 15 percent slopes. This is a sloping, somewhat poorly drained soil on the side slopes of ridges and low benches. Slopes are undulating to rolling. The areas are irregular in shape and range from 4 to 20 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is dark reddish gray channery loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is brown channery loam 2 inches thick, and the next part is mottled, reddish gray channery loam 4 inches thick. Below that, at a depth of 14 inches, the subsoil is a mottled, reddish brown channery loam fragipan 36 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 8 to 10 percent of this map unit are a few small areas of moderately steep soils. Also included and making up about 2 to 6 percent of the unit are a few small areas of soils that are similar to this Morris soil except that they have a subsoil of sandy loam.

Permeability is slow or very slow, and the available water capacity is low to moderate. Runoff is slow. In wet periods, this soil has a water table above the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan and in the upper part of the fragipan, and it is slightly acid to strongly acid in the lower part of the fragipan and in the substratum.

In most areas, this soil is used as woodland. This soil has very low potential for cultivated crops and for use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the many surface stones, the slow and very slow permeability, and the seasonal high water table.

This soil is not used for cultivated crops or as pasture because of the seasonal high water table and the surface stones. It is not economically feasible to remove the surface stones and the trees or to lower the water table for these uses.

In most areas, this soil is used as woodland. Woodland productivity is moderately high. The root zone is restricted by the seasonal high water table and the fragipan. Pruning undesirable species helps to increase the production of wood crops. In wet periods, the use of equipment is restricted by the seasonal high water table. Machine planting in large areas and the use of other equipment are restricted because of the many surface stones.

This soil is severely limited for most nonfarm uses because it has slow and very slow permeability, a seasonal high water table, and many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

NcA—Norwich and Chippewa channery silt loams, 0 to 3 percent slopes. These are nearly level, poorly drained and very poorly drained soils in glaciated, swampy areas. Slopes are slightly concave to plane. The areas are irregular in shape and range from 4 to 30 acres in size. These soils were not separated in mapping because they are similar in use and management. The areas of this map unit consist of either Norwich soils or Chippewa soils or both. Norwich soils make up about 60 percent of the unit and Chippewa soils make up about 30 percent.

Typically, the surface layer of Norwich soils is dark grayish brown channery silt loam about 4 inches thick. The subsurface layer is mottled, dark gray channery silt loam about 3 inches thick. The subsoil extends to a depth of 38 inches. In the upper 5 inches, the subsoil is mottled, brown channery loam. Below that, at a depth of 12 inches, it is a mottled, dark reddish gray channery silt loam fragipan 26 inches thick. The substratum, to a depth of 60 inches, is mottled, reddish brown channery silt loam.

Typically, the surface layer of Chippewa soils is very dark gray channery silt loam about 4 inches thick. The subsoil extends to a depth of 40 inches. In the upper 6 inches, the subsoil is mottled, olive gray channery loam. Below that, at a depth of 10 inches, it is a mottled, grayish brown channery loam fragipan 30 inches thick. The substratum, to a depth of 60 inches, is mottled, gray channery loam.

Included in mapping and making up 6 percent of this map unit are small areas of Morris and Volusia soils. Also included are a few small areas of soils that have an organic layer up to 16 inches thick at the surface.

Permeability is slow and very slow, and the available water capacity is low to very low. Runoff is slow. In wet periods, these soils have a water table above the fragi-

pan. Chippewa soils are very strongly acid to slightly acid above the fragipan, and Norwich soils are strongly acid to slightly acid above the fragipan.

In most areas, these soils are in woodland. In a few areas, they are used as pasture. These soils are not suited to cultivated crops because they have a high water table. They have medium potential for use as pasture and low potential for use as woodland. These soils are limited for most nonfarm uses by the slow and very slow permeability and the high water table.

In the drier periods, these soils have fair suitability for use as pasture. Stocking pasture at the proper rate to maintain key plant species, deferring grazing, and restricting grazing in wet periods help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

These soils have low potential for trees. The root zone is restricted by the fragipan. Removing undesirable species can help to increase the production of wood crops. The use of equipment is restricted throughout much of the year by the high water table.

These soils are limited for most nonfarm uses because they have slow and very slow permeability and a high water table. The permeability and the water table are severe limitations to the use of these soils for onsite waste disposal.

Capability subclass Vw, woodland ordination symbol 5w.

NxA—Norwich and Chippewa extremely stony silt loams, 0 to 3 percent slopes. These are nearly level, poorly drained and very poorly drained soils in glaciated, swampy areas. Slopes are slightly concave to plane. The areas are irregular in shape and range from 4 to 30 acres in size. Large stones cover about 15 to 40 percent of the surface. These soils were not separated in mapping because they are similar in use and management. The areas of this map unit consist of either Norwich soils or Chippewa soils or both. Norwich soils make up about 60 percent of the unit, and Chippewa soils make up about 30 percent.

Typically, the surface layer of Norwich soils is dark grayish brown channery silt loam about 4 inches thick. The subsurface layer is mottled, dark gray channery silt loam about 3 inches thick. The subsoil extends to a depth of 38 inches. In the upper 5 inches, the subsoil is mottled, brown channery loam. Below that, at a depth of 12 inches, the subsoil is a mottled, dark reddish gray channery silt loam fragipan 26 inches thick. The substratum, to a depth of 60 inches, is mottled, reddish brown channery silt loam.

Typically, the surface layer of Chippewa soils is very dark gray channery silt loam about 4 inches thick. The subsoil extends to a depth of 40 inches. In the upper 6 inches, the subsoil is mottled, olive gray channery loam. Below that, at a depth of 10 inches, it is a mottled, grayish brown channery loam fragipan 30 inches thick. The substratum, to a depth of 60 inches, is mottled, gray channery loam.

Included in mapping and making up 6 percent of this map unit are small areas of Morris and Volusia soils. Also included are a few small areas of soils that have an organic layer up to 16 inches thick at the surface.

Permeability is slow and very slow, and the available water capacity is low and very low. Runoff is slow. In wet periods, these soils have a water table above the fragipan. Chippewa soils are very strongly acid to slightly acid above the fragipan, and Norwich soils are strongly acid to slightly acid above the fragipan.

In most areas, these soils are in woodland. In a few areas, they are in poor quality pasture. These soils are not used for cultivated crops because they have a high water table and many surface stones. They have low potential for use as woodland. These soils are limited for most nonfarm uses by the slow and very slow permeability, the high water table, and the extremely stony surface.

These soils have low potential for trees. Woodland productivity is adversely affected by the high water table and the restricted rooting depth. Because of the fragipan and the high water table, windthrow is a severe hazard on these soils. Removing undesirable species can help to increase the production of wood crops. The use of equipment is restricted throughout much of the year because of the high water table. The large surface stones hinder the use of machinery in harvesting and seeding trees.

These soils are limited for most nonfarm uses because they have slow and very slow permeability, many surface stones, and a high water table. The permeability, surface stones, and water table are severe limitations to the use of these soils for onsite waste disposal.

Capability subclass VIIs, woodland ordination symbol 5x.

OaB—Oquaga channery loam, 3 to 8 percent slopes. This is a gently sloping, well drained soil on ridgetops, plateaus, and benches. Slopes are complex. The areas are irregular in shape and range from 4 to 35 acres in size.

Typically, the surface layer is dark brown channery loam about 8 inches thick. The subsoil is dark reddish brown channery loam about 26 inches thick. The substratum is dark reddish brown very channery loam about 6 inches thick. Red shale bedrock is at a depth of 40 inches.

Included in mapping are small, narrow areas of Arnot soils and a few areas of Rock outcrop. Also included are a few small areas of Wellsboro soils, mainly at the base of steeper slopes. These soils and Rock outcrop make up 2 to 10 percent of this unit.

Permeability is moderate, and the available water capacity is low. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is

medium. In some areas, the root zone is restricted by the moderate depth to bedrock.

In most areas, this soil is used as hayland. This soil has medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for some nonfarm uses by the moderate depth to bedrock.

If this soil is used for cultivated crops, erosion is a moderate hazard. Erosion can further reduce the depth of the root zone and lower the available water capacity. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. In places, the moderate depth to bedrock hinders the construction of diversions. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

This soil has high potential for use as pasture. If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. Woodland productivity is moderately high, but the root zone is restricted in some areas by the moderate depth to bedrock. Seedling mortality due to the low available water capacity is a major management concern. In large areas of woodland, machine planting generally is practical.

This soil is limited for nonfarm uses because of the moderate depth to bedrock and the coarse fragments. The moderate depth to bedrock is a severe limitation to the use of this soil for onsite disposal of waste. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIe, woodland ordination symbol 3o.

OaC—Oquaga channery loam, 8 to 15 percent slopes. This is a sloping, well drained soil on dissected ridges, benches, and side slopes. Slopes are complex. The areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is dark brown channery loam about 8 inches thick. The subsoil is dark reddish brown channery loam about 26 inches thick. The substratum is dark reddish brown very channery loam about 6 inches thick. Red shale bedrock is at a depth of 40 inches.

Included in mapping are small, narrow areas of Arnot soils and a few areas of Rock outcrop. Also included are a few small areas of Wellsboro soils, mainly at the base of the steeper slopes. These soils and Rock outcrop make up 2 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is very low. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium to rapid. In some areas, the root zone is restricted by the moderate depth to bedrock.

In most areas, this soil is used as hayland. It has medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the moderate depth to bedrock, the coarse fragments, and the slope.

If this soil is used for cultivated crops, erosion is a severe hazard. Erosion can reduce the depth of the root zone and lower the available water capacity. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. In places, the moderate depth to bedrock hinders the construction of diversions. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

This soil has high potential for use as pasture. If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

In a few areas, this soil is used as woodland. Woodland productivity is moderately high, but in places the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low available water capacity is a major management concern. In large areas of woodland, machine planting generally is practical.

This soil is limited for nonfarm uses because of the moderate depth to bedrock, the slope, and the coarse fragments. The moderate depth to bedrock is a severe limitation to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 3o.

OaD—Oquaga channery loam, 15 to 25 percent slopes. This is a moderately steep, well drained soil on the side slopes of ridges. Slopes are complex. The areas are long and narrow and range from 4 to 35 acres in size.

Typically, the surface layer is dark brown channery loam about 8 inches thick. The subsoil is dark reddish brown channery loam about 26 inches thick. The substratum is dark brown very channery loam about 6 inches thick. Red shale bedrock is at a depth of 40 inches.

Included in mapping and making up about 15 to 20 percent of the unit are small, narrow areas of Arnot soils and areas of Rock outcrop.

Permeability is moderate, and the available water capacity is low. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is rapid. In some areas, the root zone is restricted by the moderate depth to bedrock.

In most areas, this soil is used as hayland. This soil has a medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the moderate depth to bedrock, the coarse fragments, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a very severe hazard because of the moderately steep slopes. Erosion can further reduce the depth of the root zone and lower the available water capacity. Minimum tillage, diversions, the use of cover crops, and including long-term grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. In places, the moderate depth to bedrock hinders the construction of diversions. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. Woodland productivity is moderately high, but the root zone is restricted in some areas by the moderate depth to bedrock. Seedling mortality due to the low available water capacity is a major management concern. The moderately steep slopes restrict equipment selection and mechanical seeding.

This soil is limited for nonfarm uses because of the moderate depth to bedrock, the coarse fragments, and the moderately steep slopes. The moderate depth to bedrock and slopes are severe limitations to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IVe, woodland ordination symbol 3r.

OxB—Oquaga extremely stony loam, 3 to 8 percent slopes. This is a gently sloping, well drained soil on ridgetops, plateaus, and benches. Slopes are complex. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is dark brown channery loam about 8 inches thick. The subsoil is dark reddish brown channery loam about 26 inches thick. The substratum is dark reddish brown very channery loam about 6 inches thick. Red shale bedrock is at a depth of 40 inches.

Included in mapping are small, narrow areas of Arnot soils and areas of Rock outcrop. Also included are a few small areas of Wellsboro soils, mainly at the base of steeper slopes. These soils and Rock outcrop make up about 2 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is low. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium. In some areas, the root zone is restricted by the moderate depth to bedrock.

This soil is poorly suited to crops and to use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the moderate depth to bedrock and the many surface stones.

This soil is not used for cultivated crops because of the many surface stones. In a few areas, it is used as pasture. It is not feasible to remove the stones and trees for cultivation.

In most areas, this soil is used as woodland. Productivity is moderately high, but the root zone is restricted in some areas by the moderate depth to bedrock. Seedling mortality due to the low available water capacity is a major management concern. The use of equipment is restricted by the many surface stones. Machine planting generally is impractical in large areas of woodland.

This soil is limited for nonfarm uses because of the moderate depth to bedrock and the many surface stones. The depth to bedrock and the surface stones are severe limitations to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

OxD—Oquaga extremely stony loam, 8 to 25 percent slopes. This is a sloping and moderately steep, well drained soil on ridgetops, plateaus, and benches. Slopes are complex. The areas are irregular in shape and range from 10 to 45 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is dark brown channery loam about 8 inches thick. The subsoil is dark reddish brown channery loam about 26 inches thick. The substratum is dark reddish brown very channery loam about 6 inches thick. Red shale bedrock is at a depth of 40 inches.

Included in mapping are small, narrow areas of Arnot soils and areas of Rock outcrop. Also included are a few small areas of Wellsboro soils, mainly at the base of

steeper slopes. These soils and Rock outcrop make up about 12 to 15 percent of this map unit.

Permeability is moderate, and the available water capacity is low. Unless this soil has been limed, it is very strongly acid to medium acid throughout. Runoff is medium to rapid. The root zone is restricted by the moderate depth to bedrock.

This soil is poorly suited to crops and to use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the moderate depth to bedrock, the steepness of slopes, and the many surface stones.

This soil is not used for cultivated crops because of the many surface stones. It is used as pasture in a few areas. It is not feasible to remove the large surface stones and trees for cultivation.

In most areas, this soil is used as woodland. Woodland productivity is moderately high, but the root zone is restricted by the moderate depth to bedrock. Seedling mortality due to the low available water capacity is a major management concern. The use of equipment is restricted by the many surface stones and by the steepness of slopes. Machine planting generally is impractical in large areas of woodland.

This soil is limited for nonfarm uses because of the moderate depth to bedrock, the steepness of slopes, and the many surface stones. The depth to bedrock, the slope, and the surface stones are severe limitations to the use of this soil for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

OyF—Oquaga and Lordstown extremely stony loams, 25 to 70 percent slopes. These are steep and very steep, well drained soils on hillsides. Slopes are complex. The areas are long and narrow and range from 12 to 50 acres in size. Large stones cover about 15 to 50 percent of the surface. These soils are similar in use and management because of the steep slopes and surface stones; therefore, it was not necessary to separate them in mapping. The areas of this map unit consist of either Oquaga soils or Lordstown soils or both.

Oquaga soils make up about 60 percent of this map unit. Typically, the surface layer of Oquaga soils is dark brown channery loam about 8 inches thick. The subsoil is dark reddish brown channery loam about 26 inches thick. The substratum is dark reddish brown very channery loam about 6 inches thick. Red shale bedrock is at a depth of 40 inches.

Lordstown soils make up about 20 percent of this map unit. Typically, the surface layer of Lordstown soils is very dark grayish brown channery loam about 4 inches thick. The subsoil is yellowish brown and light olive brown channery loam about 20 inches thick. Fractured gray sandstone bedrock is at a depth of 24 inches.

Included in mapping and making up about 15 to 20 percent of this map unit are small narrow areas of Arnot soils and areas of Rock outcrop.

Permeability of these soils is moderate, and the available water capacity is low to moderate. Unless these soils have been limed, they are very strongly acid to medium acid throughout. Runoff is very rapid. In some areas, the root zone is restricted by the moderate depth to bedrock.

These soils are poorly suited to cultivated crops and to use as pasture because of the steepness of slopes and the many surface stones. These soils have high potential for use as wildlife habitat and for watershed protection. They have moderately high potential for use as woodland. These soils are limited for most nonfarm uses by the moderate depth to bedrock, the steepness of slopes, and the many surface stones.

In most areas, these soils are used as woodland. Woodland productivity is moderately high, but the steep slopes and the many surface stones restrict the use of some equipment. Seedling mortality due to the low to moderate available water capacity is a major management concern. Machine planting generally is impractical.

These soils are limited for nonfarm uses. The moderate depth to bedrock, the steepness of slopes, and the many surface stones are severe limitations to the use of these soils for onsite waste disposal. In some areas, excavating for building sites is difficult. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

Pt—Pits, borrow. Borrow pits are areas where gravel and fill material have been excavated for use in construction. Most of these areas are in valleys and adjacent to streams. The largest borrow pits are near the Jadwin and Prompton flood-control structures in the central part of Wayne County. The areas are generally irregular in shape and range from 10 to 35 acres in size. Slopes range from 0 to 70 percent.

A typical pedon of this map unit is not described because of the variability of the soil material.

Included in mapping are a few small areas of strip-mine spoil near Browndale.

The soils in this map unit generally are well drained and have moderate to rapid permeability. The available water capacity is low or very low. Unless the soil material has been limed, it is very strongly acid to extremely acid. Runoff is medium to very rapid.

Most areas of this unit are idle. Borrow pits have low potential for cultivated crops and for use as pasture or woodland. They are limited for most nonfarm uses by the steepness of slopes, the rapid permeability, and the coarse fragments.

This unit is not used for cultivated crops because of the steepness of slopes, the low and very low available water capacity, and the low fertility. If this unit is used as woodland, the high seedling mortality due to the low and very low available water capacity is a major management concern.

This map unit is limited for nonfarm uses because of the rapid permeability and the steepness of slopes. If the soil material is disturbed during construction, erosion and sedimentation need to be controlled. Erosion can be reduced by leveling and reseeding the areas. Sedimentation can be reduced through the use of properly placed silt basins.

Capability subclass and woodland ordination symbol not assigned.

Qu—Quarries. Quarries are areas where sandstone bedrock has been excavated. The sandstone from some quarries is crushed into aggregate and used as base material in road construction and in drainfields. The rock from other quarries is extracted in square-shaped blocks for use as building stone. Most areas are irregular in shape and range from 4 to 75 acres in size. Slopes range from 3 to 80 percent.

A typical pedon of this map unit is not described because of the variability of the soil material.

Included in mapping and making up 10 to 15 percent of the unit are small areas of very rocky Arnot soils.

The soil material in the quarries generally is well drained and has moderate to slow permeability. The available water capacity is very low. Bedrock is near the surface. Unless the soil material has been limed, it is medium acid to extremely acid. Runoff is medium to very rapid.

Most areas of this unit are idle. This unit has low potential for cultivated crops and for use as pasture or woodland. It is limited for most nonfarm uses by the shallowness to bedrock, the slow permeability, and, in places, the coarse fragments.

This unit is not used for cultivated crops because of the steepness of slopes and the very low available water capacity. If this unit is used as woodland, the high seedling mortality due to the very low available water capacity is a major management concern.

This unit is limited for nonfarm uses because of the shallowness to bedrock, the slow permeability, and the steepness of slopes. If the soil material is disturbed in quarrying, erosion and sedimentation need to be controlled. Properly placed silt basins help to reduce sedimentation.

Capability subclass and woodland ordination symbol not assigned.

Re—Rexford loam. This is a nearly level, somewhat poorly drained and poorly drained soil in depressions and along drainageways. Slopes are slightly concave. The areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is mottled, dark grayish brown loam about 8 inches thick. The subsoil extends to a depth of 42 inches. The upper part of the subsoil is mottled, light brown loam 3 inches thick, and the next part is mottled, pinkish gray sandy loam 7 inches thick. Below that, at a depth of 18 inches, the subsoil is a mottled, dark brown sandy loam fragipan 24 inches thick. The substratum, to a depth of 60 inches, is grayish brown gravelly sandy loam and dark yellowish brown stratified sand and gravel.

Included in mapping and making up about 2 percent of this map unit are a few small areas of similar soils that are moderately well drained.

Permeability is slow, and the available water capacity is moderate. Runoff is slow. In wet periods, this soil has a water table above the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid above the fragipan, and it is slightly acid to strongly acid in the fragipan and in the substratum.

Most areas of this soil are idle. In a few areas, this soil is used for crops and as pasture or woodland. It has medium potential for cultivated crops if adequate drainage is provided. It has medium potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the high water table and slow permeability.

If this soil is used for cultivated crops, erosion is a slight hazard. Because it has a high water table, this soil warms slowly in spring. After an intensive rainfall, crops can be damaged by ponded water. Excess water can be drained by keeping the natural drainageways open. Where outlets are available, open drains and subsurface drains can be used to improve drainage. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, restricting grazing when the soil is wet, stocking at the proper rate to maintain key plant species, and rotating pasture help to maintain or improve pasture. For optimum production, water-tolerant plants should be grown, and fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. The potential for trees is moderately high, but the root zone is restricted by the high water table and the fragipan. The use of equipment is restricted in wet periods by the high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses because it has slow permeability and a high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIw, woodland ordination symbol 3w.

RoD—Rock outcrop-Arnot complex, 3 to 25 percent slopes. This complex consists of areas of Rock outcrop and shallow, excessively drained and well drained, sloping to moderately steep soils on mountain ridges and side slopes. Slopes are complex. The areas are irregular in shape and range from 10 to 40 acres in size. Rock outcrop and Arnot soils are mapped together in this unit because the areas are so intermingled on the landscape that it was not practical to separate them in mapping at the scale used. This complex is about 70 percent Rock outcrop and 20 percent Arnot soils.

Rock outcrop consists of areas where bedrock of gray sandstone and conglomerate is exposed at the surface.

Figure 10.—An area of Rock outcrop-Arnot complex, 3 to 25 percent slopes. This complex is poorly suited to cultivated crops and to use as pasture because of the numerous rock outcrops.

Typically, the surface layer of Arnot soils is dark brown channery loam about 6 inches thick. The subsoil is reddish brown channery loam about 8 inches thick. The substratum is reddish brown very channery loam about 3 inches thick. Interbedded red shale and gray sandstone bedrock is at a depth of 17 inches.

Included in mapping and making up about 6 percent of this complex are a few small areas of Oquaga and Lordstown soils. Also included and making up about 4 percent of the complex are small areas of moderately well drained and somewhat poorly drained soils.

Permeability of the Arnot soils is moderate, and the available water capacity is very low. The root zone is restricted by the shallowness to bedrock.

This complex is too rocky and too stony for cultivated crops or for use as pasture (fig. 10). Most areas of this complex are in woodland. This unit has low potential for trees. It is limited for most nonfarm uses by the shallowness to bedrock and the rock outcrops. It has potential for use as wildlife habitat and for esthetic purposes.

Most areas of this complex are in woodland of poor quality. The potential productivity for trees is low. The root zone is restricted by the shallowness to bedrock and the rock outcrops. The high seedling mortality due to the very low available water capacity is a major management concern. Trees are subject to windthrow. The rock outcrops restrict machine planting and harvesting.

This unit is limited for nonfarm uses because of the shallowness to bedrock, the rock outcrops, and the very low available water capacity. Shallowness to bedrock and rock outcrops are severe limitations to the use of the soils in this complex for onsite waste disposal. Excavating for building sites is difficult.

Capability subclass VIIs; woodland ordination symbol for Arnot soils is 5d, woodland ordination symbol for Rock outcrop not assigned.

SwB—Swartswood channery sandy loam, 3 to 8 percent slopes. This is a gently sloping, well drained and moderately well drained soil on ridgetops, plateaus, and benches. The areas are irregular in shape and range from 4 to 35 acres in size.

Typically, the surface layer is pinkish gray channery sandy loam about 4 inches thick. The subsoil extends to a depth of 60 inches. The upper part of the subsoil is brown channery fine sandy loam 6 inches thick, and the next part is yellowish brown channery fine sandy loam 18 inches thick. Below that, at a depth of 28 inches, the subsoil is a mottled, brown channery fine sandy loam fragipan 32 inches thick. The substratum, to a depth of 70 inches, is yellowish brown channery sandy loam.

Included in mapping and making up about 10 percent of this map unit are a few small areas of soils that are similar to this Swartswood soil except that they are somewhat poorly drained. Also included and making up about 2 percent of this unit are a few small areas of soils that have a subsoil of loamy sand.

Permeability is moderately slow and slow, and the available water capacity is moderate. Runoff is slow. In wet periods, this soil can have a high water table. Unless this soil has been limed, it is extremely acid to strongly acid throughout.

In most areas, this soil is used for crops. This soil has high potential for cultivated crops and for use as pasture and moderately high potential for use as woodland. It is limited for many nonfarm uses by the moderately slow and slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a moderate hazard. Minimum tillage, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. In some areas, diversions are needed to help remove excess water and to allow for timely tillage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. The potential productivity for trees is moderately high, but, in places, the root zone is restricted by the fragipan. Machine planting is practical in the larger areas of woodland.

This soil is limited for many nonfarm uses because it has slow and very slow permeability, and, in some areas, a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIs, woodland ordination symbol 3o.

SwC—Swartswood channery sandy loam, 8 to 15 percent slopes. This is a sloping, well drained and moderately well drained soil on ridges, side slopes, and benches. The areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is pinkish gray channery sandy loam about 4 inches thick. The subsoil extends to a depth of 60 inches. The upper part of the subsoil is brown channery fine sandy loam 6 inches thick, and the next part is yellowish brown channery fine sandy loam 18 inches thick. Below that, at a depth of 28 inches, the subsoil is a mottled, brown channery fine sandy loam fragipan 32 inches thick. The substratum, to a depth of 70 inches, is yellowish brown channery sandy loam.

Included in mapping and making up about 10 percent of this map unit are a few small areas of soils that are similar to this Swartswood soil except that they are

somewhat poorly drained. Also included and making up about 2 percent of this unit are a few small areas of soils that have a subsoil of loamy sand.

Permeability is moderately slow and slow, and the available water capacity is moderate. Runoff is medium. In wet periods, this soil can have a high water table. Unless this soil has been limed, it is extremely acid to strongly acid throughout.

In most areas, this soil is used for crops. This soil has high potential for cultivated crops and for use as pasture and moderately high potential for use as woodland. It is limited for many nonfarm uses by the moderately slow and slow permeability, the seasonal high water table, where present, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a severe hazard. Minimum tillage, stripcropping, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. The potential productivity for trees is moderately high, but, in places, the root zone is restricted by the fragipan. Machine planting is practical in the larger areas of woodland.

This soil is limited for many nonfarm uses because of the slow and very slow permeability, the slopes, and, in some areas, a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 3o.

SwD—Swartswood channery loam, 15 to 25 percent slopes. This is a moderately steep, well drained and moderately well drained soil on the side slopes of ridges. The areas are long and narrow and range from 4 to 35 acres in size.

Typically, the surface layer is pinkish gray channery sandy loam about 4 inches thick. The subsoil extends to a depth of 60 inches. The upper part of the subsoil is brown channery fine sandy loam 6 inches thick, and the next part is yellowish brown channery fine sandy loam 18 inches thick. Below that, at a depth of 28 inches, the subsoil is a mottled, brown channery fine sandy loam fragipan 32 inches thick. The substratum, to a depth of 70 inches, is yellowish brown channery sandy loam.

Included in mapping and making up about 10 percent of this map unit are a few small areas of soils that are similar to this Swartswood soil except that they are somewhat poorly drained. Also included and making up about 2 percent of this unit are a few small areas of soils that have a subsoil of loamy sand.

Permeabiltiy is moderately slow and slow. The available water capacity is moderate. Runoff is rapid. In wet periods, this soil can have a high water table. Unless this soil has been limed, it is extremely acid to strongly acid throughout.

In most areas, this soil is used for crops. It has medium potential for cultivated crops. This soil has high potential for use as pasture and moderately high potential for use as woodland. It is limited for many nonfarm uses by the moderately steep slopes, the moderately slow and slow permeability, and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a very severe hazard. Minimum tillage, diversions, the use of cover crops, and including long-term grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. During reseeding, erosion needs to be controlled. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. The potential productivity for trees is moderately high, but, in places, the root zone is restricted by the fragipan. Machine planting in large areas of woodland and the use of some lumbering equipment are restricted by the steepness of slopes.

This soil is limited for many nonfarm uses because of the slow and very slow permeability, the steepness of slopes, and, in some areas, the seasonal high water table. The permeability, slopes, and water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IVe, woodland ordination symbol 3r.

SxB—Swartswood extremely stony sandy loam, 3 to 8 percent slopes. This is a gently sloping, well drained and moderately well drained soil on ridgetops, plateaus, and benches. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 25 percent of the surface.

Typically, the surface layer is pinkish gray channery sandy loam about 4 inches thick. The subsoil extends to

a depth of 60 inches. The upper part of the subsoil is brown channery fine sandy loam 6 inches thick, and the next part is yellowish brown channery fine sandy loam 18 inches thick. Below that, at a depth of 28 inches, the subsoil is a mottled, brown channery fine sandy loam fragipan 32 inches thick. The substratum, to a depth of 70 inches, is yellowish brown channery sandy loam.

Included in mapping and making up about 10 percent of this map unit are a few small areas of soils that are similar to this Swartswood soil except that they are somewhat poorly drained. Also included and making up about 2 percent of this unit are a few small areas of soils that have a subsoil of loamy sand.

Permeability is moderately slow and slow, and the available water capacity is moderate. Runoff is slow. In wet periods, this soil can have a high water table. The root zone is restricted in some areas by the fragipan. Unless this soil has been limed, it is extremely acid to strongly acid throughout.

In most areas, this soil is used as woodland. It has very low potential for cultivated crops and for use as pasture because of the many surface stones. This soil has moderately high potential for use as woodland. It is limited for most nonfarm uses by the many surface stones, the moderately slow and slow permeability, and, where present, the seasonal high water table.

This soil is too stony for cultivated crops and for use as pasture. It is not feasible to remove the large surface stones and the trees for these uses.

In most areas, this soil is used as woodland. The potential productivity for trees is moderately high. Pruning undesired species helps to increase the production of wood crops. Machine planting in large areas of woodland and the use of some lumbering equipment are restricted because of the many surface stones.

This soil is limited for most nonfarm uses because of the moderately slow and slow permeability; the seasonal high water table, if present; and the many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

SxD—Swartswood extremely stony sandy loam, 8 to 25 percent slopes. This is a sloping and moderately steep, well drained and moderately well drained soil on side slopes. The areas are long and narrow and range from 4 to 35 acres in size. Large stones cover about 15 to 35 percent of the surface.

Typically, the surface layer is pinkish gray channery sandy loam about 4 inches thick. The subsoil extends to a depth of 60 inches. The upper part of the subsoil is brown channery fine sandy loam 6 inches thick, and the next part is yellowish brown channery fine sandy loam 18 inches thick. Below that, at a depth of 28 inches, the subsoil is a mottled, brown channery fine sandy loam fragipan 32 inches thick. The substratum, to a depth of 70 inches, is yellowish brown channery sandy loam.

Included in mapping and making up about 10 percent of this map unit are a few small areas of soils that are similar to this Swartswood soil except that they are somewhat poorly drained. Also included and making up about 2 percent of this unit are a few small areas of soils that have a subsoil of loamy sand.

Permeability is slow and moderately slow, and the available water capacity is moderate. Runoff is medium to rapid. In wet periods, this soil can have a high water table. The root zone is restricted in some areas by the fragipan. Unless this soil has been limed, it is extremely acid to strongly acid throughout.

In most areas, this soil is used as woodland. It has very low potential for cultivated crops and for use as pasture because of the many surface stones. This soil has moderately high potential for use as woodland. It is limited for most nonfarm uses by the steepness of slopes, the many surface stones, the moderately slow and slow permeability, and, if present, the seasonal high water table.

In most areas, this soil is used as woodland. The potential productivity for trees is moderately high. Pruning undesired species helps to increase the production of wood crops. Machine planting in large areas of woodland and the use of some lumbering equipment are restricted because of the steepness of slopes and the many surface stones.

This soil is limited for most nonfarm uses because of the steepness of slopes; the moderately slow and slow permeability; the seasonal high water table, if present; and the many surface stones. The slopes, permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3x.

VoA—Volusia channery silt loam, 0 to 3 percent slopes. This is a nearly level, somewhat poorly drained soil on plateaus and low benches. Slopes are smooth to slightly concave. The areas are irregular in shape and range from 4 to 15 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is dark brown channery silt loam about 3 inches thick. The subsoil extends to a depth of 45 inches. In the upper 7 inches, it is dark brown and olive brown channery silt loam. Below that, at a depth of 12 inches, the subsoil is a mottled, dark grayish brown channery silt loam and channery silty clay loam fragipan 33 inches thick. The substratum, to a depth of 60 inches, is dark brown channery silt loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of Morris soils.

Permeability is slow and very slow, and the available water capacity is very low and low. Runoff is slow. In wet periods, this soil has a water table at a depth of 6 to 18 inches. Unless this soil has been limed, it is slightly acid to very strongly acid in the surface and subsurface layers and in the upper part of the subsoil; strongly acid to neutral in the lower part of the subsoil; and medium acid to moderately alkaline in the substratum.

In most areas, this soil is used for crops. This soil has medium potential for cultivated crops. It has high potential for use as pasture and moderately high potential for use as woodland. This soil is limited for many nonfarm uses by the slow and very slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a slight hazard. Because this soil has a seasonal high water table, it warms slowly in spring. After an intensive rainfall, crops can be damaged by ponded water. Excess water can be drained by keeping the natural drainageways open. Where outlets are available, surface and subsurface drains can be used to improve drainage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content.

This soil has high potential for use as permanent pasture. If pasture is grazed when the soil is wet, the surface compacts. Stocking at the proper rate to maintain key plant species, rotating pasture, deferring grazing, and restricting grazing in wet periods help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. It has moderately high potential for trees. The root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted in wet periods by the high water table. Machine planting is practical in the larger areas of woodland.

This soil is severely limited for most nonfarm uses because it has slow and very slow permeability and a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIw, woodland ordination symbol 3w.

VoB—Volusia channery silt loam, 3 to 8 percent slopes. This is a gently sloping, somewhat poorly drained soil on plateaus and low benches. The areas are irregular in shape and range from 4 to 35 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is dark brown channery silt loam about 3 inches thick. The subsoil extends to a depth of 45 inches. In the upper 7 inches, it is dark brown and olive brown channery silt loam. Below that, at a depth of 12 inches, the subsoil is a mottled, dark grayish brown channery silt loam and channery silty clay loam fragipan 33 inches thick. The substratum, to a depth of 60 inches, is dark brown channery silt loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of Morris soils.

Permeability is slow and very slow, and the available water capacity is very low and low. Runoff is medium. In wet periods, this soil has a water table at a depth between 6 and 18 inches. Unless this soil has been limed, it is slightly acid to very strongly acid in the surface and subsurface layers and in the upper part of the subsoil; strongly acid to neutral in the lower part of the subsoil; and medium acid to moderately alkaline in the substratum.

In most areas, this soil is used for crops. It has medium potential for cultivated crops. This soil has high potential for use as pasture and moderately high potential for use as woodland. It is limited for many nonfarm uses by the slow and very slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a moderate hazard. Minimum tillage, the use of cover crops, diversions, stripcropping, and including grasses and legumes in the cropping system help to control erosion. Because of the excess water, this soil warms slowly in spring. Keeping the natural drainageways open helps to remove excess water. Where outlets are available, surface and subsurface drains can be used to improve drainage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

This soil has high potential for use as permanent pasture. Stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. This soil has moderately high potential for trees. In some areas, the root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses because it has slow and very slow permeability and a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste

disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIw, woodland ordination symbol 3w.

VoC—Volusia channery silt loam, 8 to 15 percent slopes. This is a sloping, somewhat poorly drained soil on low benches and on side slopes. The areas are irregular in shape and range from 4 to 10 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is dark brown channery silt loam about 3 inches thick. The subsoil extends to a depth of 45 inches. In the upper 7 inches, it is dark brown and olive brown channery silt loam. Below that, at a depth of 12 inches, the subsoil is a mottled, dark grayish brown channery silt loam and channery silty clay loam fragipan 33 inches thick. The substratum, to a depth of 60 inches, is dark brown channery silt loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of Morris soils. Also included and making up about 2 percent of the unit are a few small areas of moderately steep soils, mainly on the lower part of slopes.

Permeability is slow and very slow, and the available water capacity is very low and low. Runoff is rapid. In wet periods, this soil has a water table at a depth of 6 to 8 inches. Unless this soil has been limed, it is slightly acid to very strongly acid in the surface and subsurface layers and in the upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to moderately alkaline in the substratum.

In most areas, this soil is used for crops. It has medium potential for cultivated crops. This soil has high potential for use as pasture and moderately high potential for use as woodland. It is limited for many nonfarm uses by the slow and very slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a severe hazard. Minimum tillage, the use of cover crops, diversion terraces, stripcropping, and including grasses and legumes in the cropping system help to control erosion. Because of the excess water, this soil warms slowly in spring. Keeping the natural drainageways open helps to remove excess water. Where outlets are available, surface and subsurface drains can be used to improve drainage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

This soil has high potential for use as permanent pasture. Stocking at the proper rate to maintain key plant species and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. It has moderately high potential for trees. In some areas, the root zone is restricted by the seasonal high water table and the fragipan. The use of equipment is restricted in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses because it has slow and very slow permeability and a seasonal high water table. The permeability and the water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 3w.

VxB—Volusia extremely stony silt loam, 0 to 8 percent slopes. This is a nearly level and gently sloping, somewhat poorly drained soil on plateaus and low benches. Slopes are slightly undulating to undulating. The areas are irregular in shape and range from 4 to 15 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is dark brown channery silt loam about 3 inches thick. The subsoil extends to a depth of 45 inches. In the upper 7 inches, it is dark brown and olive brown channery silt loam. Below that, at a depth of 12 inches, the subsoil is a mottled, dark grayish brown channery silt loam and channery silty clay loam fragipan 33 inches thick. The substratum, to a depth of 60 inches, is dark brown channery silt loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of Morris soils.

Permeability is slow and very slow, and the available water capacity is very low and low. Runoff is slow. In wet periods, this soil has a water table at a depth of 6 to 18 inches. Unless this soil has been limed, it is slightly acid to strongly acid in the surface and subsurface layers and in the upper part of the subsoil; strongly acid to neutral in the lower part of the subsoil; and medium acid to moderately alkaline in the substratum.

In most areas, this soil is used as woodland. It has very low potential for cultivated crops and for use as pasture because of the many surface stones. This soil has moderately high potential for use as woodland. It is limited for most nonfarm uses by the many surface stones, the slow and very slow permeability, and the seasonal high water table.

This soil is not used for cultivated crops or as pasture because of the seasonal high water table and the many surface stones. It is not economically feasible to remove the surface stones and the trees and to lower the water table for these uses.

In most areas, this soil is used as woodland. It has moderately high potential for trees. The root zone is

restricted by the seasonal high water table and the fragipan. Pruning the undesirable species helps to increase the production of wood crops. The use of equipment is restricted in wet periods because of the seasonal high water table. Machine planting and the use of some equipment are restricted because of the numerous surface stones.

This soil is severely limited for most nonfarm uses because it has slow and very slow permeability, a seasonal high water table, and many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3w.

VxC—Volusia extremely stony silt loam, 8 to 15 percent slopes. This is a sloping, somewhat poorly drained soil on the side slopes of ridges and low benches. Slopes are undulating to rolling. The areas are irregular in shape and range from 4 to 20 acres in size. Large stones cover about 15 to 45 percent of the surface.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is dark brown channery silt loam about 3 inches thick. The subsoil extends to a depth of 45 inches. In the upper 7 inches, it is dark brown and olive brown channery silt loam. Below that, at a depth of 12 inches, the subsoil is a mottled, dark grayish brown channery silt loam and channery silty clay loam fragipan 33 inches thick. The substratum, to a depth of 60 inches, is dark brown channery silt loam.

Included in mapping and making up about 10 to 15 percent of the map unit are a few small areas of Morris soils. Also included and making up 8 to 10 percent of the unit are a few small areas of moderately steep soils.

Permeability is slow and very slow, and the available water capacity is very low and low. Runoff is slow to medium. In wet periods, this soil has a water table at a depth of 6 to 18 inches. Unless this soil has been limed, it is slightly acid to very strongly acid in the surface and subsurface layers and in the upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to moderately alkaline in the substratum.

In most areas, this soil is used as woodland. It has very low potential for cultivated crops and for use as pasture because of the many surface stones. It has moderately high potential for use as woodland. This soil is limited for most nonfarm uses by the many surface stones, the slow and very slow permeability, and the high water table.

This soil is not used for cultivated crops or as pasture because of the seasonal high water table and the many surface stones. It is not economically feasible to remove the surface stones and the trees and to lower the water table for these uses.

In most areas, this soil is used as woodland. It has moderately high potential for trees. The root zone is restricted by the seasonal high water table and the fragipan. Pruning the undesirable species helps to increase the production of wood crops. The use of equipment is restricted in wet periods because of the seasonal high water table. Machine planting and the use of some equipment is restricted because of the numerous surface stones.

This soil is severely limited for most nonfarm uses because it has slow and very slow permeability, a seasonal high water table, and many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 3w.

WeB—Wellsboro channery loam, 3 to 8 percent slopes. This is a gently sloping, moderately well drained and somewhat poorly drained soil on ridgetops, plateaus, and benches. Slopes are slightly concave to smooth. Areas are irregular in shape and range from 4 to 35 acres in size.

Typically, the surface layer is dark brown channery loam about 7 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is dark brown channery loam 11 inches thick, and the next part is mottled, brown channery loam 2 inches thick. Below that, at a depth of 20 inches, the subsoil is a mottled, reddish brown channery loam fragipan about 30 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 8 to 10 percent of this map unit are a few small areas of well drained soils that are similar to this Wellsboro soil.

Permeability is slow, and the available water capacity is moderate. Runoff is medium. In wet periods, this soil has a water table within a depth of 12 to 24 inches. The root zone is restricted by the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid throughout.

In most areas, this soil is used for crops. It has medium potential for crops and high potential for use as pasture or woodland. This soil is limited for many nonfarm uses by the slow permeability and the seasonal high water table.

If this soil is used for cultivated crops, erosion is a moderate hazard. Minimum tillage, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Diversions and subsurface drains are needed to help remove the excess water and to allow for timely tillage. The channery surface layer hinders the seeding and har-

vesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. Productivity is high, but the root zone is restricted in some areas by the seasonal high water table and the fragipan. The use of equipment is restricted briefly in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses by the slow permeability and the seasonal high water table. The permeability and water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIw, woodland ordination symbol 2o.

WeC—Wellsboro channery loam, 8 to 15 percent slopes. This is a sloping, moderately well drained and somewhat poorly drained soil on the side slopes of ridges and benches. Slopes are concave to smooth. The areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is dark brown channery loam about 7 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is dark brown channery loam 11 inches thick, and the next part is mottled, brown channery loam 2 inches thick. Below that, at a depth of 20 inches, the subsoil is a mottled, reddish brown channery loam fragipan about 30 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of well drained soils that are similar to this Wellsboro soil.

Permeability is slow, and the available water capacity is moderate. Runoff is medium. In wet periods, this soil has a water table within a depth of 12 to 24 inches. The root zone is restricted by the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid throughout.

In most areas, this soil is used for crops. It has medium potential for crops and high potential for use as pasture or woodland. This soil is limited for many nonfarm uses by the slow permeability, the seasonal high water table, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a severe hazard. Minimum tillage, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Diversions and subsurface drains are needed to help remove the excess water and to allow for timely tillage. The channery surface layer hinders the seeding and harvesting of some crops. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. It has high potential for trees, but the root zone is restricted in some areas by the seasonal high water table and the fragipan. The use of equipment is restricted briefly in wet periods by the seasonal high water table. Machine planting is practical in the larger areas of woodland.

This soil is limited for most nonfarm uses by the slow permeability and the seasonal high water table. The permeability and water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IIIe, woodland ordination symbol 2o.

WeD—Wellsboro channery loam, 15 to 25 percent slopes. This is a moderately steep, moderately well drained and somewhat poorly drained soil on the side slopes of ridges. Slopes are smooth to rolling. The areas are long and narrow and range from 4 to 35 acres in size.

Typically, the surface layer is dark brown channery loam about 7 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is dark brown channery loam 11 inches thick, and the next part is mottled, brown channery loam 2 inches thick. Below that, at a depth of 20 inches, the subsoil is a mottled, reddish brown channery loam fragipan about 30 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 15 to 20 percent of this map unit are a few small areas of well drained soils that are similar to this Wellsboro soil.

Permeability is slow, and the available water capacity is moderate. Runoff is rapid. In wet periods, this soil has a water table within a depth of 12 to 24 inches. The root zone is restricted by the fragipan. Unless this soil has been limed, it is medium acid to very strongly acid throughout.

In most areas, this soil is used for crops. It has medium potential for crops and high potential for use as pasture or woodland. This soil is limited for many nonfarm uses by the slow permeability, the seasonal high water table, and the steepness of slopes.

If this soil is used for cultivated crops, erosion is a very severe hazard because of the steepness of slopes. Minimum tillage, diversions, the use of cover crops, and including long-term grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content and to reduce clodding and crusting.

If this soil is used as pasture, stocking at the proper rate, restricting grazing in wet periods, and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

In a few areas, this soil is used as woodland. It has high potential for trees, but in some areas the root zone is restricted by the seasonal high water table and the fragipan. Machine planting and the use of equipment are restricted because of the moderately steep slopes.

This soil is limited for most nonfarm uses because of the steepness of slopes, the slow permeability, and the seasonal high water table. The slopes, permeability, and water table are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass IVe, woodland ordination symbol 2r.

WoB—Wellsboro extremely stony loam, 3 to 8 percent slopes. This is a gently sloping, moderately well drained and somewhat poorly drained soil on ridgetops, plateaus, and benches. Slopes are concave to smooth. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 50 percent of the surface.

Typically, the surface layer is dark brown channery loam about 7 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is dark brown channery loam 11 inches thick, and the next part is mottled, brown channery loam 2 inches thick. Below that, at a depth of 20 inches, the subsoil is a mottled, reddish brown channery loam fragipan about 30 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 8 to 10 percent of this map unit are a few small areas of well drained soils that are similar to this Wellsboro soil.

Permeability is slow, and the available water capacity is moderate. Runoff is slow. In wet periods this soil has a water table within a depth of 12 to 24 inches. The root zone is restricted by the fragipan and the seasonal high water table. Unless this soil has been limed, it is medium acid to very strongly acid throughout.

In most areas, this soil is used as woodland (fig. 11). It has very low potential for crops and for use as pasture because of the many surface stones. This soil has high potential for use as woodland. It is limited for most nonfarm uses by the many surface stones, the slow permeability, and the seasonal high water table.

This soil is not suited to crops or to use as pasture because of the many surface stones. It is not feasible to remove the stones and trees for these uses.

In most areas, this soil is used as woodland. It has high potential for trees. Pruning the undesirable species helps to increase the production of wood crops. The use of equipment is restricted because of the many surface stones. Machine planting is not practical.

This soil is limited for most nonfarm uses because of the slow permeability, the seasonal high water table, and the many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 2x.

WoD—Wellsboro extremely stony loam, 8 to 25 percent slopes. This is a sloping and moderately steep, moderately well drained and somewhat poorly drained soil on the side slopes of ridges and benches. Slopes are smooth to rolling. The areas are irregular in shape and range from 4 to 35 acres in size. Large stones cover about 15 to 50 percent of the surface.

Typically, the surface layer is dark brown channery loam about 7 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is dark brown channery loam 11 inches thick, and the next part is mottled, brown channery loam 2 inches thick. Below that, at a depth of 20 inches, the subsoil is a mottled, reddish brown channery loam fragipan about 30 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Included in mapping and making up about 10 to 20 percent of this map unit are a few small areas of well drained soils that are similar to this Wellsboro soil.

Permeability is slow, and the available water capacity is moderate. Runoff is medium to rapid. In wet periods, this soil has a water table within a depth of 12 to 24 inches. The root zone is restricted by the fragipan and the seasonal high water table. Unless this soil has been limed, it is medium acid to very strongly acid throughout.

In most areas, this soil is used as woodland. This soil has very low potential for crops and for use as pasture because of the many surface stones. It has high potential for use as woodland. This soil is limited for most nonfarm uses by the slow permeability and the seasonal high water table.

This soil is too stony for cultivated crops and for use as pasture. It is not feasible to remove the stones and trees for these uses.

The potential productivity for trees is high. Pruning the

Figure 11.—An area of Wellsboro extremely stony loam, 3 to 8 percent slopes, in woodland. This soil has high potential for tree production.

undesirable species helps to increase the production of wood crops. Machine planting and the use of equipment are restricted because of the many surface stones and the steepness of slopes.

This soil is limited for most nonfarm uses because of the slow permeability, the seasonal high water table, and the many surface stones. The permeability, water table, and surface stones are severe limitations to the use of this soil for onsite waste disposal. If this soil is disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs, woodland ordination symbol 2x.

WxF—Wellsboro and Mardin extremely stony loams, 25 to 50 percent slopes. These are steep and very steep soils on hillsides. The Wellsboro soils are moderately well drained and somewhat poorly drained, and the Mardin soils are moderately well drained. Slopes are complex. The areas are long and narrow and range from 12 to 50 acres in size. Large stones cover about 15 to 50 percent of the surface. These soils are similar in

use and management because of the steep slopes and surface stones; therefore, it was not necessary to separate them in mapping. The areas of this map unit consist of either Wellsboro soils or Mardin soils or both soils.

Wellsboro soils make up 70 percent of this map unit. Typically, the surface layer of Wellsboro soils is dark brown channery loam about 7 inches thick. The subsoil extends to a depth of 50 inches. The upper part of the subsoil is dark brown channery loam 11 inches thick, and the next part is mottled, brown channery loam 2 inches thick. Below that, at a depth of 20 inches, the subsoil is a mottled, reddish brown channery loam fragipan about 30 inches thick. The substratum, to a depth of 60 inches, is reddish brown channery loam.

Mardin soils make up 20 percent of this map unit. Typically, the surface layer of Mardin soils is dark yellowish brown channery loam about 6 inches thick. The subsoil extends to a depth of 49 inches. The upper part of the subsoil is yellowish brown and light yellowish brown channery loam about 16 inches thick; mottles are in the lower 5 inches. Below that, at a depth of 22 inches, the subsoil is a mottled, dark yellowish brown and yellowish brown channery loam fragipan about 27 inches thick. The substratum, to a depth of 63 inches, is yellowish brown and dark brown channery fine sandy loam.

Included in mapping and making up 10 percent of this map unit are a few small areas of well drained soils that are similar to these Wellsboro and Mardin soils.

Permeability of these soils is slow and very slow, and the available water capacity is very low to moderate. Unless they have been limed, Wellsboro soils are medium acid to very strongly acid throughout. Mardin soils are medium acid to very strongly acid above the fragipan. Runoff on these soils is very rapid. In some areas, the root zone is restricted by the fragipan.

These soils are poorly suited to cultivated crops and to use as pasture because of the steepness of slopes and the surface stones. These soils have high potential for use as woodland and wildlife habitat and for watershed protection. They are limited for most nonfarm uses by the slow and very slow permeability, the seasonal high water table, the steepness of slopes, and the surface stones.

In most areas, these soils are used as woodland. The potential productivity for trees is high and moderately high, but the steepness of slopes and the surface stones restrict the use of some equipment. The major management concern is controlling the erosion caused by very rapid runoff.

These soils are limited for most nonfarm uses. The very slow and slow permeability, the seasonal high water table, the steepness of slopes, and the surface stones are severe limitations to the use of these soils for onsite waste disposal. If these soils are disturbed for construction, erosion and sedimentation need to be controlled.

Capability subclass VIIs; woodland ordination symbols are 2x for Wellsboro soils and 3x for Mardin soils.

WyB—Wyoming gravelly sandy loam, 3 to 8 percent slopes. This is a gently sloping, deep, somewhat excessively drained soil on terraces. The areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is dark brown gravelly sandy loam about 9 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish brown gravelly sandy loam 9 inches thick, and the lower part is dark brown gravelly sandy loam 9 inches thick. The substratum, to a depth of 60 inches, is grayish brown very gravelly sand.

Included in mapping and making up 10 to 15 percent of this map unit are a few small areas of soils that are similar to this Wyoming soil except that they have loamy sand or coarser soil material at a depth of more than 40 inches.

Permeability is rapid, and the available water capacity is low and very low. Runoff is medium. The surface layer is more than 15 percent gravel. Unless this soil has been limed, it is medium acid to extremely acid throughout.

Most areas of this soil are idle. In some areas, this soil is used for crops. In a few small areas, it is used as a source of sand and gravel. This soil has medium to low potential for cultivated crops and for use as pasture and medium potential for use as woodland. This soil has high potential for most nonfarm uses, for example, for use as sites for houses. However, it is limited for use as a site for onsite waste disposal because the pollution of ground water is a hazard.

In a few areas, this soil is used for crops; however, it is only fairly to poorly suited to this use mainly because it has low and very low available water capacity. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. Incorporating crop residue and manure into the surface layer helps to maintain the organic matter content.

If this soil is used as pasture, stocking at the proper rate and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through periodic applications of nutrients.

The potential productivity for trees is medium; however, this soil is used as woodland only in a few areas. The severe seedling mortality due to the low and very low available water capacity is a major management concern. Machine planting generally is practical.

This soil is limited for nonfarm uses by the coarse fragments and the rapid permeability. If this soil is used as a site for onsite waste disposal, the contamination of ground water is a hazard.

Capability subclass IIIs, woodland ordination symbol 4f.

WyC—Wyoming gravelly sandy loam, 8 to 15 percent slopes. This is a sloping, deep, somewhat excessively drained soil on dissected terraces. Slopes are

complex. The areas are irregular in shape and range from 4 to 12 acres in size.

Typically, the surface layer is dark brown gravelly sandy loam about 9 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish brown gravelly sandy loam 9 inches thick, and the lower part is dark brown gravelly sandy loam 9 inches thick. The substratum, to a depth of 60 inches, is grayish brown very gravelly sand.

Included in mapping and making up about 10 to 15 percent of this map unit are a few small areas of soils that are similar to this Wyoming soil except that they have loamy sand or coarser soil material at a depth of more than 40 inches.

Permeability is rapid, and the available water capacity is low and very low. Runoff is medium. The surface layer is more than 15 percent gravel. Unless this soil has been limed, it is medium acid to extremely acid throughout.

Most areas of this soil are idle. In some areas, this soil is used for crops. In a few small areas, it is used as a source of sand and gravel. This soil has medium to low potential for cultivated crops. It has medium potential for use as pasture or woodland. This soil has high potential for most nonfarm uses, for example, sites for houses. However, it is limited for use as a site for onsite waste disposal because the pollution of ground water is a hazard.

In a few areas, this soil is used for crops; however, it is only fairly to poorly suited to this use mainly because it has low and very low available water capacity. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable. Incorporating crop residue and manure into the surface layer help to maintain the organic matter content.

If this soil is used as pasture, stocking at the proper rate and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

The potential productivity for trees is moderately high; however, this soil is used as woodland only in a few areas. The severe seedling mortality due to the low and very low available water capacity is a major management concern. Machine planting in large areas of woodland generally is practical.

This soil is limited for nonfarm uses by the steepness of slopes, the coarse fragments, and the rapid permeability. If this soil is used as a site for onsite waste disposal, the contamination of ground water is a hazard.

Capability subclass IVs, woodland ordination symbol 4f.

WyD—Wyoming gravelly sandy loam, 15 to 25 percent slopes. This is a moderately steep, deep, somewhat excessively drained soil on the side slopes of terraces. Slopes are complex. The areas are long and narrow and range from 4 to 12 acres in size.

Typically, the surface layer is dark brown gravelly sandy loam about 9 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish brown gravelly sandy loam 9 inches thick, and the lower part is dark brown gravelly sandy loam 9 inches thick. The substratum, to a depth of 60 inches, is grayish brown very gravelly sand.

Included in mapping and making up 10 to 15 percent of this map unit are a few small areas of soils that are similar to this Wyoming soil except that they have a thinner combined surface layer and subsoil.

Permeability is rapid, and the available water capacity is low and very low. Runoff is rapid. The surface layer is more than 15 percent gravel. Unless this soil has been limed, it is medium acid to extremely acid throughout.

Most areas of this soil are idle. In some areas, this soil is used for crops. In a few small areas, it is used as a source of sand and gravel. This soil has low potential for cultivated crops. It has medium potential for use as pasture or woodland. This soil is limited for most nonfarm uses because of the steepness of slopes and the gravelly surface layer. It has low potential for use as sites for houses because of the steepness of slopes.

In a few areas, this soil is used for crops; however, it is only fairly to poorly suited to this use mainly because it has low and very low available water capacity for plants. Erosion is a very severe hazard. Minimum tillage, diversions, the use of cover crops, and including grasses and legumes in the cropping system help to reduce runoff and control erosion. Stripcropping can control erosion where the topography is suitable.

If this soil is used as pasture, stocking at the proper rate and rotating pasture help to maintain or improve pasture. For optimum production, fertility should be maintained through the periodic application of nutrients.

The potential productivity for trees is medium. The severe seedling mortality due to the low and very low available water capacity is a major management concern. Machine planting generally is practical.

This soil is limited for nonfarm uses by the steepness of slopes, the coarse fragments, and the rapid permeability. If this soil is used for onsite waste disposal, the contamination of ground water is a hazard.

Capability subclass IVe, woodland ordination symbol 4f.

WyE—Wyoming gravelly sandy loam, 25 to 45 percent slopes. This is a steep and very steep, deep, somewhat excessively drained soil on the side slopes of terraces, kames, eskers, and valley trains. Slopes are complex. The areas are long and narrow and range from 4 to 12 acres in size.

Typically, the surface layer is dark brown gravelly sandy loam about 9 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish

brown gravelly sandy loam 9 inches thick, and the lower part is dark brown gravelly sandy loam 9 inches thick. The substratum, to a depth of 60 inches, is grayish brown very gravelly sand.

Included in mapping and making up 10 to 15 percent of this map unit are a few small areas of soils that are similar to this Wyoming soil except that they have a thinner combined surface layer and subsoil.

Permeability is rapid, and the available water capacity is low and very low. Runoff is very rapid. The surface layer is more than 15 percent gravel. Unless this soil has been limed, it is medium acid to extremely acid throughout.

Most areas of this soil are idle. In some areas, this soil is used as woodland. In a few areas, it is used as a source of sand and gravel. This soil has very low potential for cultivated crops and for use as pasture. It has medium potential for use as woodland. This soil has very low potential for most nonfarm uses because of the steepness of slopes.

This soil is not used for crops because of the steepness of slopes and the low to very low available water capacity.

This soil has medium potential for trees. The severe seedling mortality due to the low and very low available water capacity is a major management concern. The use of some equipment is restricted because of the steep and very steep slopes.

This soil is limited for nonfarm uses because of the steepness of slopes, the coarse fragments, and the rapid permeability. If this soil is used as a site for onsite waste disposal, the contamination of ground water is a hazard.

Capability subclass VIIe, woodland ordination symbol 4f.

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 estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops, pasture, and woodland; as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities; and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

John C. Spitzer, conservation agronomist, 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 management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

Farming is a major land use in Wayne County. In 1975, the income from farming was about 26 million dollars. According to the Conservation Needs Inventory, 136,000 acres was used for crops and pasture in 1975. Of this

total, 67,000 acres was used as permanent pasture. According to the 1975 Pennsylvania Crop and Livestock Annual Summary, 7,920 acres was in corn; 240 acres was in small grains; 52,000 acres was in alfalfa and other hay; about 200 acres was in orchards; and the rest was in cropland pasture, conservation use, or idle cropland.

Many soils in Wayne County are too stony for use as cropland. The soils that have few or no surface stones have good potential for crops. About 31,000 acres of potentially good cropland is currently being used as woodland, and about 40,100 acres is used as pasture or hayland or is cropland that is temporarily idle. In addition to the food production potential of this land, food production can be increased by extending the latest crop production technology to all cropland in the county.

Soil erosion is the major hazard on most of the cropland and pastureland in Wayne County. Swartswood, Wellsboro, and Mardin soils are among the most productive soils in the county, but they are highly susceptible to erosion. On these and other soils, conservation practices can help to reduce the hazard of erosion and to increase production.

The loss of surface soil through erosion reduces the productivity of soils, especially on shallow or moderately deep soils, soils that have a fragipan, and soils that have a low or very low available water capacity. Soils that have a fragipan include the Wellsboro, Mardin, and Swartswood soils. Wyoming soils are an example of soils that have a low or very low available water capacity.

Soil erosion also results in sedimentation in streams and reservoirs and in the pollution of streams, thus reducing the quality of water for all uses.

On many sloping channery soils, erosion has exposed many coarse fragments at the surface which make seedbed preparation and tillage difficult. Examples of such soils are Lordstown channery loam and Oquaga channery loam.

Erosion-control practices establish or maintain a protective surface cover, reduce runoff and sedimentation, and increase water infiltration. Maintaining a vegetative cover helps to increase the productivity of the soils. On pasture and hayland, deferred grazing, proper grazing, and the use of grasses and legumes in the cropping system help to reduce erosion, provide nitrogen, and improve tilth. Contour farming and terraces, minimum tillage, the use of cover crops, and returning crop residue to the soil help to increase water infiltration and reduce erosion. These practices are suitable for most soils; however, terraces are not suitable on soils that have steep and irregular slopes.

Terraces and diversions reduce the length of slopes and thus reduce runoff and erosion. They are most practical on deep, well drained soils that have moderate, uniform slopes. Swartswood soils, for example, generally are suitable for terraces and diversions. Soils that have steep or irregular slopes, excessive wetness, or a clayey subsoil or that are shallow to bedrock are less suitable for terraces and diversions.

Contour farming and stripcropping are other erosion-control practices that are commonly used in the survey area. Soils that have uniform slopes, for example, Mardin and Wellsboro soils, are the best suited to contour farming and stripcropping.

Information on designing or installing erosion-control structures is available at the Wayne Conservation District office and the local office of the Soil Conservation Service.

Soil drainage is a major management need on many of the soils in Wayne County. Some soils are so wet that crop production is not practical or economically feasible unless artificial drainage is provided. Examples of these soils are the poorly drained and very poorly drained Norwich, Chippewa, and Holly soils. These soils make up about 21,826 acres in Wayne County.

The somewhat poorly drained soils in the county are so wet that crops are damaged in most years unless artificial drainage is provided. The Morris and Volusia soils are examples of somewhat poorly drained soils. These soils make up about 120,316 acres in Wayne County.

Small areas of wet soils are in some drainageways and swales. These wet soils generally are mapped as inclusions in map units of the moderately well drained Mardin and Wellsboro soils. Artificial drainage can be provided to improve the productivity of these soils; however, it may not be economically feasible.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage generally is needed on poorly drained soils that are intensively cropped. Tile drains must be more closely spaced in soils that have slow permeability than in those that have more rapid permeability. Locating adequate outlets for a tile drainage system often is difficult. Holly, Chippewa, and Norwich soils are examples of soils on which drainage is a problem.

Soil fertility is naturally low in many soils in the survey area. Many upland soils are naturally strongly acid and require applications of lime to supply calcium and to raise the pH sufficiently for good growth of alfalfa and other crops. The content of available phosphorus and magnesium is naturally low in most soils. For all soils, lime and fertilizers should be applied on the basis of soil tests, on the needs of the crop, and on the expected or desired yield. The Cooperative Extension Service can help to determine the kind and amount of fertilizer and lime to apply.

Soil tilth is an important factor in seed germination, plant growth, and water infiltration. Soils that have good tilth are granular and porous. Swartswood soils are example of soils that have good tilth.

Many of the soils in the survey area that are used for crops have a relatively low content of organic matter.

The structure of these soils generally is weak, and after an intensive rainfall the surface tends to crust. The crust generally is hard and is nearly impervious to water when the soil is dry, thus reducing water infiltration and increasing runoff. Regularly adding crop residue, manure, or other organic material to the soil helps to improve soil structure and reduce crust formation.

Fall plowing generally is not suitable on light-colored soils that have a silt loam surface layer because it commonly results in surface crusting in the following winter and spring. After fall plowing, many soils are almost as dense and hard at planting time as they were before they were plowed. In addition, sloping soils are subject to accelerated erosion if they are plowed in the fall.

The main *field crop* in Wayne County is corn. When economic conditions are favorable, grain sorghum and potatoes also are grown. Wheat, oats, and barley are the main close-growing crops in the county. Deep, well drained soils have the best potential for crops. Many other soils in the survey area can produce good yields if they are well managed.

Specialty crops produced in Wayne County include apples, vegetables, and nursery plants. Deep soils that have good natural drainage and that warm up early in spring are best suited to specialty crops such as tree fruits. Air drainage needs to be good to reduce damage by frost in areas where apples and peaches are grown.

The latest information on growing specialty crops is available at the local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the soil is not suited to the crop or the crop is not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

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 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 groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and 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 acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

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

Woodland management and productivity

Paxton G. Wolfe, woodland conservationist, Soil Conservation Service, helped prepare this section.

About 282,200 acres, or nearly 60 percent of the land area, in Wayne County is woodland (*9*). Of this total, farmers own 32 percent; private concerns, 63 percent; forest industries, 0.25 percent; and federal and state agencies, 4.75 percent. Less than 1 percent of the woodland in the county is classified as noncommercial. In addition to its economic value, the woodland in Wayne County has watershed-protection, recreational, and esthetic value.

The woodland consists of stands of second- and third-growth trees. In the following paragraphs, the principal forest cover types (*7*) in the county are described, and the extent of each forest type is given (*9*).

The maple-beech-birch forest type makes up 33 percent of the woodland in Wayne County. The component species of this forest type are sugar maple, beech, and yellow birch. Associated species are basswood, red maple, hemlock, red oak, white ash, white pine, black birch, black cherry, and yellow-poplar.

The oak-hickory forest type makes up 24 percent of the woodland. It consists mainly of white oak, red oak, and hickories; black oak and chestnut oak are predominant in some areas. Associated species include yellow-poplar, white ash, red maple, sugar maple, and beech.

The elm-ash-red maple forest type makes up 17 percent of the woodland. The component species are white ash, American elm, and red maple. Associated species are slippery elm, yellow birch, sycamore, and hemlock.

The aspen-birch forest type makes up 16 percent of the woodland. The component species are quaking aspen, bigtooth aspen, and gray birch. Associated species include pin cherry, red maple, yellow birch, white pine, ash, and sugar maple.

The white pine forest type makes up 10 percent of the woodland. White pine is the predominant species. Associated species include pitch pine, black cherry, ash, sugar maple and red maple, hemlock, red oak and white oak, quaking aspen and bigtooth aspen, and paper, gray, yellow, and black birch.

On 86 percent of the woodland in Wayne County, the soils have very high, high, or moderately high productivity. On 1 percent of the woodland, the soils have moderate productivity; on 8 percent, they have low productivity; and on about 5 percent, the soils are unclassified. In general, the soils in Wayne County can support good stands of red oak, sugar maple, and white pine. The deeper, well drained soils are better suited to trees than the shallow, poorly drained soils.

About 37 percent of the commercial woodland in Wayne County is sawtimber, 43 percent is poletimber, and 15 percent is seedlings and saplings. The rest is classified as woodland that is nonstocked or that is less than 10 percent growing-stock trees.

On soils that have very high, high, or moderately high potential productivity, desirable tree species can be established through good woodland management. The local U.S. forester or a consulting forester can provide assistance in planning a woodland improvement program. On soils that have low potential productivity, management to increase the yield of wood crops generally is not economical.

On soils that have moderate potential productivity, a thorough inventory of the growing stock on a site and an assessment of the quality of the stock are needed to determine whether woodland management is economically feasible. Also, the market potential of the species on a site and whether or not the soils rated moderate

are in a larger area of more productive soils need to be determined.

The climate in the northern half of the county is ideal for maple syrup production. "Sugar bushes" can be established on the deep, well drained and moderately well drained soils in areas of large-pole and sawtimber-sized sugar maples. The SCS forester or a consulting forester can help woodland owners in developing their stands for maple syrup production. The percentage of sugar in the sap of individual sugar maples can be checked to determine which trees should remain in the stand for tapping in February and March.

Table 7 contains information useful to woodland owners or forest managers in planning the use of soils for wood crops. Only those 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 *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *f*, high content of coarse fragments in the soil 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: x, w, d, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are 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 the *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 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. It is listed in table 7 for trees that woodland managers generally favor in woodcrop production. These trees are the most important in terms 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.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers.

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. If 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 ap-

plied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the large scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil are 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; and table 11, 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 limitation that affects shallow excavations, dwellings with or without a basement, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use and that limitations are minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils that are rated severe, costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material

available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock or hardpan to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, and *poor*, which mean about the same as *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard if the seasonal high water table is above the level of the lagoon floor. If the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of 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 trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

If it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the site should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction material. 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 shrink-swell potential, low frost action potential, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can restrict plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils or very firm clayey soils; soils that have suitable layers less than 8 inches thick; soils that have a large amount of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11, soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment (fig. 12). Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of the soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 11 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into

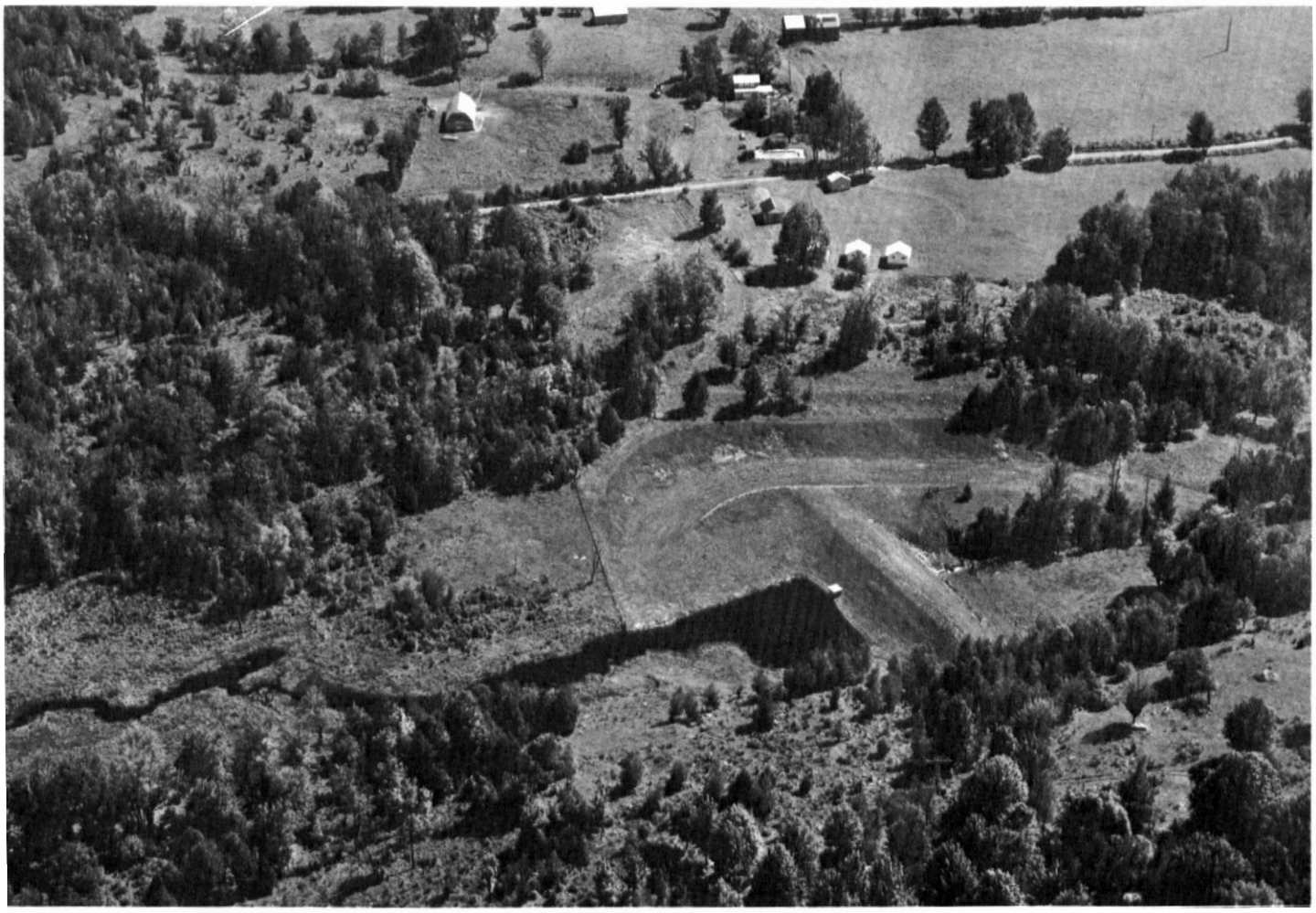


Figure 12.—A pond reservoir in an area of Holly silt loam.

the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

Wayne County has an abundance of recreation facilities that attract thousands of tourists and residents each year and that provide an important source of revenue for the county. Among the major recreation facilities are several vacation-home developments, large lakes for boating and swimming, large areas of State game lands, ski slopes, and campgrounds. Many summer camps are located in the northern part of the county near the numerous natural lakes. Lake Wallenpaupack is the largest lake in Pennsylvania. It attracts many vacationers from the New York-New Jersey area. In summer, the Delaware River is used for canoeing.

The best soils in the county for most recreation uses are deep, well drained soils that have few or no stones on the surface. The many soils in the county that have an extremely stony surface are severely limited for intensive recreation uses; however, these soils have potential for recreation uses that require only slight land alteration, for example, hiking trails. The soils that have the poorest potential for recreation use are the poorly drained and very poorly drained soils and the steep and very steep soils.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

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 remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They have moderate slopes and have few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

Clayton L. Heiney, wildlife biologist, Soil Conservation Service, helped prepare this section.

The soils in Wayne County affect the wildlife population through their influence on vegetation, which provides the food and cover for wildlife. Under natural conditions, the distribution and kinds of vegetation in an area are determined by the kinds of soil in the area. Each kind of wildlife inhabits the area where the vegetation provides the proper habitat for that kind of wildlife. If the natural conditions in an area are altered through artificial drainage or other soil management practices, the kinds and pattern of vegetation in the area change, and, in turn, the wildlife population changes.

The principal game species in Wayne County are white-tailed deer, black bear, snowshoe hare, gray squirrel, cottontail rabbit, ruffed grouse, ring-necked pheasant, woodcock, and waterfowl. The main furbearers are beaver, muskrat, otter, and mink. The nongame wildlife in the county includes songbirds, reptiles, amphibians, and small mammals.

White-tailed deer, which are found throughout Wayne County, are considered a woodland species; however, large, mature forests are not the best habitat for deer. Deer inhabit woodland that has a mixture of brush or young trees, a few mature trees, and some small open areas.

Gray squirrels, cottontail rabbits, and ruffed grouse also are found throughout the county. Ruffed grouse inhabit areas that have stands of young trees and brush and open areas. Squirrels mainly inhabit woodland that has mature, nut-producing trees. Cottontail rabbits live mainly on farmland. Abandoned farmland that is overgrown by brush generally has a large population of cottontail rabbits.

Black bear inhabit woodland that has mixed stands of conifers and hardwoods. They require access to an ample supply of water, for example, streams, ponds, or lakes.

Snowshoe hares are plentiful in Wayne County. They inhabit cool, shrubby bogs or swampland that is overgrown by spruce, hemlock, willows, alders, or brush.

Muskrat, mink, beaver, and river otter inhabit wetland areas along rivers, lakes, and ponds. Muskrats are found throughout Wayne County. Mink, beaver, and otter generally are found only in the more remote areas.

Waterfowl are abundant in Wayne County. The most common species are mallards, Canada geese, wood ducks, and black ducks. They inhabit the Delaware River and its tributaries as well as ponds, lakes, and beaver dams.

The changing pattern of land use in Wayne County, especially the increasing acreage used for urban development, greatly affects the distribution and abundance of wildlife. The population of species such as the black bear and the river otter is affected more by man's activities in an area than by the kinds of soil or vegetation.

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 of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife 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, lovegrass, 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, goldenrod, beggarweed, wheatgrass, and grama.

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 hardwood plants are oak, poplar, cherry, sweetgum, 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.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, and wildrice and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams (fig. 13). Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants.

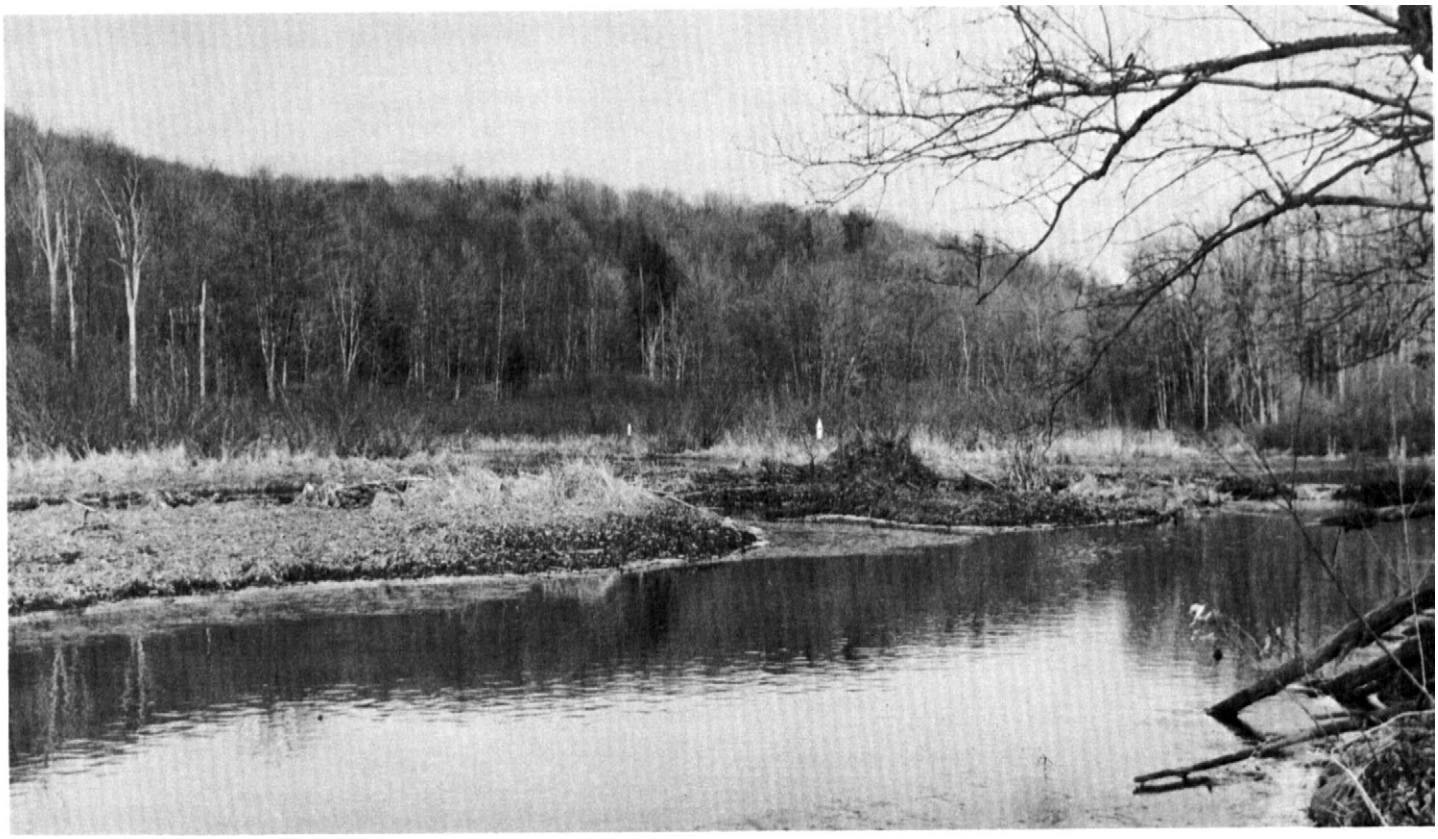


Figure 13.—This area of Medihemists and Medifibrists has been developed as a shallow-water area for wildlife.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil 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.

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 (*8*). 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.

The two systems commonly used in classifying soils for engineering use are the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes 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.

If 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 material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in the Unified and AASHTO soil classi-

fication systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and in plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

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 the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems. In table 15 it is expressed as inches of water per inch of soil.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

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 layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons 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.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well 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.

Classification of the soils

The system of soil classification currently used by the National Cooperative Soil Survey has six categories (*10*). 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 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the

order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Fluvaquents (*Fluv*, meaning water deposited, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

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 the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic, Typic Fluvaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*8*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Arnot series

The Arnot series consists of loamy-skeletal, mixed, mesic Lithic Dystrochrepts. Arnot soils formed on ridges, hillsides, and knobs in glacial till that is dominantly reddish shale and grayish sandstone. These soils are shallow and are somewhat excessively drained and well drained. Slopes range from 3 to 25 percent but are dominantly 8 to 25 percent.

Arnot soils formed in parent material that is similar to that of the moderately deep, well drained Oquaga soils; the deep, moderately well drained and somewhat poorly drained Wellsboro soils; the deep, somewhat poorly drained Morris soils; and the deep, poorly drained and very poorly drained Norwich soils.

Typical pedon of Arnot channery loam, in an area of Arnot channery loam, very rocky, 3 to 8 percent slopes, on the ridge of Moosic Mountain, 1 mile north of Farview State Hospital:

O1—2 1/2 to 1 1/2 inches; leaf and twig litter.
O2—1 1/2 inches to 0; black (N 2/0) partly decayed leaf and twig litter.
A1—0 to 6 inches; dark brown (10YR 3/3) channery loam; weak fine granular structure; friable, slightly sticky and slightly plastic; 35 percent coarse fragments; strongly acid; gradual wavy boundary.
B—6 to 14 inches; reddish brown (5YR 4/4) channery loam; weak fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.
C—14 to 17 inches; reddish brown (5YR 4/3) very channery loam; loose, nonsticky and nonplastic; 65 percent coarse fragments; very strongly acid; gradual wavy boundary.
R—17 inches; red shale interbedded with gray sandstone.

The solum is 10 to 18 inches thick. Bedrock is at a depth of 12 to 20 inches. Coarse fragments make up 35 to 50 percent of the solum. Unless the soil has been limed, it is medium acid to extremely acid throughout.

The A horizon has hue of 5YR to 2.5Y, value of 2 to 4, and chroma of 2 or 3.

The B horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. Fine earth textures are silt loam and loam.

The C horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. Fine earth textures are silt loam and loam.

Barbour series

The Barbour series consists of coarse-loamy over sandy or sandy-skeletal, mixed, mesic Fluventic Dystrochrepts. Barbour soils formed on flood plains, recent alluvial fans, and low terraces in alluvium that derived from glacial till of red sandstone and shale. These soils are deep and well drained. Slopes are 0 to 3 percent.

Barbour soils formed in parent material similar to that of the deep, moderately well drained and somewhat poorly drained Basher soils and the poorly drained and very poorly drained Holly soils.

Typical pedon of Barbour loam, in a hayfield at Creamton in Clinton Township, 200 feet north of the intersection of State Routes 170 and 247:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; very friable, nonsticky and nonplastic; many roots; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B2—6 to 12 inches; dark brown (7.5YR 4/4) loam; weak medium and fine subangular blocky structure; friable, nonsticky and nonplastic; common roots; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B3—12 to 28 inches; dark brown (7.5YR 4/4) gravelly loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; common roots; 25 percent coarse fragments; strongly acid; clear wavy boundary.

IIC—28 to 60 inches; reddish brown (7.5YR 4/3) very gravelly loamy sand; single grain; loose; 60 percent gravel; very strongly acid.

The solum is 18 to 40 inches thick, and the IIC horizon is at a depth of 20 to 40 inches. Bedrock is at a depth of more than 5 feet. Coarse fragments make up 0 to 40 percent of the horizons above the IIC horizon and 0 to 60 percent of the substratum. The soil is very strongly acid to medium acid in the solum and strongly acid to slightly acid in the substratum.

The A horizon has hue of 5YR to 2.5Y, value of 3 and 4, and chroma of 2 to 4.

The B horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 4 to 6. Fine earth textures range from silt loam to sandy loam.

The colors of the C horizon vary in shades of red and brown. Fine earth textures range from loamy sand to sand.

Basher series

The Basher series consists of coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts. Basher soils formed on flood plains in alluvium that derived from glacial till of red sandstone and shale. These soils are deep and are moderately well drained and somewhat poorly drained. Slopes are 0 to 3 percent.

Basher soils formed in parent material similar to that of the deep, somewhat excessively drained Wyoming soils, the well drained Barbour and Linden soils, and the poorly drained and very poorly drained Holly soils.

Typical pedon of Basher silt loam, in a pasture in Berlin Township, 0.3 mile north of U.S. Route 6 on State Route 106:

Ap—0 to 5 inches; dark brown (7.5YR 3/2) silt loam; weak very fine granular structure; very friable, nonsticky and nonplastic; 10 percent coarse fragments; many interstitial pores; slightly acid; clear wavy boundary.

A12—5 to 14 inches; dark brown (7.5YR 3/4) silt loam; weak very fine subangular blocky structure; very friable, nonsticky and nonplastic; 10 percent coarse fragments; common tubular pores; medium acid; abrupt wavy boundary.

B21—14 to 18 inches; brown (7.5YR 5/4) and dark brown (7.5YR 4/4) fine sandy loam; very weak fine subangular blocky structure; very friable, nonsticky and nonplastic; 10 percent coarse fragments; common pores; strongly acid; clear wavy boundary.

B22—18 to 30 inches; dark brown (7.5YR 4/4) silt loam; few medium distinct yellowish red (5YR 4/6) and dark reddish gray (5YR 4/2) mottles; weak fine and medium subangular blocky structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; common fine pores; strongly acid; clear wavy boundary.

B23—30 to 40 inches; dark brown (7.5YR 4/4) fine sandy loam; common medium distinct dark brown (7.5YR 4/2) and yellowish red (5YR 5/6) mottles; weak fine and very fine subangular blocky structure; firm, nonsticky and nonplastic; 10 percent coarse fragments; common fine pores; strongly acid; clear wavy boundary.

IIC1—40 to 57 inches; dark brown (7.5YR 4/4) gravelly loam; common distinct pinkish gray (5YR 6/2) and strong brown (7.5YR 5/6) mottles; massive; very friable; 30 to 45 percent coarse fragments; common very fine pores; very strongly acid; gradual wavy boundary.

IIC2—57 to 70 inches; reddish brown (5YR 4/3) gravelly loam; common coarse distinct yellowish red (5YR 5/8) mottles; massive; very friable; 30 to 45 percent coarse fragments; very strongly acid.

The solum is 16 to 40 inches thick. Bedrock is at a depth of more than 40 inches. Mottles that have chroma of 2 or less are within a depth of 24 inches. The content of coarse fragments is 0 to 20 percent within a depth of 30 inches and 0 to 60 percent below a depth of 30 inches. Unless this soil has been limed, it is extremely

acid to medium acid in the solum and slightly acid to very strongly acid in the C horizon.

The A horizon has hue of 2.5YR to 10YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 3 to 6. Some pedons have a B3 horizon that has hue of 10YR. Fine earth textures are silt loam, loam, or fine sandy loam.

The C horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 1 to 4. Fine earth textures within a depth of 40 inches are silt loam, loam, or fine sandy loam. Below a depth of 40 inches, they range to sand.

Chippewa series

The Chippewa series consists of fine-loamy, mixed, mesic Typic Fragiaquepts. Chippewa soils formed in depressions, along drainageways, and on the outer edge of swamps in glacial till that is dominantly grayish sandstone and shale. These soils are deep and are poorly drained and very poorly drained. Slopes are 0 to 3 percent.

Chippewa soils formed in parent material similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the moderately deep, well drained Lordstown soils; the deep, moderately well drained Mardin soils; and the deep, somewhat poorly drained Volusia soils.

Typical pedon of Chippewa channery silt loam, in an area of Norwich and Chippewa extremely stony silt loams, 0 to 3 percent slopes, in woodland in Salem Township, 3/4 mile east of Bidwell, 400 feet south of Route 63008:

O1—2 1/2 inches to 0; mat of leaves and twigs in varying stages of decomposition.

A1—0 to 4 inches; very dark gray (10YR 3/1) channery silt loam; weak fine granular structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear smooth boundary.

Bg—4 to 10 inches; olive gray (5Y 5/2) channery loam; many medium prominent light olive brown (2.5Y 5/6) mottles; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

Bxg—10 to 40 inches; grayish brown (2.5Y 5/2) channery loam; common medium distinct dark yellowish brown (10YR 4/4) and olive (5Y 5/6) mottles; strong coarse prismatic structure; firm, brittle, nonsticky and nonplastic; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

Cg—40 to 60 inches; gray (N 5/0) channery loam; common medium distinct mottles of higher chroma; massive; very firm; 25 percent coarse fragments; medium acid.

The solum is 36 to 56 inches thick. Bedrock is at a depth of 3 1/2 to 8 feet or more. The fragipan is at a depth of 8 to 20 inches. The content of coarse fragments is 15 to 35 percent above the Bx horizon and 20 to 50 percent in the Bx and C horizons. Unless the soil has beem limed, it is very strongly acid to slightly acid above the Bx horizon, strongly acid to neutral in the Bx horizon, and medium acid to moderately alkaline in the C horizon.

The A horizon has hue of 10YR and 2.5Y, value of 2 to 4, and chroma of 1 and 2. Some pedons have an A2g horizon that has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2 and that has mottles of low chroma.

The Bg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. Fine earth textures in the B horizon are silt loam or loam.

The Bx horizon has hue of 10YR to 5Y, value or 3 to 6, and chroma of 1 and 2. It has common or many mottles of higher chroma. Fine earth textures in the Bx horizon are silt loam, loam, or fine sandy loam.

The C horizon has hue of 10YR to 5Y and N, value of 3 to 6, and chroma of 1 and 2. Fine earth textures are silt loam, loam, or fine sandy loam.

Fluvaquents

Fluvaquents are deep, somewhat poorly drained soils that formed in stratified recent alluvium that derived from red sandstone and glacial till. These soils are on slightly concave flood plains and recent alluvial fans that receive sediment during intense storms. Slopes are 0 to 3 percent.

Fluvaquents formed in parent material similar to that of the deep, well drained Barbour and Linden soils; the deep, moderately well drained and somewhat poorly drained Basher soils; and the poorly drained and very poorly drained Holly soils.

A typical pedon is not described because Fluvaquents are so variable. The solum is 24 to 40 inches thick. Bedrock is at a depth of more than 3 1/2 feet.

The A horizon dominantly has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. It ranges from sandy loam to silt loam and their gravelly or cobbly analogs.

The C horizon has variegated and mottled colors. It ranges from loam to sand and their gravelly, very gravelly, cobbly, or very cobbly analogs.

Fluvents

Fluvents are deep, excessively drained soils that formed in stratified recent alluvium that derived from red sandstone and glacial till. These soils are on slightly convex flood plains and recent alluvial fans that receive sediment during intense storms. Slopes are 0 to 3 percent.

Fluvents formed in parent material similar to that of the deep, well drained Barbour and Linden soils; the deep, moderately well drained and somewhat poorly drained Basher soils; and the poorly drained and very poorly drained Holly soils.

A typical pedon is not described because Fluvents are so variable. The solum is 10 to 40 inches thick. Bedrock is at a depth of more than 3 1/2 feet.

The A horizon dominantly has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. It ranges from silt loam to loamy sand and their gravelly or very gravelly analogs.

The C horizon has variegated colors. It ranges from loam to sand and their gravelly, very gravelly, cobbly, or very cobbly analogs.

Holly series

The Holly series consists of fine-loamy, mixed, nonacid, mesic Typic Fluvaquents. Holly soils formed on flood plains in alluvium that derived from glacial till of red sandstone and shale. These soils are deep and are poorly drained and very poorly drained. Slopes are 0 to 3 percent.

Holly soils formed in parent material similar to that of the deep, well drained Barbour and Linden soils and the deep, moderately well drained and somewhat poorly drained Basher soils.

Typical pedon of Holly silt loam, in a pasture in Cherry Ridge Township, 100 feet east of Collins Creek, 2 1/2 miles upstream from Hoadleys:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; slightly acid; clear wavy boundary.

B1g—3 to 7 inches; dark gray (5Y 4/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.

B21g—7 to 12 inches; dark gray (5Y 4/1) loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles, weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.

B22g—12 to 28 inches; gray (5Y 5/1) sandy loam; common medium prominent brown (7.5YR 5/4) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable, slightly sticky and nonplastic; slightly acid; clear smooth boundary.

C1g—28 to 42 inches; gray (N 5/0) sandy loam; common medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; slightly sticky and nonplastic; neutral; clear wavy boundary.

IIC2g—42 to 60 inches; dark gray (N 4/0) fine sand; single grain; loose, nonsticky and nonplastic; neutral.

The solum is 26 to 44 inches thick. Depth to bedrock or to strongly contrasting material is more than 40 inches. The content of coarse fragments is 0 to 15 percent to a depth of 40 inches and 0 to 35 percent below a depth of 40 inches. Unless the soil has been limed, it is neutral to strongly acid.

The Ap or A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2.

The B horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 or less. It has mottles within a depth of 12 inches. The B horizon ranges from silt loam to sandy loam; it can have thin layers less than 4 inches thick of finer or coarser textured soil material.

The C horizon has hue of N or 10YR to 5Y, value of 4 or 5, and chroma of 1 to 6. It is mottled. Fine earth textures range from loam to sand.

Linden series

The Linden series consists of coarse-loamy, mixed, mesic Fluventic Dystrochrepts. Linden soils are deep, well drained soils that formed in alluvium that derived from glacial till of red sandstone and shale. They are on flood plains, recent alluvial fans, and low terraces adjacent to the Delaware River. Slopes are 0 to 3 percent.

Linden soils formed in parent material similar to that of the deep, well drained Barbour soils; the deep, moderately well drained and somewhat poorly drained Basher soils; and the poorly drained and very poorly drained Holly soils. The deep, somewhat excessively drained Wyoming soils are on adjacent, higher terraces.

Typical pedon of Linden fine sandy loam, rarely flooded, in a hayfield in Damascus Township at Milanville, 250 feet north of junction of Calkin's Creek and the Delaware River:

Ap—0 to 6 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; strongly acid; clear wavy boundary.

B1—6 to 11 inches; reddish brown (5YR 4/4) fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; strongly acid; abrupt wavy boundary.

B21—11 to 19 inches; reddish brown (5YR 4/4) fine sandy loam; weak very fine subangular blocky structure; very friable, nonsticky and nonplastic; strongly acid; clear wavy boundary.

B22—19 to 26 inches; reddish brown (5YR 4/4) silt loam; weak very fine and fine subangular blocky structure; very friable, nonsticky and nonplastic; strongly acid; clear wavy boundary.

B23—26 to 44 inches; reddish brown (5YR 4/3) fine sandy loam; weak very fine and fine subangular

blocky structure; very friable, nonsticky and nonplastic; 10 percent gravel; strongly acid; clear wavy boundary.

B3—44 to 48 inches; brown (7.5YR 4/4) gravelly sandy loam; banding or stratification of reddish brown (5YR 4/4) mottles; weak medium granular structure; very friable, nonsticky and nonplastic; 20 percent gravel; strongly acid; gradual wavy boundary.

IIC—48 to 65 inches; stratified brown (7.5YR 5/4), dark brown (7.5YR 4/2), and reddish brown (5YR 4/4) gravelly loamy sand; single grain; loose; 40 percent gravel; strongly acid.

The solum is 30 to 50 inches thick. Bedrock is at a depth of more than 6 feet. Coarse fragments make up 0 to 10 percent of the A and B2 horizons, 0 to 25 percent of the B3 and C horizons within a depth of 40 inches, and 0 to 80 percent of the C horizon below a depth of 40 inches. Unless the soil has been limed, it is extremely acid to medium acid throughout.

The Ap horizon has hue of 10YR to 5YR, value of 3 and 4, and chroma of 2 to 4.

The B horizon has hue of 2.5YR and 5YR, value of 3 to 5, and chroma of 3 and 4. In some pedons, individual layers of the B horizon have hue of 7.5YR. Fine earth textures are silt loam, loam, or fine sandy loam.

The C horizon has hue of 2.5YR and 10YR, value of 3 to 5, and chroma of 3 or 4. In some pedons, individual layers of the C horizon have hue of 7.5YR. Fine earth textures range from loam to sand within a depth of 40 inches and from sandy loam to sand below a depth of 40 inches.

Lordstown series

The Lordstown series consists of coarse-loamy, mixed, mesic Typic Dystrochrepts. Lordstown soils formed on ridges, benches, hillsides, and dissected plateaus in glacial till that is dominantly gray sandstone and shale. These soils are moderately deep and well drained. Slopes range from 3 to 60 percent but are dominantly 8 to 25 percent.

Lordstown soils formed in parent material similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the deep, moderately well drained Mardin soils; the deep, somewhat poorly drained Volusia soils; and the deep, poorly drained and very poorly drained Chippewa soils.

Typical pedon of Lordstown channery loam, in an area of Lordstown extremely stony loam, 8 to 25 percent slopes, in woodland in Lake Township, 1 mile south of Tresslarville, on the eastern side of State Route 196:

O1—2 inches to 0; mat of leaves and twigs in varying stages of decomposition.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) channery loam; weak fine granular structure; very friable, nonsticky and nonplastic; 30 percent coarse fragments; strongly acid; clear wavy boundary.

B1—4 to 8 inches; yellowish brown (10YR 5/4) channery loam; weak very fine and fine subangular blocky structure; friable, nonsticky and nonplastic; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

B2—8 to 18 inches; light olive brown (2.5Y 5/4) channery loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

B3—18 to 24 inches; yellowish brown (10YR 5/4) channery loam; weak very fine subangular blocky structure; very friable, nonsticky and nonplastic; 30 percent coarse fragments; strongly acid; abrupt wavy boundary.

R—24 inches; fractured gray sandstone.

The solum is 20 to 36 inches thick. Bedrock is at a depth of 20 to 40 inches. Coarse fragments make up 15 to 35 percent of the solum and 20 to 60 percent of the C horizon. Unless the soil has been limed, it is medium acid to very strongly acid throughout.

The Ap horizon, where present, has hue of 10YR and 2.5Y, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 10YR and 2.5Y, value of 4 and 5, and chroma of 3 to 6. Fine earth textures range from silt loam to fine sandy loam.

The C horizon, where present, has hue of 10YR and 2.5Y, value of 4 and 5, and chroma of 3 to 6. Fine earth textures range from loam to fine sandy loam.

Mardin series

The Mardin series consists of coarse-loamy, mixed, mesic Typic Fragiochrepts. Mardin soils formed on plateaus, benches, and hillsides in glacial till that is dominantly grayish sandstone and siltstone. These soils are deep and moderately well drained. Slopes range from 3 to 25 percent but are dominantly 3 to 15 percent.

Mardin soils formed in parent material that is similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the moderately deep, well drained Lordstown soils; the deep, somewhat poorly drained Volusia soils; and the deep, poorly drained and very poorly drained Chippewa soils.

Typical pedon of Mardin channery loam, in an area of Mardin extremely stony loam, 8 to 25 percent slopes, in an excavation on lot 548, Indian Rocks, Bear Tract Subdivision in Salem Township:

O1—2 to 1 1/2 inches; mat of twigs and leaves in varying stages of decomposition.

O2—1 1/2 inches to 0; black (10YR 2/1) decomposed organic material; very friable; nonsticky and nonplastic; 10 percent coarse fragments; very strongly acid; abrupt wavy boundary.

A1—0 to 6 inches; dark yellowish brown (10YR 3/4) channery loam; weak very fine subangular blocky structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B21—6 to 17 inches; yellowish brown (10YR 5/4) channery loam; weak fine and very fine subangular blocky structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

B22—17 to 22 inches; light yellowish brown (10YR 6/4) channery loam; common medium faint yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; very friable, nonsticky and nonplastic; 30 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx1—22 to 28 inches; dark yellowish brown (10YR 4/4) channery loam; common fine faint strong brown (7.5YR 5/6) and dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure; firm, brittle, nonsticky and nonplastic; 35 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx2—28 to 49 inches; yellowish brown (10YR 5/4) channery loam; common medium faint dark brown (7.5YR 4/4) and dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure; firm, brittle, nonsticky and nonplastic; 40 percent coarse fragments; strongly acid; gradual wavy boundary.

C—49 to 63 inches; yellowish brown (10YR 5/4) and dark brown (7.5YR 4/4) channery fine sandy loam; weak coarse prismatic structure; very firm, nonsticky and nonplastic; 30 percent coarse fragments; strongly acid.

The solum is 40 to 70 inches thick. Bedrock is at a depth of 3 1/2 to 8 feet or more. The fragipan is at a depth of 14 to 26 inches. Coarse fragments make up 15 to 35 percent of the horizons above the Bx horizon and 20 to 60 percent of the Bx and C horizons. Unless the soil has been limed, it is medium acid to very strongly acid above the Bx horizon and slightly acid to strongly acid in the Bx and C horizons.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4.

The B2 horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8. Mottles are common or many in some or all parts of the B2 horizon between depths of 12 and 26 inches. Fine earth textures are loam or silt loam.

The Bx horizon has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 2 to 4. Fine earth textures are silt loam or loam.

The C horizon has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 2 to 4. Fine earth textures range from silt loam to sandy loam.

Medifibrists

Medifibrists are deep, very poorly drained soils that formed in organic material in swamps and bogs. The organic material consists of partly decomposed wood, mosses, and herbaceous plants. Slopes are 0 to 3 percent.

Medifibrists formed in parent material that is similar to that of Medihemists.

A typical pedon is not described because Medifibrists are so variable. The solum ranges from 18 inches to 10 feet or more in thickness. Bedrock is at a depth of more than 4 feet. These soils are strongly acid to extremely acid.

The A horizon is black peat about 20 inches thick.

The B horizon is dark brown to reddish brown organic material. Fibers are not destroyed when the organic material is rubbed. The B horizon is about 40 inches thick.

Gray mineral soil material is at a depth of more than 55 inches.

Medihemists

Medihemists are deep, very poorly drained soils that formed in organic material in swamps and bogs. The organic material consists of poorly decomposed woody and herbaceous plants. Slopes are 0 to 3 percent.

Medihemists formed in parent material that is similar to that of Medifibrists.

A typical pedon is not described because Medihemists are so variable. The solum ranges from 18 inches to 10 feet or more in thickness. Bedrock is at a depth of more than 4 feet. The soils are strongly acid to extremely acid.

The A horizon is dominantly black mucky peat about 15 inches thick.

The B horizon is dark grayish brown to dark reddish brown organic material. Fibers are largely destroyed when the soil material is rubbed. The B horizon is about 40 inches thick.

Gray mineral soil material is at a depth of more than 55 inches.

Morris series

The Morris series consists of coarse-loamy, mixed, mesic Aeric Fragiaquepts. Morris soils are deep and somewhat poorly drained. They formed in glacial till that is dominantly reddish sandstone and shale. Morris soils are on plateaus, benches, and the lower part of slopes on hillsides. Slopes range from 0 to 15 percent, but are dominantly 0 to 8 percent.

Morris soils formed in parent material that is similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the moderately deep, well drained Oquaga soils; the deep, moderately well drained and somewhat poorly drained Wellsboro soils; and the

deep, poorly drained and very poorly drained Norwich soils.

Typical pedon of Morris channery loam, 3 to 8 percent slopes, in a hayfield in Clinton Township, 6 miles north of Waymart on State Route 296, 200 feet south of intersection with Route T439, on west side of road:

Ap—0 to 8 inches; dark reddish gray (5YR 4/2) channery loam; weak fine granular structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 10 inches; brown (7.5YR 4/4) channery loam; weak medium subangular blocky structure; friable, nonsticky and nonplastic; 25 percent coarse fragments; medium acid; gradual wavy boundary.

B22—10 to 14 inches; reddish gray (5YR 5/2) channery loam; common medium distinct reddish brown (5YR 4/4) and gray (N 5/0) mottles; weak medium subangular blocky structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; medium acid; clear wavy boundary.

Bx—14 to 50 inches; reddish brown (2.5YR 4/4) channery loam; common medium distinct gray (N 6/0) and strong brown (7.5YR 5/6) mottles; gray (N 5/0) prism faces; moderate coarse prismatic structure; firm, brittle, slightly sticky and slightly plastic; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

C—50 to 60 inches; reddish brown (2.5YR 4/4) channery loam; massive; firm; 30 percent coarse fragments; strongly acid.

The solum is 40 to 75 inches thick. Bedrock is at a depth of 3 1/2 to 8 feet or more. The fragipan is at a depth of 10 to 22 inches. Coarse fragments make up 10 to 40 percent of individual horizons of the A and B2 horizons and 15 to 50 percent of the Bx and C horizons. Unless the soil has been limed, it is medium acid to very strongly acid in the A and B2 horizons and in the upper part of the Bx horizon and it is slightly acid to strongly acid in the lower part of the Bx horizon and in the C horizon.

The A horizon has hue of 5YR to 10YR, value of 2 to 4, and chroma of 1 to 3.

In the B2 horizon, the dominant colors have hue of 5YR to 10YR, value of 5 to 7, and chroma of 1 or 2. Individual layers of the B horizon have hue of 5YR to 10YR, value of 3 to 6, and chroma of 2 to 6. The B2 horizon has mottles of gray or brown. Fine earth textures are silt loam or loam.

In the Bx horizon, the dominant colors have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 6. The Bx horizon has mottles of gray or brown. Prism faces have hue of 5YR to 10YR or are neutral, value of 5 to 7, and chroma of 0 to 3. Textures are silt loam or loam.

The C horizon is mottled. The dominant colors have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 6. Fine earth textures are silt loam or loam.

Norwich series

The Norwich series consists of fine-loamy, mixed, mesic Typic Fragiaquepts. Norwich soils are deep, poorly drained and very poorly drained soils that formed in glacial till that is dominantly reddish sandstone and shale. These soils are in depressions, along drainageways, and on the edge of swamps. Slopes are 0 to 3 percent.

Norwich soils formed in parent material similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the moderately deep, well drained Oquaga soils; the deep, moderately well drained and somewhat poorly drained Wellsboro soils; and the deep, somewhat poorly drained Morris soils.

Typical pedon of Norwich channery silt loam, in an area of Norwich and Chippewa extremely stony silt loams, 0 to 3 percent slopes, in a pasture in Damascus Township, 2 miles east of Calkins, 500 feet north of Route 63029:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) channery silt loam; moderate medium granular structure; very friable, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.

A2g—4 to 7 inches; dark gray (10YR 4/1) channery silt loam; common medium prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

Bg—7 to 12 inches; brown (7.5YR 5/2) channery loam; common medium distinct light olive brown (2.5YR 5/4 and 5/6) mottles; weak medium subangular blocky structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; strongly acid; abrupt wavy boundary.

Bxg—12 to 38 inches; dark reddish gray (5YR 4/2) channery silt loam; common medium distinct gray (5YR 5/1) and yellowish brown (10YR 5/6 and 5/8) mottles; strong very coarse prismatic structure; very firm, brittle, slightly sticky and slightly plastic; 25 percent coarse fragments; medium acid; gradual wavy boundary.

Cg—38 to 60 inches; reddish brown (5YR 4/3) channery silt loam; common medium distinct gray (N 5/0), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/6) mottles; 35 percent coarse fragments; medium acid.

The solum is 36 to 55 inches thick. Bedrock is at a depth of 3 1/2 to 8 feet or more. The fragipan is at a

depth of 10 to 24 inches. Coarse fragments make up 10 to 35 percent of the soil above the Bx horizon and 15 to 45 percent of the Bx and C horizons. Unless the soil has been limed, it is slightly acid to strongly acid in the A and B horizons and neutral to strongly acid in the C horizon.

The A horizon has hue of 7.5YR and 10YR, value of 2 to 4, and chroma of 1 and 2.

The B horizon has hue of 2.5YR to 5Y, value of 4 to 6, and chroma of 1 or 2. It has common or many mottles of higher chroma. Fine earth textures are silt loam or loam.

Dominant colors of the Bx horizon have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 1 to 3. Colors that have chroma of 3 are below a depth of 30 inches. Fine earth textures range from silt loam to sandy loam.

The dominant colors of the C horizon have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 1 to 3. Fine earth textures range from silt loam to sandy loam.

Oquaga series

The Oquaga series consists of loamy-skeletal, mixed, mesic Typic Dystrochrepts. Oquaga soils formed on ridges, benches, hillsides, and dissected plateaus in glacial till that is dominantly reddish sandstone and shale. These soils are moderately deep and well drained. Slopes range from 3 to 70 percent but are dominantly 8 to 25 percent.

Oquaga soils formed in parent material similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the deep, moderately well drained and somewhat poorly drained Wellsboro soils; the deep, somewhat poorly drained Morris soils; and the deep, poorly drained and very poorly drained Norwich soils.

Typical pedon of Oquaga channery loam, in an area of Oquaga extremely stony loam, 8 to 25 percent slopes, in woodland in Berlin Township, 1/4 mile north of Berlin Center:

O1—2 1/2 inches to 0; mat of leaves and twigs in varying stages of decomposition.

A1—0 to 8 inches; dark brown (7.5YR 3/2) channery loam; weak fine and medium granular structure; friable, nonsticky and nonplastic; 40 percent coarse fragments; strongly acid; clear wavy boundary.

B2—8 to 34 inches; dark reddish brown (5YR 3/4) channery loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 35 percent coarse fragments; strongly acid; gradual wavy boundary.

C—34 to 40 inches; dark reddish brown (5YR 3/3) very channery loam; loose, nonsticky and nonplastic; 65 percent coarse fragments; very strongly acid.

R—40 inches; red shale interbedded with red sandstone.

The solum is 20 to 35 inches thick. Bedrock is at a depth of 20 to 40 inches. Coarse fragments make up 35 to 50 percent of the solum and 35 to 75 percent of the C horizon. Unless the soil has been limed, it is very strongly acid to medium acid throughout.

The A horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 4 to 6. Fine earth textures range from silt loam to fine sandy loam.

The C horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 2 to 4. Fine earth textures are silt loam or loam.

Rexford series

The Rexford series consists of coarse-loamy, mixed, mesic Aeric Fragiaquepts. Rexford soils formed on terraces in glacial outwash that derived from red and gray sandstone and shale. These soils are deep and are somewhat poorly drained and poorly drained. Slopes are 0 to 3 percent.

Rexford soils formed in parent material similar to that of the deep, somewhat excessively drained Wyoming soils. They are near the deep, well drained Barbour and Linden soils; the deep, moderately well drained and somewhat poorly drained Basher soils; and the deep, poorly drained and very poorly drained Holly soils, all of which are on flood plains.

Typical pedon of Rexford loam, in a pasture in Berlin Township on State Route 652, 1/2 mile northeast of intersection with US Route 6, on south side of road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam; few fine faint strong brown (7.5YR 5/6) mottles; moderate medium granular structure; friable, slightly sticky and slightly plastic; 5 percent coarse fragments; slightly acid; abrupt wavy boundary.

B21—8 to 11 inches; light brown (7.5YR 6/4) loam; many medium distinct reddish yellow (7.5YR 6/6) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; 10 percent coarse fragments; medium acid; clear wavy boundary.

B22—11 to 18 inches; pinkish gray (7.5YR 6/2) sandy loam; many medium distinct yellowish red (5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; strongly acid; 15 percent coarse fragments; clear wavy boundary.

Bx—18 to 42 inches; dark brown (7.5YR 4/2) sandy loam; common medium distinct pinkish gray (5YR 6/2) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic and moderate medium platy structure; firm, brittle, slightly sticky and nonplastic; strongly acid; 15 percent coarse fragments; abrupt wavy boundary.

C1—42 to 46 inches; grayish brown (10YR 5/2) gravelly sandy loam; massive; firm, nonsticky and nonplastic;

35 percent gravel; strongly acid; abrupt wavy boundary.

IIC2—46 to 60 inches; dark yellowish brown (10YR 4/4) stratified sand and gravel; strongly acid.

The solum is 24 to 50 inches thick. Bedrock is at a depth of 3 1/2 to 8 feet or more. The fragipan is at a depth of 15 to 24 inches. Coarse fragments make up 0 to 40 percent of individual horizons in the solum. Unless the soil has been limed, it is medium acid to very strongly acid above the Bx horizon and slightly acid to strongly acid in the Bx and C horizons.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2.

The upper part of the B2 horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. The lower part has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 or 2. Individual horizons of the B2 horizon are mottled. Fine earth textures range from silt loam to sandy loam.

The Bx horizon has hue of 5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Fine earth textures range from silt loam to sandy loam.

The C horizon has hue of 5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Fine earth textures range from silt loam to sandy loam.

Swartswood series

The Swartswood series consists of coarse-loamy, mixed, mesic Typic Fragiochrepts. Swartswood soils formed on ridges, hillsides, and dissected plateaus in glacial till that derived mainly from gray sandstone. These soils are deep and are well drained and moderately well drained. Slopes range from 3 to 25 percent but are dominantly 3 to 8 percent.

Swartswood soils formed in parent material similar to that of the moderately deep, well drained Lordstown soils; the deep, moderately well drained Mardin soils; and the deep, somewhat poorly drained Volusia soils.

Typical pedon of Swartswood channery sandy loam, in an area of Swartswood extremely stony sandy loam, 8 to 25 percent slopes, in woodland in Clinton Township, 3/4 mile west of Aldenville, adjacent to White Oak Pond:

O1—2 inches to 0; mat of leaves and twigs in varying stages of decomposition.

A2—0 to 4 inches; pinkish gray (7.5YR 6/2) channery sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; 15 percent coarse fragments; extremely acid; abrupt irregular boundary.

B21ir—4 to 10 inches; brown (10YR 5/3) channery fine sandy loam; weak fine granular structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—10 to 28 inches; yellowish brown (10YR 5/4) channery fine sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx—28 to 60 inches; brown (10YR 5/3) channery fine sandy loam; common medium distinct dark grayish brown (10YR 4/2) and dark brown (7.5YR 4/4) mottles; weak thick platy structure and moderate coarse prismatic structure; firm, brittle; 25 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—60 to 70 inches; yellowish brown (10YR 5/4) channery sandy loam; massive; firm; 35 percent coarse fragments; very strongly acid.

The solum is 40 to 60 inches thick. The fragipan is at a depth of 20 to 36 inches. Bedrock is at a depth of 3 1/2 to 20 feet or more. Coarse fragments make up 5 to 40 percent of the horizons above the Bx horizon and 15 to 60 percent of the Bx and C horizons. Unless the soil has been limed, it is strongly acid to extremely acid throughout.

The Ap horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Most pedons have an A2 horizon that has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 3.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Fine earth textures are sandy loam or loam. In some pedons, the soil material is mottled below a depth of 26 inches.

The Bx horizon has hue of 5YR to 2.5Y, value of 4 and 5, and chroma of 2 to 6. Fine earth textures are sandy loam and loam. In most pedons, the Bx horizon is mottled.

The C horizon has hue of 5YR to 2.5Y, value of 4 and 5, and chroma of 2 to 6. Fine earth textures are sandy loam or loam.

Volusia series

The Volusia series consists of fine-loamy, mixed, mesic Aeric Fragiaquepts. Volusia soils formed on plateaus, benches, and the lower part of slopes on hillsides in glacial till that is dominantly grayish sandstone and siltstone. These soils are deep and somewhat poorly drained. Slopes range from 0 to 15 percent but are dominantly 0 to 8 percent.

Volusia soils formed in parent material that is similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the moderately deep, well drained Lordstown soils; the deep, moderately well drained Mardin soils; and the deep, poorly drained and very poorly drained Chippewa soils.

Typical pedon of Volusia channery silt loam, in an area of Volusia extremely stony silt loam, 0 to 8 percent slopes, in an idle pasture in Mount Pleasant Township, on Route T495, 1/4 mile west of intersection with Route 63055:

A11—0 to 2 inches; very dark grayish brown (10YR 3/2) channery silt loam; moderate very fine and fine granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
A12—2 to 5 inches; dark brown (10YR 4/3) channery silt loam; weak very fine subangular blocky structure; friable, nonsticky and slightly plastic; 15 percent coarse fragments; very strongly acid; abrupt wavy boundary.
B21—5 to 9 inches; dark brown (10YR 4/3) channery silt loam; moderate fine subangular blocky structure; friable, nonsticky and slightly plastic; 15 percent coarse fragments; strongly acid; clear wavy boundary.
B22—9 to 12 inches; olive brown (2.5Y 4/4) channery silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid; clear wavy boundary.
Bx1—12 to 22 inches; dark grayish brown (2.5Y 4/2) channery silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; very firm, brittle, nonsticky and nonplastic; 30 percent coarse fragments; medium acid; gradual wavy boundary.
Bx2—22 to 33 inches; dark grayish brown (10YR 4/2) channery silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; very firm, brittle, nonsticky and nonplastic; 30 percent coarse fragments; medium acid; gradual wavy boundary.
Bx3—33 to 45 inches; dark grayish brown (10YR 4/2) channery silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; very firm, brittle, nonsticky and nonplastic; 15 percent coarse fragments; medium acid; gradual wavy boundary.
C—45 to 60 inches; dark brown (10YR 4/3) channery silt loam; moderate coarse prismatic structure; very firm, nonsticky and nonplastic; 10 percent rock fragments; medium acid.

The solum is 40 to 72 inches thick. Bedrock is at a depth of 3 1/2 to 8 feet or more. The fragipan is at a depth of 10 to 20 inches. Coarse fragments make up 10 to 30 percent of the solum and 10 to 60 percent of the C horizon. Unless the soil has been limed, it is slightly acid to very strongly acid in the upper part of the solum and strongly acid to neutral in the lower part, and it is medium acid to moderately alkaline in the C horizon.

The Ap horizon, where present, has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. Some pedons have an A2 horizon that has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 or 3 and has mottles of high chroma.

The B1 and B2 horizons have hue of 10YR and 2.5Y, value of 4 to 6, and chroma of 2 to 4. They have mottles of chroma higher than the matrix. Fine earth textures are loam or silt loam.

The Bx horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. Fine earth textures range from silty clay loam to loam.

The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. Fine earth textures are silt loam or loam.

Wellsboro series

The Wellsboro series consists of coarse-loamy, mixed mesic Typic Fragiochrepts. Wellsboro soils formed on plateaus, benches, and hillsides in glacial till that is dominantly reddish sandstone and shale. These soils are deep and are moderately well drained and somewhat poorly drained. Slopes range from 3 to 50 percent but are dominantly 3 to 15 percent.

Wellsboro soils formed in parent material that is similar to that of the shallow, somewhat excessively drained and well drained Arnot soils; the moderately deep, well drained Oquaga soils; the deep, somewhat poorly drained Morris soils; and the deep, poorly drained and very poorly drained Norwich soils.

Typical pedon of Wellsboro channery loam, 3 to 8 percent slopes, in a borrow pit in Texas Township, adjacent to U.S. Route 6, 1 1/2 miles west of Honesdale:

A1—0 to 7 inches; dark brown (7.5YR 4/2) channery loam; weak very fine granular structure; very friable, nonsticky and nonplastic; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.
B21—7 to 18 inches; dark brown (7.5YR 4/4) channery loam; weak very fine subangular blocky structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; strongly acid; gradual wavy boundary.
B22—18 to 20 inches; brown (7.5YR 5/4) channery loam; few fine faint strong brown (7.5YR 5/6) and dark gray (N 4/0) mottles; weak fine subangular blocky structure; friable, nonsticky and slightly plastic; 20 percent coarse fragments; very strongly acid; clear wavy boundary.
Bx1—20 to 38 inches; reddish brown (5YR 4/4) channery loam; common medium distinct yellowish red (5YR 5/6) and dark gray (N 4/0) mottles; weak coarse prismatic structure; firm, brittle, nonsticky and nonplastic; 25 percent coarse fragments; very strongly acid; gradual wavy boundary.
Bx2—38 to 50 inches; reddish brown (5YR 4/4) channery loam; reddish gray (5YR 5/2) coatings on prism faces; weak coarse prismatic structure; firm, brittle, nonsticky and nonplastic; 30 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—50 to 60 inches; reddish brown (5YR 5/4) channery loam; massive; firm, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid.

The solum is 40 to 75 or more inches thick. Bedrock is at a depth between 3 1/2 feet and 8 or more feet. The fragipan is at a depth between 15 and 26 inches. The A and B2 horizons are 10 to 40 percent coarse fragments, and the Bx and C horizons are 15 to 50 percent. Unless the soil is limed, it is medium acid to very strongly acid throughout.

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

The B horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 5. Below a depth of 20 inches, subhorizons of the B2 horizon have chroma of 2. Below a depth of 12 inches, part of the B2 horizon has gray or brown mottles. Fine earth textures are loam or silt loam.

The Bx horizon has hue of 10R to 5YR, value of 3 to 5, and chroma of 2 to 4. In many pedons, the interior of prisms has gray or brown mottles. Prism faces have hue of 10R to 5YR, value of 4 to 7, and chroma of 2 or 3. Fine earth textures in the Bx horizon range from silt loam to sandy loam.

The C horizon has hue of 10R to 5YR, value of 3 to 5, and chroma of 2 to 4. Fine earth textures range from silt loam to sandy loam.

Wyoming series

The Wyoming series consists of loamy-skeletal, mixed, mesic Typic Dystrochrepts. Wyoming soils formed on kames, eskers, and valley trains in gravelly water-sorted material that derived from red and gray sandstone and shale. These soils are deep and somewhat excessively drained. Slopes range from 3 to 45 percent but are dominantly 3 to 15 percent.

Wyoming soils formed in parent material similar to that of the deep, somewhat poorly drained and poorly drained Rexford soils; the deep, well drained Barbour and Linden soils; and the deep, moderately well drained and somewhat poorly drained Basher soils. Unlike Wyoming soils, Barbour, Linden, and Basher soils are on flood plains.

Typical pedon of Wyoming gravelly sandy loam, 3 to 8 percent slopes, in Paupack Township, 1 1/2 miles southwest of Hawley, adjacent to the parking lot for Lake Wallenpaupack:

A1—0 to 9 inches; dark brown (10YR 3/3) gravelly sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; many roots; 25 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B21—9 to 18 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; common roots; 35 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22—18 to 27 inches; dark brown (10YR 4/3) gravelly sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; common roots; 60 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—27 to 60 inches; grayish brown (10YR 5/2) very gravelly sand; single grain; loose, nonsticky and nonplastic; 75 percent coarse fragments; very strongly acid.

The solum is 18 to 35 inches thick. Bedrock is at a depth of 10 feet or more. Coarse fragments make up 15 to 50 percent of the A horizon, 20 to 60 percent of the B2 horizon, and 35 to 75 percent of the B3 and C horizons. Unless the soil has been limed, it is medium acid to extremely acid throughout.

The Ap horizon, where present, has hue of 10YR to 5YR, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 2.5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. Fine earth textures are fine sandy loam to coarse sandy loam.

The C horizon has hue of 2.5YR to 10YR, value of 4 or 5, and chroma of 2 to 4. Fine earth textures below a depth of 25 inches range from sand to sandy loam.

Formation of the soils

In this section, the factors and processes of soil formation are described and are related to the soils of Wayne County.

Factors of soil formation

Soils form through the chemical and physical weathering of geologic material. The extent of weathering and the characteristics of the soil that is formed are dependent on the nature of the parent material; on the climate of the area; on the relief, or lay of the land; on the kinds and amount of plants and animals in and on the soil; and on the length of time these factors have affected soil formation. In an area such as Wayne County where the vegetation and climate vary only slightly from place to place, the parent material produces greater differences among the soils in texture and mineral content than most of the other soil-forming factors.

The climate of an area affects the nature and extent of weathering. Relief affects drainage, aeration, runoff, erosion, and exposure to sun and wind. Plants and animals influence soil characteristics through physical and chemical removals and additions. And time is required for the other four soil-forming factors to affect the parent material.

Parent material

The main parent materials of the soils in Wayne County are glacial till and outwash of sand and gravel. These parent materials are derived mainly from local red and gray sandstone, siltstone, and shale.

The soils on uplands, for example, Swartswood, Mardin, Volusia, and Norwich soils, formed in the deep glacial till that covers most of the county. The moderately deep Oquaga and Lordstown soils and the shallow Arnot soils formed in areas where the slopes are steepest and the deposits of glacial till are thinner. Oquaga and Arnot soils are on the steep slopes of the Delaware River bluffs where sandstone is exposed. Wellsboro soils are along the foot of the bluffs.

Wyoming and Rexford soils formed in outwash sand and gravel that was deposited on the uplands as kames or terraces and in the larger stream valleys.

The Barbour, Basher, and Holly soils formed along streams in alluvial deposits consisting of stratified silt, sand, and gravel. These soils are among the youngest in the county. Many closed depressions and blocked valleys on the uplands have been filled with water. Sphagnum bogs have developed in some of these areas, and in others, woody vegetation has encroached on the lakes. In these wet areas, the plants grow, die, and fall into the water, where they are partly preserved. Medihemists and Medifibrists formed in these accumulations of organic material.

Climate

The climate of Wayne County is the humid-temperate, continental type. Some characteristics of the soils in the county indicate that this climate prevailed when the soils were forming and that it affected soil formation. Many of the soils are acid and strongly leached. The effect of climate on the formation of soils has been nearly uniform throughout the county. The formation of some soils, however, may have been affected by a microclimate caused by differences in relief. More information on the climate of Wayne County can be found under "Climate" in the section "General nature of the county."

Relief

Before the advance of the Wisconsin glaciers, streams had dissected the uplands and formed valleys, producing a hilly landscape. The glaciers tended to plane off the hills and deposited glacial material in many stream valleys. As the glaciers retreated, major streams cut into these unconsolidated deposits, and today the uplands form a gently sloping to moderately steep plateau. A few kames and terraces are scattered on the landscape. Slopes generally are less than 25 percent, except in the eastern part of the county where major streams have cut into the plateau to a depth of 200 to 400 feet.

The bedrock is the same throughout most of the county. It consists of beds of sandstone and shale that dip gently to the northwest and have an occasional, mild anticlinal arch. Bedrock has only mildly influenced the topography in Wayne County.

Plants and animals

Hardwood forests, mainly of the oak-hickory type, originally covered most of Wayne County. Forests of sugar maple, beech, and yellow birch were less extensive. Hemlocks and pines grew in small areas at the higher elevations where the climate was cooler and wetter.

The soils in Wayne County are typical of those that formed under forest vegetation. Where they have not been disturbed, the soils have a layer of leaf litter on the surface that is underlain by a black O2 horizon 1 to 3 inches thick. The O2 horizon is commonly underlain by a dark-colored A1 horizon. In some areas, a light-colored A2 horizon underlies the O2 horizon; an example of this can be seen in the profile described as typical of the Swartswood series in the section "Soil series and morphology."

As the forests were cleared and the soils were plowed, the layer of organic matter was incorporated into the plow layer or was burned. Thus, in many areas, the soils were exposed to wind and rain, and erosion accelerated.

The activities of man, including cultivation, artificial drainage, adding lime and fertilizer, and maintaining a cover of perennial grasses and legumes, have had a major effect on the soils.

Time

Time is needed for soils to form. The last glacial advance and retreat in the Wayne County uplands occurred during the Wisconsin stage, about 10,000 to 14,000 years ago. The soils in Wayne County, therefore, are not so old or so well developed as most of the soils in the southeastern counties of Pennsylvania, which were not subject to glaciation.

Soils that formed in alluvial material, for example, the Barbour and Basher soils, are considered young or recent because their parent material has been in place for a shorter time than that of the other soils in the county. Alluvial soils generally have less distinct horizons than many of the older soils on uplands.

Lordstown, Oquaga, and Wyoming soils, which formed on uplands and terraces, show some horizon development; however, weathering and profile development in these soils were slowed because of characteristics of the topography and the parent material.

Swartswood, Volusia, and Chippewa soils have developed profiles that have fairly distinct horizons.

Processes of soil formation

As weathering proceeds and plants grow on a young soil, several processes take place that help to differentiate the layers, or horizons, in a soil. These soil-forming processes are gains, losses, transfers, and transformations.

Gains occur as leaves and other organic material are deposited on the surface. Gains of organic matter and minerals, including some plant nutrients, are also brought about by animals, floods, wind, and gravity.

Losses occur as minerals are decomposed and some of the products of weathering are leached from the soil by percolating water. Losses also include the removal of nutrients from the soil in harvesting crops, forage, or trees. Other kinds of losses are the removal of fine particles of soil by erosion and the escape of gases as organic matter decays.

Transfers of material from one part of the soil to another are common in most soils. Organic matter is transferred in suspension or in solution from the upper part of the profile to the lower part. Calcium is leached from the surface layer, and some is held for a while by clay in the subsoil. Silt and clay coatings in the B horizon of Volusia and Norwich soils indicate the transfer of silt and clay from horizons higher in the profile. Bases and other nutrients are absorbed by plant roots and rise in the stems to be stored in leaves and twigs. When the plants die and decay, the nutrients are returned to the soil.

Transformations in a soil occur through chemical weathering. For example, iron, aluminum, calcium, and other elements are released from the primary and secondary minerals in the soil and changed into other compounds. In the well drained Lordstown soils, the gray colors of the parent material gradually are replaced by brown and yellow colors as iron compounds are weathered and oxidized. These brown and yellow colors indicate the release of iron or the oxidation of ferrous oxides to ferric oxides in the presence of an adequate supply of oxygen.

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) Cooper, Franklin D. 1976. The mineral industry of Pennsylvania. U.S. Dep. Inter. Inf. Circ. 81.

(4) Hunt, Charles B. 1967. Physiography of the United States. W.H. Freeman and Co. San Francisco.

(5) Lohman, Stanley W. 1937. Ground water in northeastern Pennsylvania. Pa. Geol. Surv. Ser. 4.

(6) Pennsylvania Geological Survey. 1960. Geol. map of Pa. Ser. 4.

(7) Society of American Foresters. 1954. Forest cover types of North America. Rep. Comm. Forest Types, 67 pp.

(8) 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.]

(9) United States Department of Agriculture. 1968. The timber resources of Pennsylvania. Forest Serv. Resour. Bull. E-8.

(10) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

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

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

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

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

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

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

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

Channery soil. A soil, that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches

along the longest axis. A single piece is called a fragment.

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 slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A mapping 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.

Compressible. Excessive decrease in volume of soft soil under load.

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

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

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

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

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

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

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

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

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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

Cutbanks cave. Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

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

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

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 long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

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

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

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

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

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

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

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

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

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

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

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

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

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

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

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

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

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

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

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, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

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

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

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.

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.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

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 clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

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, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

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

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.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

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

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

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the basis of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

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

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

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

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

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

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
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

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

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

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

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

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

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

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.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

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

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.
Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.
Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.
Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1958-75 at Hawley, Pa.]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January----	34.3	11.4	22.9	62	-16	9	2.69	1.70	3.59	6	10.8
February---	35.3	11.5	23.4	59	-17	0	2.61	1.32	3.66	6	13.7
March------	43.9	21.5	32.7	72	1	31	3.08	2.13	3.95	6	12.9
April------	57.0	31.9	44.5	86	16	171	3.11	2.03	4.08	7	2.2
May--------	67.9	41.7	54.8	89	26	459	3.52	1.88	4.84	8	.1
June-------	75.7	51.6	63.7	92	36	711	3.76	1.66	5.46	7	.0
July-------	80.0	55.8	67.9	92	43	865	3.26	1.78	4.46	7	.0
August-----	78.7	54.5	62.9	91	41	928	3.83	2.16	5.18	7	.0
September--	72.1	47.7	59.9	90	29	597	3.48	2.12	4.69	6	.0
October----	63.0	36.1	49.6	82	19	310	2.64	1.01	3.95	5	.3
November---	50.3	29.0	39.6	75	11	77	3.52	2.25	4.66	7	3.7
December---	36.9	17.8	27.4	62	-7	11	3.17	1.79	4.30	7	13.5
Year-----	57.9	34.2	45.8	93	-18	4,169	38.67	32.15	44.89	79	57.2

[1]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

[Recorded in the period 1958-75 at Hawley, Pa.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 3	May 21	May 26
2 years in 10 later than--	April 27	May 15	May 22
5 years in 10 later than--	April 17	May 4	May 15
First freezing temperature in fall:			
1 year in 10 earlier than--	October 6	September 21	September 14
2 years in 10 earlier than--	October 12	September 28	September 19
5 years in 10 earlier than--	October 22	October 11	September 29

TABLE 3.--GROWING SEASON

[Recorded in the period 1958-75 at Hawley, Pa.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	162	130	118
8 years in 10	170	140	124
5 years in 10	187	159	136
2 years in 10	203	179	149
1 year in 10	212	189	155

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

Map symbol	Soil name	Acres	Percent
ArB	Arnot channery loam, very rocky, 3 to 8 percent slopes	7,424	1.6
ArC	Arnot channery loam, very rocky, 8 to 15 percent slopes	5,342	1.1
ArD	Arnot channery loam, very rocky, 15 to 25 percent slopes	9,665	2.0
Ba	Barbour loam	2,451	0.5
Bh	Basher silt loam	6,293	1.3
FF	Fluvents and Fluvaquents, cobbly	2,480	0.5
Ho	Holly silt loam	9,352	2.0
La	Linden fine sandy loam, rarely flooded	970	0.2
LdB	Lordstown channery loam, 3 to 8 percent slopes	1,267	0.3
LdC	Lordstown channery loam, 8 to 15 percent slopes	1,142	0.2
LdD	Lordstown channery loam, 15 to 25 percent slopes	444	0.1
LxB	Lordstown extremely stony loam, 3 to 8 percent slopes	8,096	1.7
LxC	Lordstown extremely stony loam, 8 to 25 percent slopes	16,350	3.4
MaB	Mardin channery loam, 3 to 8 percent slopes	9,454	2.0
MaC	Mardin channery loam, 8 to 15 percent slopes	6,789	1.4
MaD	Mardin channery loam, 15 to 25 percent slopes	870	0.2
MdB	Mardin extremely stony loam, 3 to 8 percent slopes	13,015	2.7
MdD	Mardin extremely stony loam, 8 to 25 percent slopes	16,793	3.5
ME	Medihemists and Medifibrists	5,735	1.2
MoA	Morris channery loam, 0 to 3 percent slopes	1,277	0.3
MoB	Morris channery loam, 3 to 8 percent slopes	20,880	4.4
MoC	Morris channery loam, 8 to 15 percent slopes	6,293	1.3
MxB	Morris extremely stony loam, 0 to 8 percent slopes	39,810	8.3
MxC	Morris extremely stony loam, 8 to 15 percent slopes	16,269	3.4
NcA	Norwich and Chippewa channery silt loams, 0 to 3 percent slopes	1,310	0.3
NxA	Norwich and Chippewa extremely stony silt loams, 0 to 3 percent slopes	11,164	2.3
OaB	Oquaga channery loam, 3 to 8 percent slopes	6,892	1.4
OaC	Oquaga channery loam, 8 to 15 percent slopes	7,609	1.6
OaD	Oquaga channery loam, 15 to 25 percent slopes	3,479	0.7
OxB	Oquaga extremely stony loam, 3 to 8 percent slopes	13,345	2.8
OxD	Oquaga extremely stony loam, 8 to 25 percent slopes	34,541	7.3
OyF	Oquaga and Lordstown extremely stony loams, 25 to 70 percent slopes	26,625	5.6
Pt	Pits, borrow	514	0.1
Qu	Quarries	191	*
Re	Rexford loam	505	0.1
RoD	Rock outcrop-Arnot complex, 3 to 25 percent slopes	1,684	0.4
SwB	Swartswood channery sandy loam, 3 to 8 percent slopes	1,214	0.3
SwC	Swartswood channery sandy loam, 8 to 15 percent slopes	744	0.2
SwD	Swartswood channery sandy loam, 15 to 25 percent slopes	206	*
SxB	Swartswood extremely stony sandy loam, 3 to 8 percent slopes	4,569	1.0
SxD	Swartswood extremely stony sandy loam, 8 to 25 percent slopes	3,693	0.8
VoA	Volusia channery silt loam, 0 to 3 percent slopes	920	0.2
VoB	Volusia channery silt loam, 3 to 8 percent slopes	7,514	1.6
VoC	Volusia channery silt loam, 8 to 15 percent slopes	2,379	0.5
VxB	Volusia extremely stony silt loam, 0 to 8 percent slopes	20,408	4.3
VxC	Volusia extremely stony silt loam, 8 to 15 percent slopes	4,566	1.0
WeB	Wellsboro channery loam, 3 to 8 percent slopes	24,985	5.2
WeC	Wellsboro channery loam, 8 to 15 percent slopes	19,850	4.2
WeD	Wellsboro channery loam, 15 to 25 percent slopes	2,487	0.5
WoB	Wellsboro extremely stony loam, 3 to 8 percent slopes	18,435	3.9
WoD	Wellsboro extremely stony loam, 8 to 25 percent slopes	33,805	7.1
WxF	Wellsboro and Mardin extremely stony loams, 25 to 50 percent slopes	3,859	0.8
WyB	Wyoming gravelly sandy loam, 3 to 8 percent slopes	1,785	0.4
WyC	Wyoming gravelly sandy loam, 8 to 15 percent slopes	2,476	0.5
WyD	Wyoming gravelly sandy loam, 15 to 25 percent slopes	1,229	0.3
WyE	Wyoming gravelly sandy loam, 25 to 45 percent slopes	329	0.1
	Water	4,387	0.9
	Total	476,160	100.0

* Less than 0.1 percent.

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

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

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
ArB---- Arnot	---	---	---	---	---	---	---
ArC---- Arnot	---	---	---	---	---	---	---
ArD---- Arnot	---	---	---	---	---	---	---
Ba---- Barbour	120	24	80	45	4.5	3.5	8.5
Bh---- Basher	120	24	80	45	4.5	3.5	8.5
FF---- Fluvents	---	---	---	---	---	---	---
Ho---- Holly	100	20	70	---	---	3.5	6.5
La---- Linden	120	24	80	45	4.5	3.5	8.5
LdB---- Lordstown	85	17	75	45	3.5	3.0	6.5
LdC---- Lordstown	85	17	70	40	3.5	3.0	6.5
LdD---- Lordstown	80	16	65	35	3.0	3.0	5.5
LxB, LxC---- Lordstown	---	---	---	---	---	---	---
MaB---- Mardin	90	18	70	40	4.0	3.0	7.5
MaC---- Mardin	85	17	65	40	4.0	3.0	7.5
MaD---- Mardin	80	16	65	35	3.5	3.0	6.5
MdB, MdD---- Mardin	---	---	---	---	---	---	---
ME---- Medihemists	---	---	---	---	---	---	---
MoA---- Morris	80	16	65	35	3.0	3.0	6.0
MoB---- Morris	80	16	65	35	3.0	3.0	6.0
MoC---- Morris	70	14	60	30	3.0	3.0	6.0
MxB, MxC---- Morris	---	---	---	---	---	---	---

See footnote at end of table.

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

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
NcA---------- Norwich	---	---	---	---	---	---	4.5
NxA---------- Norwich	---	---	---	---	---	---	---
OaB---------- Oquaga	85	17	75	45	3.5	3.0	6.5
OaC---------- Oquaga	85	17	70	40	3.5	3.0	6.5
OaD---------- Oquaga	80	16	65	35	3.0	3.0	5.5
OxB, OxD---------- Oquaga	---	---	---	---	---	---	---
OyF---------- Oquaga	---	---	---	---	---	---	---
Pt. Pits							
Qu. Quarries							
Re---------- Rexford	80	16	65	35	3.0	3.0	5.5
RoD---------- Rock outcrop	---	---	---	---	---	---	---
SwB---------- Swartswood	100	20	80	45	4.5	4.5	8.5
SwC---------- Swartswood	90	18	75	40	4.5	4.5	8.5
SwD---------- Swartswood	80	16	65	35	4.0	4.0	8.0
SxB, SxD---------- Swartswood	---	---	---	---	---	---	---
VoA---------- Volusia	80	16	65	35	3.0	3.0	5.5
VoB---------- Volusia	80	16	65	35	3.0	3.0	5.5
VoC---------- Volusia	70	14	60	30	3.0	3.0	5.5
VxB, VxC---------- Volusia	---	---	---	---	---	---	---
WeB---------- Wellsboro	90	18	70	40	4.0	3.0	7.5
WeC---------- Wellsboro	85	17	65	40	4.0	3.0	7.5
WeD---------- Wellsboro	80	16	65	35	3.5	3.0	6.5
WoB, WoD---------- Wellsboro	---	---	---	---	---	---	---

See footnote at end of table.

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

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
WxF---------- Wellsboro	---	---	---	---	---	---	---
WyB---------- Wyoming	90	18	75	45	4.0	3.0	7.5
WyC---------- Wyoming	75	15	70	40	3.5	2.5	6.5
WyD---------- Wyoming	70	14	50	30	3.0	2.0	5.5
WyE---------- Wyoming	---	---	---	---	---	---	---

* 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 a period of 30 days.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	3,421	---	---	---
II	58,539	8,159	49,166	1,214
III	78,605	44,806	9,857	23,942
IV	11,191	8,715	---	2,476
V	1,310	---	1,310	---
VI	---	---	---	---
VII	309,787	329	---	309,458
VIII	8,215	---	---	---

TABLE 7.--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	
ArB, ArC--Arnot	5d	Slight	Severe	Severe	Moderate	Northern red oak Sugar maple Eastern white pine White ash	54 50 54 60	Eastern white pine, red pine, Austrian pine, European larch, pitch pine.
ArD--Arnot	5d	Slight	Severe	Severe	Moderate	Northern red oak Sugar maple Eastern white pine White ash	54 50 54 60	Eastern white pine, red pine, Austrian pine, European larch, pitch pine.
Ba--Barbour	2o	Slight	Slight	Slight	Slight	Sugar maple	70	Eastern white pine, Norway spruce, black walnut.
Bh--Basher	2o	Slight	Slight	Slight	Slight	Sugar maple Northern red oak	70 75	Eastern white pine, black walnut, Norway spruce, European larch.
Ho--Holly	2w	Slight	Severe	Severe	Moderate	Pin oak Swamp white oak Red maple White ash	80 55 60 60	Red maple, white ash.
La--Linden	1o	Slight	Slight	Slight	Slight	Northern red oak White ash Sugar maple Black cherry Black walnut Eastern white pine Yellow-poplar	90 90 90 90 90 90 100	Yellow-poplar, black walnut, black cherry, red pine, European larch, Norway spruce, eastern white pine.
LdB, LdC--Lordstown	3f	Slight	Slight	Moderate	Slight	Northern red oak Sugar maple White ash	65 73 75	Eastern white pine, European larch, black cherry, red pine, Norway spruce.
LdD--Lordstown	3r	Slight	Moderate	Moderate	Slight	Northern red oak Sugar maple White ash	65 73 75	Eastern white pine, European larch, black cherry, red pine, Norway spruce.
LxB, LxC--Lordstown	3x	Slight	Moderate	Moderate	Slight	Sugar maple Northern red oak White ash	73 65 75	Eastern white pine, red pine, European larch, Norway spruce.
MaB, MaC--Mardin	3o	Slight	Slight	Slight	Slight	Sugar maple Northern red oak Black cherry	60 65 75	Red pine, European larch, Norway spruce, eastern white pine.
MaD--Mardin	3r	Slight	Moderate	Slight	Slight	Sugar maple Northern red oak Black cherry	60 65 75	Red pine, European larch, Norway spruce, eastern white pine.
MdB, MdD--Mardin	3x	Slight	Moderate	Slight	Slight	Sugar maple Northern red oak Black cherry	60 65 75	Red pine, European larch, Norway spruce, eastern white pine.

TABLE 7.--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	
MoA, MoB, MoC--Morris	3w	Slight	Moderate	Moderate	Moderate	Northern red oak Sugar maple Black cherry White ash	65 79 69 71	Eastern white pine, Norway spruce, white spruce, European larch.
MxB, MxC--Morris	3x	Slight	Moderate	Moderate	Moderate	White ash Northern red oak Sugar maple Black cherry	71 65 79 69	European larch, white spruce, eastern white pine.
NcA*:								
Norwich	5w	Slight	Severe	Severe	Severe	Red maple	60	Eastern white pine, white spruce.
Chippewa	5w	Slight	Severe	Severe	Severe	Red maple	60	Eastern white pine, white spruce.
NxA*:								
Norwich	5x	Slight	Severe	Severe	Severe	Red maple	60	Eastern white pine, white spruce.
Chippewa	5x	Slight	Severe	Severe	Severe	Red maple	60	Eastern white pine, white spruce.
OaB, OaC--Oquaga	3o	Slight	Slight	Moderate	Slight	Sugar maple Northern red oak Black cherry Eastern white pine	69 71 72 75	Eastern white pine, red pine, European larch, Norway spruce, black cherry.
OaD--Oquaga	3r	Slight	Moderate	Moderate	Slight	Sugar maple Northern red oak Black cherry Eastern white pine	69 71 72 75	Eastern white pine, red pine, European larch, Norway spruce, black cherry.
OxB, OxD--Oquaga	3x	Slight	Moderate	Moderate	Slight	Sugar maple Northern red oak White ash	73 69 75	Eastern white pine, red pine, European larch, Norway spruce.
OyF*:								
Oquaga	3x	Moderate	Moderate	Moderate	Slight	Sugar maple Northern red oak White ash	73 69 75	Eastern white pine, red pine, European larch, Norway spruce.
Lordstown	3x	Moderate	Moderate	Moderate	Slight	Sugar maple Northern red oak White ash	73 65 75	Eastern white pine, red pine, European larch, Norway spruce.
Re--Rexford	3w	Slight	Moderate	Moderate	Moderate	Northern red oak White ash Sugar maple Black cherry	70 70 70 70	Black cherry, European larch, Norway spruce, white spruce, eastern white pine.
RoD*:								
Rock outcrop.								
Arnot	5d	Slight	Severe	Severe	Moderate	Northern red oak Sugar maple Eastern white pine White ash	54 50 54 60	Eastern white pine, red pine, Austrian pine, European larch, pitch pine.

See footnote at end of table.

TABLE 7.--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	
SwB, SwC---------- Swartswood	3o	Slight	Slight	Slight	Slight	Northern red oak----	70	Red pine,
						Sugar maple----------	70	eastern white pine,
						White ash----------	70	European larch,
								Norway spruce.
SwD---------- Swartswood	3r	Slight	Moderate	Slight	Slight	Northern red oak----	70	Red pine,
						Sugar maple----------	70	eastern white pine,
						White ash----------	70	European larch,
								Norway spruce.
SxB, SxD---------- Swartswood	3x	Slight	Moderate	Slight	Slight	Northern red oak----	70	Red pine,
						Sugar maple----------	70	eastern white pine,
						White ash----------	70	European larch,
								Norway spruce.
VoA, VoB, VoC, VxB, VxC---------- Volusia	3w	Slight	Moderate	Moderate	Moderate	Northern red oak----	65	Eastern white pine,
						Sugar maple----------	64	Norway spruce,
						White ash----------	75	European larch,
								white spruce,
								black cherry.
WeB, WeC---------- Wellsboro	2o	Slight	Slight	Slight	Slight	Northern red oak----	78	Norway spruce,
						Sugar maple----------	70	eastern white pine,
						Black cherry--------	80	red pine,
								black cherry,
								European larch.
WeD---------- Wellsboro	2r	Slight	Moderate	Slight	Slight	Northern red oak----	78	Norway spruce,
						Sugar maple----------	70	eastern white pine,
						Black cherry--------	80	red pine,
								black cherry,
								European larch.
WoB, WoD---------- Wellsboro	2x	Slight	Moderate	Slight	Slight	Northern red oak----	78	Norway spruce,
						Sugar maple----------	70	eastern white pine,
						Black cherry--------	80	red pine,
								black cherry,
								European larch.
WxF*:								
Wellsboro---------	2x	Moderate	Severe	Slight	Slight	Northern red oak----	78	Norway spruce,
						Sugar maple----------	70	eastern white pine,
						Black cherry--------	80	red pine,
								black cherry,
								European larch.
Mardin----------	3x	Moderate	Severe	Slight	Slight	Sugar maple----------	60	Red pine,
						Northern red oak----	65	European larch,
						Black cherry--------	75	Norway spruce,
								eastern white pine.
WyB, WyC---------- Wyoming	4f	Slight	Slight	Severe	Slight	Northern red oak----	55	Eastern white pine,
								red pine,
								Virginia pine.
WyD, WyE---------- Wyoming	4f	Slight	Moderate	Severe	Slight	Northern red oak----	55	Eastern white pine,
								red pine,
								Virginia pine.

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

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 map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ArB--- Arnot	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.
ArC--- Arnot	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.	Severe: depth to rock, rock outcrops.
ArD--- Arnot	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.
Ba--- Barbour	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Bh--- Basher	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Moderate: floods, frost action.	Moderate: floods.
FF*: Fluvents.						
Fluvaquents.						
Ho--- Holly	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness, frost action.	Severe: wetness, floods.
La--- Linden	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Slight.
LdB--- Lordstown	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, small stones.
LdC--- Lordstown	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.	Moderate: slope, depth to rock, small stones.
LdD--- Lordstown	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
LxB--- Lordstown	Severe: large stones, depth to rock.	Severe: large stones.	Severe: large stones, depth to rock.	Severe: large stones.	Moderate: large stones, depth to rock.	Severe: large stones.
LxC--- Lordstown	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
MaB--- Mardin	Severe: wetness.	Moderate: frost action, wetness.	Severe: wetness.	Moderate: frost action, wetness.	Moderate: frost action.	Moderate: small stones.
MaC--- Mardin	Severe: wetness.	Moderate: frost action, wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: frost action, slope.	Moderate: small stones.

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
MaD---------- Mardin	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
MdB---------- Mardin	Severe: large stones.	Severe: large stones.	Severe: large stones, wetness.	Severe: large stones.	Moderate: frost action.	Severe: large stones.
MdD---------- Mardin	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones, wetness.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
ME*: Medihemists.						
Medifibrists.						
MoA, MoB---------- Morris	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: frost action, wetness.	Severe: frost action.	Moderate: wetness, small stones.
MoC---------- Morris	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: slope, frost action, wetness.	Severe: frost action.	Moderate: wetness, small stones, slope.
MxB---------- Morris	Severe: wetness, large stones.	Severe: large stones, frost action, wetness.	Severe: large stones, wetness.	Severe: large stones, frost action, wetness.	Severe: frost action.	Severe: large stones.
MxC---------- Morris	Severe: wetness, large stones.	Severe: large stones, frost action, wetness.	Severe: large stones, wetness.	Severe: slope, large stones, frost action.	Severe: frost action.	Severe: large stones.
NcA*: Norwich----------	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
Chippewa----------	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
NxA*: Norwich----------	Severe: wetness, large stones.	Severe: wetness, frost action, large stones.	Severe: wetness, large stones.	Severe: wetness, frost action, large stones.	Severe: wetness, frost action.	Severe: wetness, large stones.
Chippewa----------	Severe: wetness, large stones.	Severe: wetness, large stones.	Severe: wetness, large stones.	Severe: wetness, large stones.	Severe: wetness, frost action.	Severe: wetness, large stones.
OaB---------- Oquaga	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, small stones.
OaC---------- Oquaga	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.	Moderate: slope, depth to rock.
OaD---------- Oquaga	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
OxB---------- Oquaga	Severe: large stones, depth to rock.	Severe: large stones.	Severe: large stones, depth to rock.	Severe: large stones.	Moderate: large stones, depth to rock.	Severe: large stones.

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
OxD---------- Oquaga	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
OyF*: Oquaga----------	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
Lordstown--------	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
Pt. Pits						
Qu. Quarries						
Re---------- Rexford	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
RoD*: Rock outcrop.						
Arnot----------	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock, rock outcrops.
SwB---------- Swartswood	Moderate: wetness.	Moderate: frost action.	Moderate: wetness.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: small stones.
SwC---------- Swartswood	Moderate: slope, wetness.	Moderate: slope, frost action.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, small stones.
SwD---------- Swartswood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SxB---------- Swartswood	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: large stones, frost action.	Severe: large stones.
SxD---------- Swartswood	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
VoA, VoB---------- Volusia	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: frost action.	Moderate: small stones, wetness.
VoC---------- Volusia	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: slope, wetness, frost action.	Severe: frost action.	Moderate: slope, small stones, wetness.
VxB---------- Volusia	Severe: wetness, large stones.	Severe: wetness, large stones, frost action.	Severe: wetness, large stones.	Severe: wetness, large stones, frost action.	Severe: frost action.	Severe: large stones.
VxC---------- Volusia	Severe: wetness, large stones.	Severe: wetness, large stones, frost action.	Severe: wetness, large stones.	Severe: slope, large stones, wetness.	Severe: frost action.	Severe: large stones.

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
WeB---------- Wellsboro	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Moderate: small stones.
WeC---------- Wellsboro	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action.	Moderate: slope, small stones.
WeD---------- Wellsboro	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, frost action.	Severe: slope,
WoB---------- Wellsboro	Severe: wetness, large stones.	Severe: large stones, frost action.	Severe: large stones, wetness.	Severe: large stones, frost action.	Severe: frost action.	Severe: large stones.
WoD---------- Wellsboro	Severe: slope, wetness, large stones.	Severe: slope, large stones, frost action.	Severe: slope, large stones, wetness.	Severe: slope, large stones, frost action.	Severe: slope, frost action.	Severe: slope, large stones.
WxF*: Wellsboro--------	Severe: slope, wetness, large stones.	Severe: slope, large stones, frost action.	Severe: slope, large stones, wetness.	Severe: slope, large stones, frost action.	Severe: slope, frost action.	Severe: slope, large stones.
Mardin----------	Severe: slope, large stones, wetness.	Severe: slope, large stones, frost action.	Severe: slope, large stones, wetness.	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.
WyB---------- Wyoming	Severe: small stones.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: small stones.
WyC---------- Wyoming	Severe: small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
WyD, WyE---------- Wyoming	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones.

* 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," and "fair." 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
ArB Arnot	Severe: depth to rock, rock outcrops.	Severe: depth to rock.	Severe: depth to rock, rock outcrops.	Slight	Poor: small stones, thin layer.
ArC Arnot	Severe: depth to rock, rock outcrops.	Severe: slope, depth to rock.	Severe: depth to rock, rock outcrops.	Moderate: slope.	Poor: small stones, thin layer.
ArD Arnot	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock.	Severe: rock outcrops, depth to rock.	Severe: slope.	Poor: slope, small stones, thin layer.
Ba Barbour	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Fair: thin layer.
Bh Basher	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
FF*: Fluvents. Fluvaquents.					
Ho Holly	Severe: floods, wetness, percs slowly.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness.
La Linden	Moderate: floods.	Severe: floods, seepage.	Severe: seepage.	Severe: seepage.	Good.
LdB Lordstown	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: small stones, thin layer.
LdC Lordstown	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: small stones, thin layer.
LdD Lordstown	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope.
LxB Lordstown	Severe: large stones, depth to rock.	Severe: depth to rock, large stones.	Severe: large stones, depth to rock.	Slight	Poor: large stones.
LxC Lordstown	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: large stones, depth to rock.	Severe: slope.	Poor: slope, large stones.
MaB Mardin	Severe: percs slowly, wetness.	Moderate: small stones, slope.	Severe: wetness.	Severe: wetness.	Fair: small stones.
MaC Mardin	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: small stones, slope.

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
MaD---------- Mardin	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
MdB---------- Mardin	Severe: large stones, wetness, percs slowly.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
MdD---------- Mardin	Severe: slope, large stones, wetness.	Severe: slope, large stones.	Severe: wetness, large stones.	Severe: slope, wetness.	Poor: slope, large stones.
ME*: Medihemists. Medifibrists.					
MoA---------- Morris	Severe: percs slowly, wetness.	Moderate: small stones.	Severe: wetness.	Severe: wetness.	Fair: thin layer, small stones.
MoB---------- Morris	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: thin layer, small stones.
MoC---------- Morris	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer, small stones.
MxB---------- Morris	Severe: large stones, percs slowly, wetness.	Severe: large stones.	Severe: large stones, wetness.	Severe: wetness.	Poor: large stones.
MxC---------- Morris	Severe: large stones, percs slowly, wetness.	Severe: slope, large stones.	Severe: large stones, wetness.	Severe: wetness.	Poor: large stones.
NcA*: Norwich----------	Severe: wetness, percs slowly.	Moderate: small stones.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Chippewa----------	Severe: wetness, percs slowly.	Moderate: small stones.	Severe: wetness.	Severe: wetness.	Poor: wetness.
NxA*: Norwich----------	Severe: wetness, percs slowly.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: wetness, large stones.
Chippewa----------	Severe: wetness, percs slowly, large stones.	Severe: small stones.	Severe: wetness, large stones.	Severe: wetness, large stones.	Poor: wetness, large stones.
OaB---------- Oquaga	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Fair: thin layer.
OaC---------- Oquaga	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, thin layer.

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
OaD---------- Oquaga	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope.
OxB---------- Oquaga	Severe: large stones, depth to rock.	Severe: depth to rock, large stones.	Severe: large stones, depth to rock.	Slight----------	Poor: large stones.
OxD---------- Oquaga	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: large stones, depth to rock.	Severe: slope.	Poor: slope, large stones.
OyF*: Oquaga----------	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope.	Poor: slope, large stones.
Lordstown----------	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope.	Poor: slope, large stones.
Pt. Pits					
Qu. Quarries					
Re---------- Rexford	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
RoD*: Rock outcrop.					
Arnot----------	Severe: slope, depth to rock, rock outcrops.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones, thin layer.
SwB---------- Swartswood	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones.
SwC---------- Swartswood	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: small stones, slope.
SwD---------- Swartswood	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
SxB---------- Swartswood	Severe: percs slowly, wetness, large stones.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
SxD---------- Swartswood	Severe: slope, percs slowly, large stones.	Severe: slope, large stones.	Severe: wetness, large stones.	Severe: slope, wetness.	Poor: slope, large stones.
VoA---------- Volusia	Severe: wetness, percs slowly.	Moderate: small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones.

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
VoB---------- Volusia	Severe: wetness, percs slowly.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones.
VoC---------- Volusia	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, small stones.
VxB---------- Volusia	Severe: wetness, percs slowly, large stones.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
VxC---------- Volusia	Severe: wetness, percs slowly, large stones.	Severe: slope, large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
WeB---------- Wellsboro	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones.
WeC---------- Wellsboro	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: small stones, slope.
WeD---------- Wellsboro	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
WoB---------- Wellsboro	Severe: wetness, percs slowly, large stones.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
WoD---------- Wellsboro	Severe: slope, wetness, percs slowly.	Severe: slope, large stones.	Severe: wetness, large stones.	Severe: slope, wetness.	Poor: slope, large stones.
WxF*: Wellsboro----------	Severe: slope, wetness, percs slowly.	Severe: slope, large stones.	Severe: slope, wetness, large stones.	Severe: slope, wetness.	Poor: slope, large stones.
Mardin----------	Severe: slope, large stones, wetness.	Severe: slope, large stones.	Severe: slope, large stones, wetness.	Severe: slope, wetness.	Poor: slope, large stones.
WyB---------- Wyoming	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
WyC---------- Wyoming	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
WyD---------- Wyoming	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope, small stones.
WyE---------- Wyoming	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, small stones.

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

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
ArB, ArC---------- Arnot	Poor: thin layer, area reclaim, rock outcrops.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, area reclaim.
ArD---------- Arnot	Poor: thin layer, area reclaim, rock outcrops.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones, area reclaim.
Ba---------- Barbour	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Bh---------- Basher	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
FF*: Fluvents. Fluvaquents.				
Ho---------- Holly	Poor: wetness, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: wetness.
La---------- Linden	Fair: low strength, frost action.	Poor: excess fines.	Poor: excess fines.	Good.
LdB, LdC---------- Lordstown	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
LdD---------- Lordstown	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
LxB---------- Lordstown	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
LxC---------- Lordstown	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
MaB, MaC---------- Mardin	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
MaD---------- Mardin	Fair: frost action, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
MdB---------- Mardin	Fair: frost action, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
MdD---------- Mardin	Fair: frost action, slope, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
ME*: Medihemists. Medifibrists.				
MoA, MoB, MoC--------- Morris	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MxB, MxC---------- Morris	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
NcA*: Norwich----------	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, small stones.
Chippewa----------	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, small stones.
NxA*: Norwich----------	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, large stones.
Chippewa----------	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, large stones.
OaB, OaC---------- Oquaga	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
OaD---------- Oquaga	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
OxB---------- Oquaga	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
OxD---------- Oquaga	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
OyF*: Oquaga----------	Poor: slope, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
Lordstown----------	Poor: slope, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
Pt. Pits				
Qu. Quarries				
Re---------- Rexford	Poor: wetness, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: wetness.
RoD*: Rock outcrop.				
Arnot----------	Poor: thin layer, area reclaim, rock outcrops.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones, area reclaim.
SwB, SwC---------- Swartswood	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
SwD---------- Swartswood	Fair: slope, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SxB---------- Swartswood	Fair: frost action, large stones.	Poor: excess fines.	Poor: excess fines.	Poor: large stones.
SxD---------- Swartswood	Fair: large stones, slope.	Poor: excess fines.	Poor: excess fines.	Poor: slope, large stones.
VoA, VoB, VoC---------- Volusia	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
VxB, VxC---------- Volusia	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
WeB, WeC---------- Wellsboro	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
WeD---------- Wellsboro	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
WoB---------- Wellsboro	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
WoD---------- Wellsboro	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
WxF*: Wellsboro----------	Poor: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
Mardin----------	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
WyB, WyC---------- Wyoming	Good----------	Fair: excess fines.	Good----------	Poor: small stones.
WyD---------- Wyoming	Fair: slope.	Fair: excess fines.	Good----------	Poor: slope, small stones.
WyE---------- Wyoming	Poor: slope.	Fair: excess fines.	Good----------	Poor: slope, small stones.

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

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	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
ArB, ArC, ArD---- Arnot	Depth to rock, slope.	Thin layer, depth to rock, rock outcrops.	Depth to rock, no water, rock outcrops.	Not needed-----	Depth to rock, slope, rock outcrops.	Droughty, rooting depth, slope.
Ba---------- Barbour	Seepage--------	Piping, seepage.	No water-------	Not needed-----	Not needed-----	Not needed.
Bh---------- Basher	Seepage--------	Piping, low strength.	Deep to water	Floods, wetness.	Not needed-----	Not needed.
FF*: Fluvents.						
Fluvaquents.						
Ho---------- Holly	Seepage--------	Piping, wetness, seepage.	Slow refill----	Floods, frost action.	Not needed-----	Wetness.
La---------- Linden	Seepage--------	Seepage, piping.	Deep to water	Not needed-----	Not needed-----	Favorable.
LdB, LdC, LdD----- Lordstown	Depth to rock, slope, seepage.	Piping, low strength.	Deep to water	Not needed-----	Depth to rock, rooting depth, slope.	Droughty, slope.
LxB, LxC---------- Lordstown	Slope, depth to rock.	Depth to rock, large stones.	Depth to rock, large stones, no water.	Not needed-----	Slope, depth to rock, large stones.	Slope, rooting depth, large stones.
MaB, MaC, MaD----- Mardin	Slope----------	Favorable------	Deep to water	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.
MdB, MdD---------- Mardin	Slope----------	Large stones---	Deep to water, large stones.	Percs slowly, slope.	Percs slowly, slope, large stones.	Percs slowly, slope, large stones.
ME*: Medihemists.						
Medifibrists.						
MoA, MoB, MoC----- Morris	Slope----------	Wetness--------	Slope, slow refill.	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.
MxB, MxC---------- Morris	Slope----------	Large stones---	Large stones, slope, slow refill.	Percs slowly, wetness, slope.	Percs slowly, wetness, large stones.	Percs slowly, wetness, large stones.
NcA*: Norwich----------	Favorable------	Favorable------	Favorable------	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Chippewa---------	Favorable------	Favorable------	Favorable------	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
NxA*: Norwich----------	Favorable------	Large stones---	Large stones---	Wetness, percs slowly, large stones.	Large stones, wetness, percs slowly.	Large stones, wetness, percs slowly.
Chippewa---------	Favorable------	Large stones---	Large stones---	Wetness, percs slowly, large stones.	Large stones, wetness, percs slowly.	Large stones, wetness, percs slowly.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
OaB, OaC, OaD----- Oquaga	Depth to rock, slope.	Piping, thin layer.	No water, depth to rock.	Not needed-----	Depth to rock	Droughty, rooting depth.
OxB, OxD---------- Oquaga	Slope, depth to rock.	Depth to rock, large stones.	Depth to rock, large stones, no water.	Not needed-----	Slope, depth to rock, large stones.	Slope, rooting depth, large stones.
OyF*: Oquaga----------	Slope, depth to rock.	Depth to rock, large stones.	Depth to rock, large stones, no water.	Not needed-----	Slope, depth to rock, large stones.	Slope, rooting depth, large stones.
Lordstown--------	Slope, depth to rock.	Depth to rock, large stones.	Depth to rock, large stones, no water.	Not needed-----	Slope, depth to rock, large stones.	Slope, rooting depth, large stones.
Pt. Pits						
Qu. Quarries						
Re---------- Rexford	Seepage--------	Piping, low strength.	Slow refill----	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, wetness.
RoD*: Rock outcrop.						
Arnot----------	Depth to rock, slope.	Thin layer, depth to rock.	Depth to rock, no water.	Slope, percs slowly.	Depth to rock, slope.	Droughty, rooting depth, slope.
SwB, SwC, SwD----- Swartswood	Slope----------	Favorable------	Deep to water, slow refill.	Slope, percs slowly.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
SxB, SxD---------- Swartswood	Slope----------	Large stones---	Deep to water, slow refill.	Large stones, slope.	Large stones, percs slowly.	Large stones, percs slowly.
VoA, VoB, VoC----- Volusia	Slope----------	Favorable------	Slow refill----	Wetness, percs slowly, slope.	Wetness, percs slowly, rooting depth.	Wetness, percs slowly, rooting depth.
VxB, VxC---------- Volusia	Slope----------	Large stones---	Large stones---	Wetness, percs slowly, slope.	Wetness, large stones, rooting depth.	Wetness, large stones, rooting depth.
WeB, WeC, WeD----- Wellsboro	Slope----------	Favorable------	Deep to water	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.
WoB, WoD---------- Wellsboro	Slope----------	Large stones---	Deep to water, large stones.	Percs slowly, slope, large stones.	Percs slowly, slope, large stones.	Percs slowly, slope, large stones.
WxF*: Wellsboro--------	Slope----------	Large stones---	Deep to water, large stones.	Percs slowly, slope, large stones.	Percs slowly, slope, large stones.	Percs slowly, slope, large stones.
Mardin----------	Slope----------	Large stones---	Deep to water, large stones.	Percs slowly, slope.	Percs slowly, slope, large stones.	Percs slowly, slope, large stones.
WyB, WyC, WyD, WyE---------- Wyoming	Seepage, slope.	Seepage, piping.	No water-------	Not needed-----	Complex slope, piping.	Droughty, slope.

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

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
ArB Arnot	Moderate: small stones, rock outcrops.	Moderate: small stones, rock outcrops.	Severe: depth to rock, small stones.	Moderate: small stones, rock outcrops.	Severe: depth to rock, rock outcrops.
ArC Arnot	Moderate: slope, small stones, rock outcrops.	Moderate: slope, small stones, rock outcrops.	Severe: slope, depth to rock, small stones.	Moderate: small stones, rock outcrops.	Severe: depth to rock, rock outcrops.
ArD Arnot	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: small stones, slope.	Severe: slope, depth to rock.
Ba Barbour	Moderate: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Bh Basher	Moderate: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
FF*: Fluvents. Fluvaquents.					
Ho Holly	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
La Linden	Moderate: floods.	Slight	Slight	Slight	Moderate: floods.
LdB Lordstown	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: depth to rock, small stones.
LdC Lordstown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, depth to rock, small stones.
LdD Lordstown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
LxB Lordstown	Severe: large stones.	Moderate: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
LxC Lordstown	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: slope, large stones.
MaB Mardin	Moderate: percs slowly, wetness.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
MaC Mardin	Moderate: slope, percs slowly.	Moderate: small stones, slope.	Severe: slope, small stones.	Moderate: small stones.	Moderate: small stones, slope.
MaD Mardin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: small stones, slope.	Severe: slope.

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
MdB---- Mardin	Severe: large stones.	Moderate: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
MdD---- Mardin	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: large stones.	Severe: slope, large stones.
ME*: Medihemists.					
Medifibrists.					
MoA, MoB---- Morris	Moderate: wetness, small stones.	Moderate: wetness, small stones.	Severe: small stones, wetness.	Moderate: wetness, small stones.	Moderate: wetness.
MoC---- Morris	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope, small stones.	Moderate: wetness, small stones.	Moderate: wetness, slope.
MxB---- Morris	Severe: large stones.	Moderate: large stones, wetness.	Severe: large stones, wetness.	Severe: large stones.	Severe: large stones.
MxC---- Morris	Severe: large stones.	Moderate: slope, wetness.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones.
NcA*: Norwich----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Chippewa----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
NxA*: Norwich----	Severe: large stones, wetness, percs slowly.	Severe: wetness.	Severe: large stones, wetness.	Severe: large stones, wetness.	Severe: wetness, large stones.
Chippewa----	Severe: wetness, large stones.	Severe: wetness.	Severe: wetness, large stones.	Severe: wetness, large stones.	Severe: wetness, large stones.
OaB---- Oquaga	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: depth to rock, small stones.
OaC---- Oquaga	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, depth to rock.
OaD---- Oquaga	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
OxB---- Oquaga	Severe: large stones.	Moderate: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
OxD---- Oquaga	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: large stones.	Severe: slope, large stones.
OyF*: Oquaga----	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.

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
OyF*: Lordstown	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Pt. Pits					
Qu. Quarries					
Re Rexford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
RoD*: Rock outcrop.					
Arnot	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: small stones.	Severe: slope, depth to rock.
SwB Swartswood	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
SwC Swartswood	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: slope, small stones.
SwD Swartswood	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
SxB Swartswood	Severe: large stones	Moderate: large stones.	Severe: large stones, small stones.	Severe: large stones.	Severe: large stones.
SxD Swartswood	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones, small stones.	Severe: large stones.	Severe: slope, large stones.
VoA, VoB Volusia	Moderate: wetness, small stones.	Moderate: wetness, small stones.	Severe: small stones, wetness.	Moderate: wetness, small stones.	Moderate: small stones, wetness.
VoC Volusia	Moderate: slope, wetness.	Moderate: slope, wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness, small stones.	Moderate: slope, small stones, wetness.
VxB Volusia	Severe: large stones.	Moderate: wetness, large stones.	Severe: large stones, wetness.	Severe: large stones.	Severe: large stones.
VxC Volusia	Severe: large stones.	Moderate: slope, large stones.	Severe: slope, large stones, wetness.	Severe: large stones.	Severe: large stones.
WeB Wellsboro	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
WeC Wellsboro	Moderate: slope, percs slowly, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: slope, small stones.

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
WeD---------- Wellsboro	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
WoB---------- Wellsboro	Severe: large stones.	Moderate: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
WoD---------- Wellsboro	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: large stones.	Severe: slope, large stones.
WxF*: Wellsboro----------	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Mardin----------	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
WyB---------- Wyoming	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
WyC---------- Wyoming	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope, small stones.	Moderate: small stones.	Moderate: small stones, slope.
WyD---------- Wyoming	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: small stones, slope.	Severe: slope.
WyE---------- Wyoming	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: 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	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
ArB, ArC, ArD---- Arnot	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor
Ba---- Barbour	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
Bh---- Basher	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
FF*: Fluvents.										
Fluvaquents.										
Ho---- Holly	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
La---- Linden	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
LdB---- Lordstown	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor
LdC---- Lordstown	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor
LdD---- Lordstown	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
LxB---- Lordstown	Very poor	Very poor	Good	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
LxC---- Lordstown	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
MaB---- Mardin	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor
MaC---- Mardin	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor
MaD---- Mardin	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor
MdB---- Mardin	Very poor	Very poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor
MdD---- Mardin	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
ME*: Medihemists.										
Medifibrists.										
MoA---- Morris	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair
MoB---- Morris	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MoC---------- Morris	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor
MxB---------- Morris	Very poor	Very poor	Good	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
MxC---------- Morris	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
NcA*:										
Norwich----------	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
Chippewa----------	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
NxA*:										
Norwich----------	Very poor	Very poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair
Chippewa----------	Very poor	Very poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair
OaB---------- Oquaga	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor
OaC---------- Oquaga	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor
OaD---------- Oquaga	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
OxB---------- Oquaga	Very poor	Very poor	Good	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
OxD---------- Oquaga	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
OyF*:										
Oquaga----------	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
Lordstown----------	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
Pt. Pits										
Qu. Quarries										
Re---------- Rexford	Poor	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair
RoD*:										
Rock outcrop.										
Arnot----------	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor
SwB---------- Swartswood	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
SwC---------- Swartswood	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
SwD---------- Swartswood	Poor	Fair	Good	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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
SxB---- Swartswood	Very poor.	Very poor.	Good	Good	Good	Poor	Very poor	Poor	Fair	Very poor
SxD---- Swartswood	Very poor.	Very poor.	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor
VoA---- Volusia	Poor	Fair	Fair	Poor	Poor	Fair	Fair	Fair	Poor	Fair
VoB---- Volusia	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor
VoC---- Volusia	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor
VxB---- Volusia	Very poor.	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor
VxC---- Volusia	Very poor.	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
WeB---- Wellsboro	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor
WeC---- Wellsboro	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor
WeD---- Wellsboro	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
WoB---- Wellsboro	Very poor	Very poor	Good	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor
WoD---- Wellsboro	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
WxF*:										
Wellsboro---	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
Mardin----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor
WyB, WyC, WyD---- Wyoming	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor
WyE---- Wyoming	Very poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor

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

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ArB, ArC, ArD---- Arnot	0-6	Channery loam---	ML, GM, SM	A-2, A-4	5-10	60-85	55-70	45-60	30-55	<30	NP-5
	6-17	Very channery silt loam, channery loam.	GM, SM, GM-GC	A-2, A-4, A-1	10-25	30-60	25-55	20-55	15-50	<30	NP-5
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ba---------- Barbour	0-12	Loam----------	ML, ML-CL	A-4	0	95-100	90-100	75-95	55-85	15-25	2-6
	12-28	Silt loam, loam, gravelly loam.	ML, SM, ML-CL, SM-SC	A-4, A-2	0-10	75-100	60-95	50-95	30-85	15-25	2-6
	28-60	Loamy sand, very gravelly sand, gravelly loamy fine sand.	SM, SP, GM, GP	A-1, A-2, A-4	0-15	45-95	40-95	20-80	2-40	10-20	NP
Bh---------- Basher	0-14	Silt loam-------	ML, CL-ML	A-4	0-5	90-100	85-100	75-95	55-85	15-25	2-6
	14-40	Silt loam, loam, gravelly fine sandy loam.	SM, ML, CL-ML	A-4, A-2	0-5	75-100	70-95	50-95	30-85	10-20	2-6
	40-70	Silt loam, fine sandy loam, gravelly loam.	SM, ML, CL-ML, GM	A-4, A-2, A-1	0-15	60-100	40-95	30-95	20-85	10-20	2-6
FF*: Fluvents.											
Fluvaquents.											
Ho---------- Holly	0-12	Silt loam-------	ML	A-4	0	90-100	85-100	80-100	70-90	25-35	NP-10
	12-42	Silt loam, loam, sandy loam.	ML, SM	A-4, A-6	0	85-100	80-100	75-95	45-85	20-40	NP-14
	42-60	Stratified silt loam to gravelly sand.	ML, SM, GM	A-4	0-5	70-100	65-100	55-90	35-70	20-40	NP-10
La---------- Linden	0-26	Fine sandy loam	ML, SM	A-4	0	80-100	80-100	65-100	40-90	---	---
	26-48	Silt loam, gravelly loam, sandy loam.	ML, SM	A-4, A-2	0-5	80-100	65-100	40-95	25-90	<30	NP-3
	48-65	Loam, gravelly sandy loam, very gravelly sand.	SM, GM, GP, ML	A-2, A-1, A-3, A-4	0-20	40-100	30-100	15-90	5-75	<25	NP-5
LdB, LdC, LdD---- Lordstown	0-4	Channery loam---	ML, GM, SM	A-4	5-20	65-85	50-75	50-75	40-65	<30	NP-4
	4-18	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
	18-24	Very channery loam, channery silt loam, very channery fine sandy loam.	ML, GM, SM	A-2, A-4, A-1	5-25	40-75	30-70	25-70	15-60	<30	NP-4
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
LxB, LxC---------- Lordstown	0-4	Extremely stony loam.	ML, GM, SM	A-4	10-20	65-85	50-75	50-75	40-65	<30	NP-4
	4-18	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
	18-24	Very channery loam, channery silt loam, very channery fine sandy loam.	ML, GM, SM	A-2, A-4, A-1	5-25	40-75	30-70	25-70	15-60	<30	NP-4
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MaB, MaC, MaD------ Mardin	0-6	Channery loam---	GM, ML, CL, SC	A-4	5-20	65-75	60-70	50-70	35-60	25-35	5-10
	6-22	Channery silt loam, channery loam, gravelly loam.	CL, GC, SC, CL-ML	A-4	5-10	60-75	55-70	45-70	35-65	15-25	5-10
	22-49	Channery loam, channery silt loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	55-75	50-70	40-70	30-65	20-30	5-10
	49-63	Channery loam, channery silt loam, very channery silt loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	55-75	50-70	40-70	30-65	20-30	5-10
MdB, MdD---------- Mardin	0-6	Extremely stony loam.	GM, ML, CL, SC	A-4	15-25	65-75	60-70	50-70	35-60	25-35	5-10
	6-22	Channery silt loam, channery loam, gravelly loam.	CL, GC, SC, CL-ML	A-4	5-10	60-75	55-70	45-70	35-65	15-25	5-10
	22-49	Channery loam, channery silt loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	55-75	50-70	40-70	30-65	20-30	5-10
	49-63	Channery loam, channery silt loam, very channery silt loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	55-75	50-70	40-70	30-65	20-30	5-10
ME*: Medihemists.											
Medifibrists.											
MoA, MoB, MoC------ Morris	0-14	Channery loam---	GM, ML, CL, SM-SC	A-4, A-2	0-15	60-95	50-85	40-75	30-65	20-30	1-10
	14-60	Channery silt loam, channery loam, channery silty clay loam.	GM, SM, CL, SM-SC	A-2, A-4	0-20	60-95	45-80	40-80	25-75	15-25	NP-9
MxB, MxC---------- Morris	0-14	Extremely stony loam.	GM, ML, CL, SM-SC	A-4, A-2	5-20	60-95	55-85	40-80	30-70	20-30	1-10
	14-60	Channery loam, channery silt loam, channery silty clay loam.	GM, ML, CL, SM-SC	A-2, A-4	0-20	60-95	45-80	40-80	25-75	15-25	NP-9

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	
NcA*:											
Norwich	0-7	Channery silt loam.	GM, ML, SM	A-7, A-5	0-15	65-90	60-85	60-70	40-65	40-50	5-15
	7-12	Channery silt loam, channery loam, loam.	GM, ML, CL-ML, GM-GC	A-4	0-15	65-95	65-90	60-85	40-80	25-35	5-10
	12-60	Channery silt loam, channery loam, very channery loam.	CL, GC, CL-ML, SC	A-4	0-20	65-90	60-70	60	40-65	15-25	5-10
Chippewa	0-10	Channery silt loam.	GM, ML, SM	A-7, A-5	0-10	65-90	60-70	50-70	35-65	40-50	5-15
	10-40	Channery silt loam, channery loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	60-80	55-70	45-70	30-65	15-25	5-10
	40-60	Channery silt loam, channery loam, very channery loam.	GM, ML, CL, GC-GM	A-2, A-4	10-25	60-80	55-70	45-70	30-65	25-35	5-10
NxA*:											
Norwich	0-7	Extremely stony silt loam.	GM, ML, SM	A-7, A-5	15-25	70-90	65-85	60-80	40-75	40-50	5-15
	7-12	Channery silt loam, channery loam, loam.	GM, ML, SM, CL-ML	A-4	0-15	65-95	65-90	60-85	40-80	25-35	5-10
	12-60	Channery silt loam, channery loam, very channery loam.	CL-ML, SM-SC, GC, SC	A-4	10-20	65-90	60-70	60-70	40-65	15-25	5-10
Chippewa	0-10	Extremely stony silt loam.	GM, ML, SM	A-7, A-5	10-20	65-90	60-85	50-80	35-75	40-50	5-15
	10-40	Channery silt loam, channery loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	60-80	55-70	45-70	30-65	15-25	5-10
	40-60	Channery silt loam, channery loam, very channery loam.	GM, ML, CL, GC-GM	A-2, A-4	10-25	60-80	55-70	45-70	30-65	25-35	5-10
OaB, OaC, OaD----- Oquaga	0-34	Channery loam---	ML, GM, SM-SC	A-4, A-2	5-20	50-85	40-70	35-70	25-65	<25	NP-5
	34-40	Very channery loam, very channery silt loam, channery silt loam.	GM, ML, SM, SM-SC	A-1, A-2, A-4	10-25	35-70	25-60	20-60	15-55	<25	NP-5
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
OxB, OxD----- Oquaga	0-34	Extremely stony loam.	ML, GM, SM-SC	A-4, A-2	10-20	50-85	40-70	35-70	25-65	<25	NP-5
	34-40	Very channery silt loam, very channery loam.	GM, ML, SM, SM-SC	A-1, A-2, A-4	10-25	35-70	25-60	20-60	15-55	<25	NP-5
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
OyF*:											
Oquaga	0-34	Extremely stony loam.	ML, GM, SM-SC	A-4, A-2	10-20	50-85	40-70	35-70	25-65	<25	NP-5
	34-40	Very channery silt loam, very channery loam.	GM, ML, SM, SM-SC	A-1, A-2, A-4	10-25	35-70	25-60	20-60	15-55	<25	NP-5
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lordstown	0-4	Extremely stony loam.	ML, GM, SM	A-4	10-20	65-85	50-75	50-75	40-65	<30	NP-4
	4-18	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
	18-24	Very channery loam, channery silt loam, very channery fine sandy loam.	ML, GM, SM	A-2, A-4, A-1	5-25	40-75	30-70	25-70	15-60	<30	NP-4
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pt. Pits											
Qu. Quarries											
Re	0-18	Loam	ML, CL, SM, SC-SM	A-4, A-2	0-5	95-100	80-100	75-95	30-90	15-35	NP-10
Rexford	18-42	Gravelly sandy loam, loam, silt loam.	ML, SM, GM, CL-ML	A-2, A-4	0-10	60-95	50-90	40-85	25-70	15-35	NP-5
	42-46	Gravelly sandy loam, loam, silt loam.	ML, SM, GM, ML-CL	A-2, A-4	0-15	60-90	50-80	35-65	25-55	<30	NP
	46-60	Stratified sand to gravel.	GP-GM, SP-SM, GW, SP	A-1	0-20	40-55	30-50	10-40	4-12	<10	NP
RoD*:											
Rock outcrop.											
Arnot	0-6	Channery loam	ML, GM, SM	A-2, A-4	5-10	60-85	55-70	45-60	30-55	<30	NP-5
	6-17	Very channery silt loam, very channery loam.	GM, SM, GM-GC	A-2, A-4, A-1	10-25	30-60	25-55	20-55	15-50	<30	NP-5
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SwB, SwC, SwD	0-28	Channery sandy loam.	SM, ML, GM	A-2, A-1, A-4	0-20	60-90	50-85	30-80	15-65	---	---
Swartswood	28-60	Gravelly fine sandy loam, flaggy sandy loam, channery loam.	GM, SM, ML	A-1, A-2, A-4	5-25	50-85	35-80	20-75	10-60	<20	NP-3

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	
SxB, SxD---------- Swartswood	0-28	Extremely stony sandy loam.	SM, ML, GM	A-2, A-4, A-1	10-25	60-90	50-85	30-80	15-65	---	---
	28-60	Gravelly fine sandy loam, flaggy sandy loam, channery loam.	GM, SM, ML	A-2, A-1, A-4	5-25	50-80	35-80	20-70	10-60	<20	NP-3
VoA, VoB, VoC------ Volusia	0-9	Channery silt loam.	GM, ML, SM	A-4	5-10	70-85	65-80	55-80	40-70	30-40	5-10
	9-12	Channery silt loam, channery loam, silt loam.	CL-ML, CL, GM-GC, SC	A-4	5-10	65-90	60-85	50-85	35-75	15-25	5-10
	12-45	Channery silt loam, channery loam, silty clay loam.	GM-GC, CL, GC, CL-ML	A-4	10-25	75-90	70-85	60-85	40-80	20-30	5-10
	45-60	Very channery loam, channery loam, silt loam.	GM-GC, SC, CL, CL-ML	A-2, A-4, A-1	0-25	40-90	35-85	30-85	20-75	20-30	5-10
VxB, VxC---------- Volusia	0-9	Extremely stony silt loam.	SM, ML, GM	A-4	10-20	65-85	60-80	50-80	35-70	30-40	5-10
	9-12	Channery silt loam, channery loam, gravelly loam.	CL-ML, CL, GM-GC, SC	A-4	5-10	70-85	65-80	55-80	40-70	15-25	5-10
	12-45	Channery silt loam, channery loam.	GM-GC, CL-ML, CL, GC	A-4	10-25	75-90	70-85	60-85	40-75	20-30	5-10
	45-60	Very channery loam, channery loam, channery silt loam.	GM-GC, CL-ML, CL, SC	A-4, A-2, A-1	0-25	40-90	35-85	30-85	20-75	20-30	5-10
WeB, WeC, WeD------ Wellsboro	0-7	Channery loam---	ML, CL, SM, GM	A-2, A-4	0-15	70-90	65-85	60-80	30-60	---	---
	7-20	Loam, channery silt loam, gravelly loam.	ML, SM, GM, ML-CL	A-2, A-4	0-15	70-100	60-100	55-95	30-70	15-40	NP-10
	20-60	Loam, channery sandy loam, gravelly silt loam.	SM, GM, ML, CL	A-2, A-4	0-20	55-90	45-90	35-80	25-60	15-30	NP-10
WoB, WoD---------- Wellsboro	0-7	Extremely stony loam.	ML, CL, SM, GM	A-4, A-2	10-20	70-90	65-85	60-80	30-60	---	---
	7-20	Loam, channery silt loam, gravelly loam.	ML, SM, GM, ML-CL	A-2, A-4	0-15	70-100	60-100	55-95	30-70	15-40	NP-10
	20-60	Loam, channery silt loam, channery loam.	GM, ML, CL, SM	A-2, A-4	0-20	55-90	45-90	35-80	25-60	15-30	NP-10
WxF*: Wellsboro---------	0-7	Extremely stony loam.	ML, CL, SM, GM	A-4, A-2	10-20	70-90	65-85	60-80	30-60	---	---
	7-20	Loam, channery silt loam, gravelly loam.	ML, SM, GM, ML-CL	A-2, A-4	0-15	70-100	60-100	55-95	30-70	15-40	NP-10
	20-60	Loam, channery silt loam, channery loam.	GM, ML, CL, SM	A-2, A-4	0-20	55-90	45-90	35-80	25-60	15-30	NP-10

See footnote at end of table.

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WxF*:											
Mardin	0-6	Extremely stony loam.	GM, ML, CL, SC	A-4	15-25	65-75	60-70	50-70	35-60	25-35	5-10
	6-22	Channery silt loam, channery loam, gravelly loam.	CL, GC, SC, CL-ML	A-4	5-10	60-75	55-70	45-70	35-65	15-25	5-10
	22-49	Channery loam, channery silt loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	55-75	50-70	40-70	30-65	20-30	5-10
	49-63	Channery loam, channery silt loam, very channery silt loam.	CL, GC, SC, CL-ML	A-2, A-4	10-25	55-75	50-70	40-70	30-65	20-30	5-10
WyB, WyC, WyD, WyE-Wyoming	0-9	Gravelly sandy loam.	SM, SW-SM, GM	A-1, A-2	0-15	40-90	30-70	10-60	8-35	<30	NP-5
	9-27	Gravelly sandy loam, very gravelly sandy loam.	SM, GM, GW, SW	A-1, A-2	0-25	40-75	35-65	5-55	5-35	<30	NP-5
	27-60	Very gravelly loamy sand, very gravelly sand.	GW, GM, SM, SW	A-1	5-30	30-65	20-55	5-50	1-12	<25	NP-5

* 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 more than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that 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	
						K	T
	In	In/hr	In/in	pH			
ArB, ArC, ArD----	0-6	0.6-2.0	0.10-0.15	3.6-6.0	Low----------	0.24	2-1
Arnot	6-17	0.6-2.0	0.08-0.12	3.6-6.0	Low----------	0.17	
	17	---	---	---	----------	---	
Ba----------	0-12	0.6-2.0	0.16-0.21	4.5-6.0	Low----------	0.49	4
Barbour	12-28	2.0-6.0	0.10-0.19	4.5-6.0	Low----------	0.64	
	28-60	6.0-20	0.02-0.07	4.5-6.5	Low----------	0.17	
Bh----------	0-14	0.6-2.0	0.16-0.21	3.6-6.0	Low----------	0.49	4
Basher	14-40	0.2-2.0	0.12-0.19	3.6-6.0	Low----------	0.64	
	40-70	0.6-6.0	0.10-0.19	4.5-6.5	Low----------	0.64	
FF*:							
Fluvents.							
Fluvaquents.							
Ho----------	0-12	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5
Holly	12-42	0.2-2.0	0.17-0.21	5.1-7.3	Low----------	0.28	
	42-60	0.6-6.0	0.07-0.18	5.6-7.3	Low----------	0.28	
La----------	0-26	2.0-6.0	0.14-0.18	3.6-6.0	Low----------	0.49	4
Linden	26-48	2.0-6.0	0.14-0.18	3.6-6.0	Low----------	0.64	
	48-65	6.0-20	0.05-0.08	3.6-6.0	Low----------	0.17	
LdB, LdC, LdD, LxB, LxC--------	0-4	0.6-2.0	0.11-0.17	4.5-6.0	Low----------	0.20	3
Lordstown	4-18	0.6-2.0	0.10-0.16	4.5-6.0	Low----------	0.28	
	18-24	0.6-2.0	0.05-0.14	4.5-6.0	Low----------	0.28	
	24	---	---	---	----------	---	
MaB, MaC, MaD----	0-6	0.6-2.0	0.11-0.17	4.5-6.0	Low----------	0.20	3
Mardin	6-22	0.6-2.0	0.09-0.12	4.5-6.0	Low----------	0.28	
	22-49	<0.2	0.01-0.03	5.1-6.5	Low----------	0.28	
	49-63	<0.2	0.01-0.03	5.1-6.5	Low----------	0.28	
MdB, MdD----------	0-6	0.6-2.0	0.11-0.17	4.5-6.0	Low----------	0.20	3
Mardin	6-22	0.6-2.0	0.09-0.12	4.5-6.0	Low----------	0.28	
	22-49	<0.2	0.01-0.03	5.1-6.5	Low----------	0.28	
	49-63	<0.2	0.01-0.03	5.1-6.5	Low----------	0.28	
ME*:							
Medihemists.							
Medifibrists.							
MoA, MoB, MoC----	0-14	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.24	3-2
Morris	14-60	<0.2	0.02-0.08	5.1-6.5	Low----------	0.28	
MxB, MxC----------	0-14	0.6-2.0	0.12-0.16	4.5-6.0	Low----------	0.24	3-2
Morris	14-60	<0.2	0.02-0.08	5.1-6.5	Low----------	0.28	
NcA*, NxA*:							
Norwich---------	0-7	0.6-2.0	0.12-0.18	5.1-6.5	Low----------	0.24	3
	7-12	0.6-2.0	0.11-0.18	5.1-6.5	Low----------	0.28	
	12-60	<0.2	0.02-0.04	5.1-7.3	Low----------	0.28	
Chippewa--------	0-10	0.6-2.0	0.11-0.18	4.5-6.5	Low----------	0.24	3
	10-40	<0.2	0.01-0.02	5.1-7.3	Low----------	0.28	
	40-60	<0.2	0.01-0.02	5.6-8.4	Low----------	0.28	
OaB, OaC, OaD----	0-34	0.6-2.0	0.08-0.12	4.5-6.0	Low----------	0.24	3
Oquaga	34-40	0.6-2.0	0.04-0.12	4.5-6.0	Low----------	0.28	
	40	---	---	---	----------	---	

See footnote at end of table.

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	
						K	T
	In	In/hr	In/in	pH			
OxB, OxD--------- Oquaga	0-34 34-40 40	0.6-2.0 0.6-2.0 ---	0.08-0.12 0.04-0.12 ---	4.5-6.0 4.5-6.0 ---	Low---------- Low---------- ----------	0.24 0.28 ---	3
OyF*: Oquaga---------- 	0-34 34-40 40	0.6-2.0 0.6-2.0 ---	0.08-0.12 0.04-0.12 ---	4.5-6.0 4.5-6.0 ---	Low---------- Low---------- ----------	0.24 0.28 ---	3
Lordstown------- 	0-4 4-18 18-24 24	0.6-2.0 0.6-2.0 0.6-2.0 ---	0.11-0.17 0.10-0.16 0.05-0.14 ---	4.5-6.0 4.5-6.0 4.5-6.0 ---	Low---------- Low---------- Low---------- ----------	0.20 0.28 0.28 ---	3
Pt. Pits							
Qu. Quarries							
Re---------- Rexford	0-18 18-42 42-46 46-60	0.6-2.0 0.06-0.2 0.2-2.0 >2.0	0.14-0.18 0.04-0.08 0.04-0.08 0.03-0.06	4.5-6.0 5.1-6.5 5.1-6.5 5.1-6.5	Low---------- Low---------- Low---------- Low----------	0.24 0.28 0.28 0.17	3-2
RoD*: Rock outcrop. 							
Arnot---------- 	0-6 6-17 17	0.6-2.0 0.6-2.0 ---	0.10-0.15 0.08-0.12 ---	3.6-6.0 3.6-6.0 ---	Low---------- Low---------- ----------	0.24 0.17 ---	2-1
SwB, SwC, SwD---- Swartswood	0-28 28-60	0.6-2.0 0.06-0.6	0.08-0.12 0.08-0.12	3.6-5.5 3.6-5.5	Low---------- Low----------	0.20 0.28	3-2
SxB, SxD--------- Swartswood	0-28 28-60	0.6-2.0 0.06-0.6	0.08-0.12 0.08-0.12	3.6-5.5 3.6-5.5	Low---------- Low----------	0.17 0.28	3-2
VoA, VoB, VoC---- Volusia	0-9 9-12 12-45 45-60	0.6-2.0 0.6-2.0 <0.2 <0.2	0.11-0.17 0.09-0.16 0.01-0.02 0.01-0.02	4.5-6.5 4.5-6.5 5.1-7.3 5.6-8.4	Low---------- Low---------- Low---------- Low----------	0.24 0.28 0.28 0.28	3
VxB, VxC--------- Volusia	0-9 9-12 12-45 45-60	0.6-2.0 0.6-2.0 <0.2 <0.2	0.14-0.19 0.09-0.16 0.01-0.02 0.01-0.02	4.5-6.5 4.5-6.5 5.1-7.3 5.6-8.4	Low---------- Low---------- Low---------- Low----------	0.24 0.28 0.28 0.28	3
WeB, WeC, WeD---- Wellsboro	0-7 7-20 20-60	0.6-2.0 0.6-2.0 0.06-0.2	0.10-0.14 0.10-0.14 0.06-0.10	4.5-6.0 4.5-6.0 4.5-6.0	Low---------- Low---------- Low----------	0.20 0.28 0.28	3-2
WoB, WoD--------- Wellsboro	0-7 7-20 20-60	0.6-2.0 0.6-2.0 0.06-0.2	0.10-0.14 0.10-0.14 0.06-0.10	4.5-6.0 4.5-6.0 4.5-6.0	Low---------- Low---------- Low----------	0.28 0.28 0.28	3-2
WxF*: Wellsboro------- 	0-7 7-20 20-60	0.6-2.0 0.6-2.0 0.06-0.2	0.10-0.14 0.10-0.14 0.06-0.10	4.5-6.0 4.5-6.0 4.5-6.0	Low---------- Low---------- Low----------	0.28 0.28 0.28	3-2
Mardin---------- 	0-6 6-22 22-49 49-63	0.6-2.0 0.6-2.0 <0.2 <0.2	0.11-0.17 0.09-0.12 0.01-0.03 0.01-0.03	4.5-6.0 4.5-6.0 5.1-6.5 5.1-6.5	Low---------- Low---------- Low---------- Low----------	0.20 0.28 0.28 0.28	3

See footnote at end of table.

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	
						K	T
	In	In/hr	In/in	pH			
WyB, WyC, WyD, WyE---------- Wyoming	0-9	6.0-20	0.06-0.14	3.6-6.0	Low----------	0.17	3
	9-27	6.0-20	0.06-0.09	3.6-6.0	Low----------	---	
	27-60	6.0-20	0.02-0.04	3.6-6.0	Low----------	---	

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

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

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				
ArB, ArC, ArD----- Arnot	C/D	None--------	---	---	>4.0	Perched	Apr-May	12-20	Hard	Moderate	Low------	High.
Ba---------- Barbour	B	Occasional to rare.	Brief to long.	Dec-Apr	>60	---	---	>60	---	Moderate	Low------	Moderate.
Bh---------- Basher	B	Occasional to rare.	Brief to long.	Dec-Apr	1.5-2.0	Apparent	Jan-May	>42	Hard	Moderate	Moderate	Moderate.
FF*: Fluvents.												
Fluvaquents.												
Ho---------- Holly	B/D	Frequent----	Brief-----	Nov-May	0-0.5	Apparent	Dec-May	>42	Hard	High-----	High-----	Moderate.
La---------- Linden	B	Rare--------	Very brief to brief.	Jan-Apr	>5.0	Apparent	Nov-Mar	>60	---	Moderate	Low------	High.
LdB, LdC, LdD, LxB, LxC---------- Lordstown	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
MaB, MaC, MaD----- Mardin	C	None--------	---	---	1.0-2.0	Perched	Mar-May	>42	Hard	Moderate	Moderate	Moderate.
MdB, MdD---------- Mardin	C	None--------	---	---	1.0-2.0	Perched	Mar-May	>42	Hard	Moderate	Moderate	Moderate.
ME*: Medihemists.												
Medifibrists.												
MoA, MoB, MoC, MxB, MxC---------- Morris	C	None--------	---	---	0.5-1.5	Perched	Nov-Mar	>42	Hard	High-----	High-----	Moderate.
NcA*: Norwich----------	D	None--------	---	---	0.0-0.5	Perched	Nov-May	>42	Hard	High-----	High-----	Moderate.
Chippewa---------	D	None--------	---	---	0.0-0.5	Perched	Nov-May	>42	Hard	High-----	High-----	Moderate.
NxA*: Norwich----------	D	None--------	---	---	0.0-0.5	Perched	Nov-May	>42	Hard	High-----	High-----	Moderate.
Chippewa---------	D	None--------	---	---	0.0-0.5	Perched	Nov-May	>42	Hard	High-----	High-----	Moderate.

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				
OaB, OaC, OaD----- Oquaga	C	None--------	---	---	>6.0	---	Mar-May	20-40	Hard	Low------	Low------	Moderate.
OxB, OxD---------- Oquaga	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	Moderate.
OyF*:												
Oquaga----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	Moderate.
Lordstown--------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Pt. Pits												
Qu. Quarries												
Re---------- Rexford	C	None--------	---	---	0.0-1.5	Perched	Oct-May	>42	Hard	High-----	High-----	High.
RoD*: Rock outcrop.												
Arnot----------	C/D	None--------	---	---	1.0-1.5	Perched	Apr-May	12-20	Hard	Moderate	Low------	High.
SwB, SwC, SwD, SxB, SxD--------- Swartswood	C	None--------	---	---	2.5-4.0	Perched	Nov-Mar	>42	Hard	Moderate	Low------	High.
VoA, VoB, VoC, VxB, VxC--------- Volusia	C	None--------	---	---	0.5-1.5	Perched	Dec-May	>42	Hard	High-----	High-----	Moderate.
WeB, WeC, WeD, WoB, WoD--------- Wellsboro	C	None--------	---	---	1.0-2.0	Perched	Nov-Mar	>42	Hard	High-----	High-----	Moderate.
WxF*:												
Wellsboro--------	C	None--------	---	---	1.0-2.0	Perched	Nov-Mar	>42	Hard	High-----	High-----	Moderate.
Mardin----------	C	None--------	---	---	1.0-2.0	Perched	Mar-May	>42	Hard	Moderate	Moderate	Moderate.
WyB, WyC, WyD, WyE---------- Wyoming	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.

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

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Arnot	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Barbour	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Fluventic Dystrochrepts
Basher	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Chippewa	Fine-loamy, mixed, mesic Typic Fragiaquepts
Holly	Fine-loamy, mixed, nonacid, mesic Typic Fluvaquents
Linden	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Lordstown	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Mardin	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Morris	Coarse-loamy, mixed, mesic Aeric Fragiaquepts
Norwich	Fine-loamy, mixed, mesic Typic Fragiaquepts
Oquaga	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Rexford	Coarse-loamy, mixed, mesic Aeric Fragiaquepts
Swartswood	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Volusia	Fine-loamy, mixed, mesic Aeric Fragiaquepts
Wellsboro	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Wyoming	Loamy-skeletal, mixed, mesic Typic Dystrochrepts

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