SOIL SURVEY
MERCER COUNTY
Pennsylvania

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
THE PENNSYLVANIA STATE UNIVERSITY
Agricultural Experiment Station and Agricultural Extension Service
and
THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE
State Soil and Water Conservation Commission

Major fieldwork for this soil survey was done in the period 1961–66. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service, the Pennsylvania State University Agricultural Experiment Station and Agricultural Extension Service, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission. It is part of the technical assistance furnished to the Mercer County Soil and Water Conservation District. Financial assistance was provided by the Mercer County Board of Commissioners, and by the Department of Housing and Urban Development under the provisions of section 701 of the Housing Act of 1954, amended.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It shows the page where each soil is described and where each capability unit is described. It also shows where to find information about engineering, woodland management, and wildlife habitat management.

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

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

Foresters and others can refer to the section "Use of the Soils for Woodland" for information useful in the management of woodland.

Game managers, sportsmen, and others can find information useful in the maintenance, improvement, and development of wildlife habitat in the section "Soil Interpretations for Wildlife Habitat."

Community planners and others can read about soil properties that affect the choice of sites for buildings, community facilities, and recreational facilities in the sections "Use of the Soils in Community Development" and "Use of the Soils for Recreational Facilities."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and interpretations pertinent to highway engineering and agricultural engineering.

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

Newcomers in Mercer County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

Cover picture: Typical farmstead in Mercer County. Buildings are on Chenango gravelly loam. Field in right background is Wayland silt loam, coarse variant.

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SOIL SURVEY OF MERCER COUNTY, PENNSYLVANIA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PENNSYLVANIA STATE UNIVERSITY, AGRICULTURAL EXPERIMENT STATION AND AGRICULTURAL EXTENSION SERVICE, AND THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE STATE SOIL AND WATER CONSERVATION COMMISSION

MERCER COUNTY is in the northwestern part of Pennsylvania (fig. 1), about midway between Pittsburgh and Erie. The total area of the county is 435,840 acres. Mercer, the county seat, is about 5 miles south of the geographical center of the county. Sharon, the largest city, is in the extreme western part.

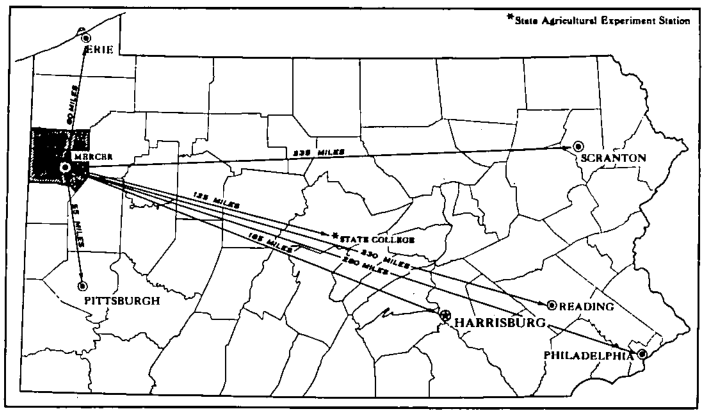

Figure 1.—Location of Mercer County in Pennsylvania.

Dairying is predominant in the agriculture of the county. The main crops grown are those used to feed dairy cattle: corn, wheat, oats, and hay. There are several herds of beef cattle. Truck farming and fruit farming also are significant enterprises. About 36 percent of the county is woodland. There are manufacturing plants in eight localities. The amount of land occupied by expanding industrial facilities and associated housing is increasing.

The Mercer County Soil and Water Conservation District was organized in 1957 (*9*).[1] The district helps its members to get technical assistance from the Soil Conservation Service of the United States Department of Agriculture and from the Pennsylvania State University.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Mercer County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. As they traveled over the county, they observed the steepness, length, and shape of slopes, the size and speed of streams, 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 that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*22*).

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Canfield and Chenango, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Canfield silt loam, 0 to 3 percent slopes, is one of several phases within the Canfield series.

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

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in

[1] Italic numbers in parentheses refer to Literature Cited, page 71.

planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of other soils that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. The one mapping unit of this kind shown on the soil map of Mercer County is an undifferentiated group.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not necessarily uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Frenchtown and Luray silt loams is an example.

In most areas surveyed there are places where the soil material has been so drastically changed by the activities of man that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Mine dumps and Urban land are land types in Mercer County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, engineers, and homeowners.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this publication shows, in color, the soil associations in Mercer County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. It is useful also in watershed management, woodland management, and community development. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The four soil associations in Mercer County are described in the following pages.

1. Ravenna-Frenchtown association

Somewhat poorly drained to poorly drained, nearly level to gently sloping soils formed in glacial till, on uplands

This is the most extensive association in the county. It is in the least sloping parts of the uplands. The landscape is one of scattered hills on an undulating plain. Many narrow streams dissect the areas.

About 60 percent of this association consists of Ravenna soils, about 20 percent of Frenchtown soils, and about 20 percent of minor soils (fig. 2). Altogether, the association makes up about 57 percent of the county.

Ravenna soils are gently sloping and somewhat poorly drained. Generally, they surround small areas of level, wetter soils. They have a slowly permeable subsoil and moderate available moisture capacity.

Frenchtown soils are nearly level and poorly drained. They have a slowly permeable subsoil and moderate available moisture capacity.

Most extensive of the minor soils are Canfield soils, which are in the more sloping areas; Luray soils, which are on flats and in depressions; and Wayland soils, coarse variant, which are on the flood plains of narrow streams.

Dairying is the most common type of farming in this association. Most areas need tile drainage to make them suitable for cultivated crops, and the more sloping areas need erosion control practices. Many small areas that are very wet or stony or steep are woodland. Some areas have reverted to grass or scrubby trees. Areas near small towns and cities are being used increasingly for building sites and for other community development purposes. A high water table and restricted permeability are soil limitations that affect many of these uses.

2. Chenango-Braceville-Halsey association

Well drained to very poorly drained, gently sloping to moderately steep soils underlain by sandy and gravelly deposits, on stream terraces and moraines

This association occurs as bands on terraces along most major streams in the county and on the moraines in the eastern and southeastern parts of the county.

About 35 percent of this association consists of Chenango soils, about 17 percent of Braceville soils, about 15 percent of Halsey soils, and about 33 percent of minor soils (fig. 3). Altogether, the association makes up about 20 percent of the county.

Chenango soils, which are at the highest elevations, are gently sloping to moderately steep and are well drained. They are underlain with sand and gravel and are somewhat droughty.

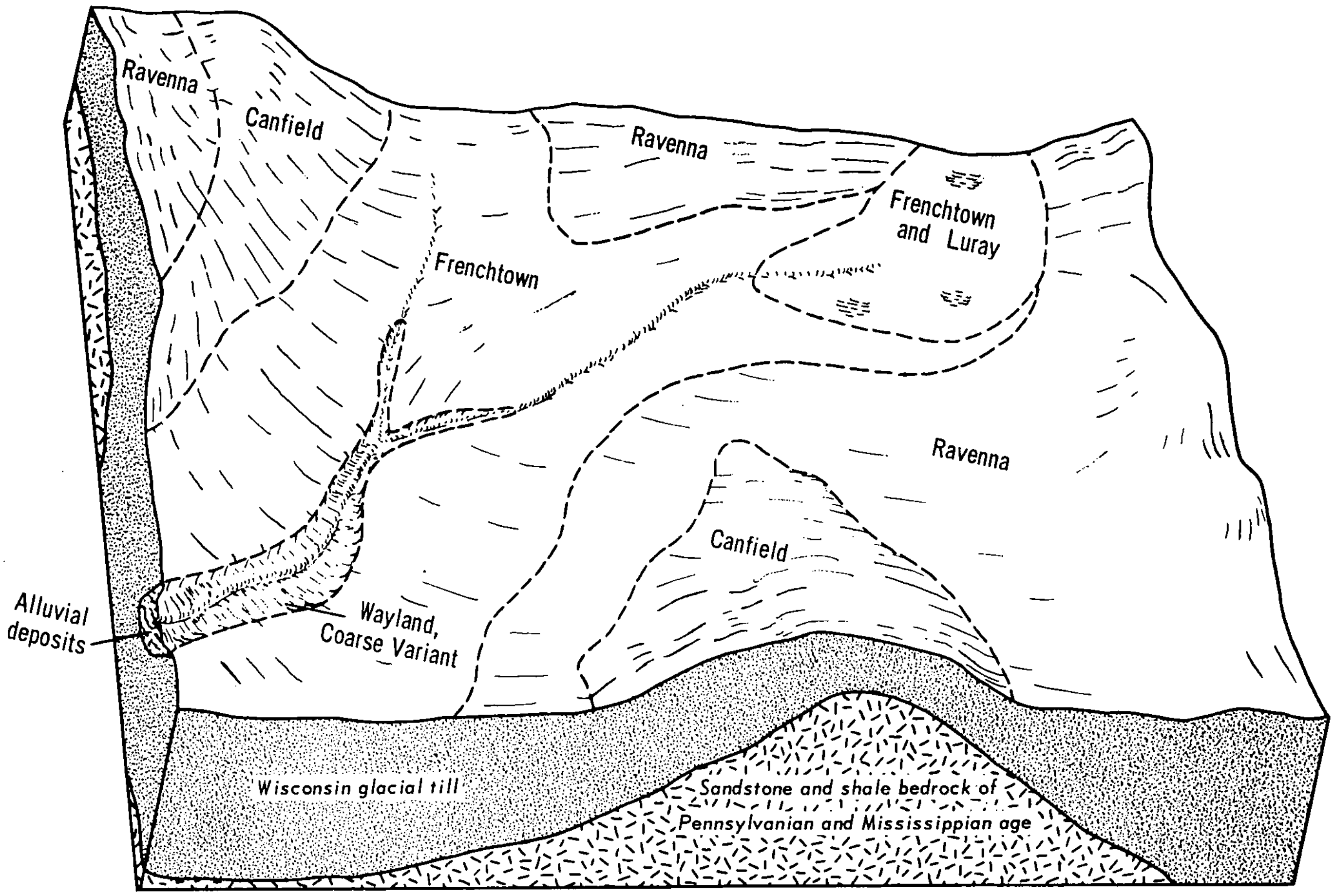

Figure 2.—Relationship of soils and underlying material in association 1.

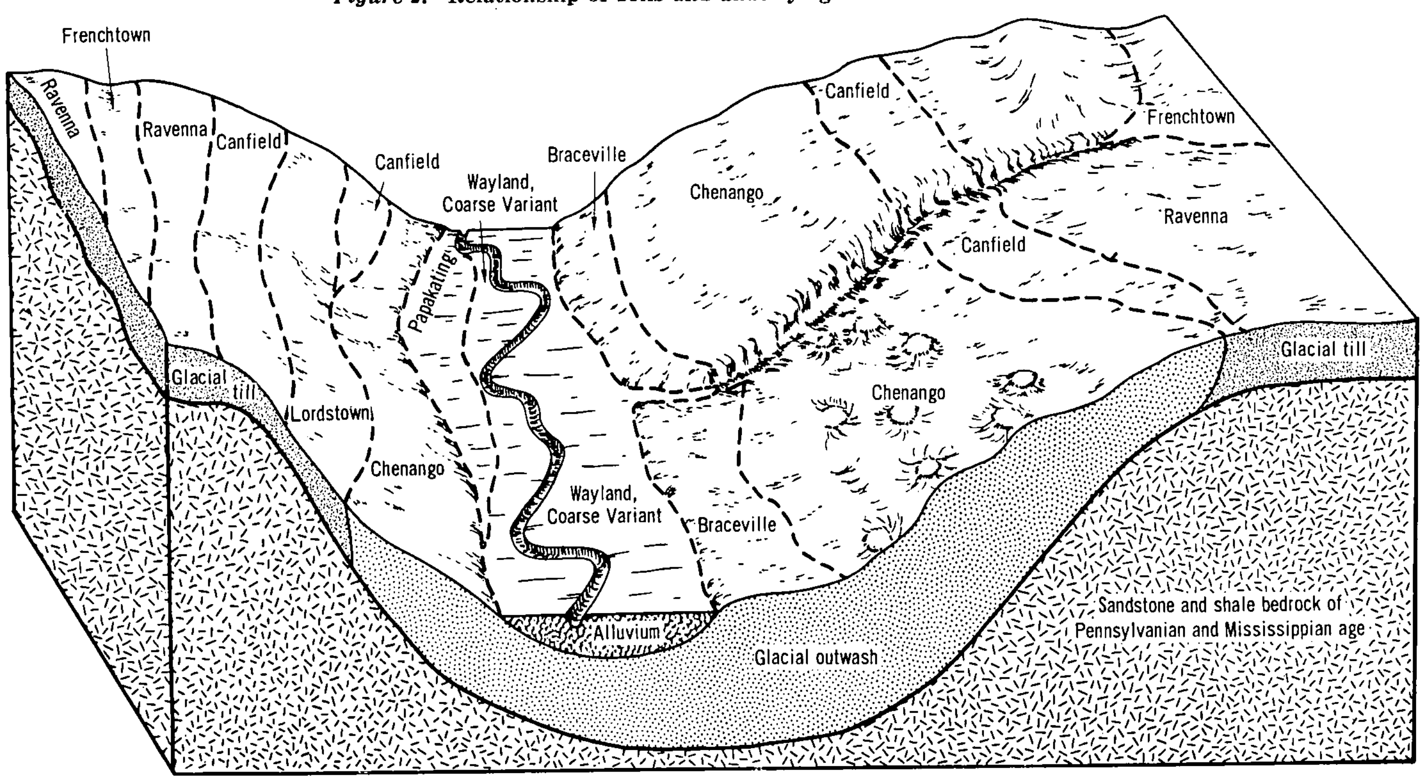

Figure 3.—Relationship of soils and underlying material in associations 2 and 3.

Braceville soils are gently sloping, moderately well drained, and moderately slowly permeable. They are wet in spring but are somewhat droughty in summer.

Halsey soils are nearly level to gently sloping, poorly drained to very poorly drained, and moderately slowly permeable. Runoff from Chenango and Braceville soils keeps them wet most of the year.

Most extensive of the minor soils are Canfield and Ravenna soils, which are on uplands; Wayland soils, coarse variant, which are on flood plains; and Red Hook soils, which are on terraces.

The soils in this association are used in a variety of ways. There are some productive general farms and, at the other extreme, there is some idle land. The rolling and complex slopes in some areas make farming and erosion control difficult. Many sites are suitable for buildings and community development. In some of the dominant soils, contamination of ground water is a hazard if onsite sewage disposal systems are used. Because of a high water table and moderately slow permeability, some of the soils have a severe limitation for use as septic tank filter fields.

3. *Canfield-Ravenna association*

Moderately well drained and somewhat poorly drained, gently sloping to moderately steep soils underlain by glacial till, on uplands

This association is dominant on the more strongly sloping parts of the uplands, near major streams. Less extensive areas occur on high knobs throughout the county and on the moraines in the eastern and southeastern parts of the county.

About 68 percent of this association consists of Canfield soils, about 15 percent of Ravenna soils, and about 17 percent of minor soils (see fig. 3). Altogether, the association makes up about 17 percent of the county.

Canfield soils are gently sloping to sloping and are moderately well drained. They have a slowly permeable subsoil and moderate available moisture capacity.

Ravenna soils are somewhat poorly drained. They are on the lower parts of slopes and in wide drainageways. They have a slowly permeable subsoil and, in spring, a high water table.

Most extensive of the minor soils are nearly level Frenchtown soils, which are on uplands; Wayland, coarse variant, soils, which are on the flood plains of small streams; Braceville soils, which are on terraces and moraines; and steep Lordstown soils, which are on uplands.

Most of the steeper parts of this association are in woodland. The less steep parts are used for general farming. Erosion control on the more sloping areas and tile drainage of wet spots are needed if crops are grown. The slowly permeable subsoil in the major soils and a seasonal high water table in some areas are limitations that affect use for buildings and for community development. The steeper areas along major streams offer possibilities for recreational developments.

4. *Wayland, coarse variant-Papakating-Red Hook association*

Very poorly drained to moderately well drained, nearly level soils underlain by alluvium, on flood plains

This association occurs as bands on the flood plains of most of the streams in the county. Most of the areas are flooded when the streams overflow and are seasonally wet.

About 67 percent of this association consists of Wayland soils, coarse variant; about 20 percent of Papakating soils; about 6 percent of Red Hook soils, flooded; and about 7 percent of minor soils. Altogether, this association makes up about 6 percent of the county.

Wayland soils are poorly drained to somewhat poorly drained. They have a seasonal high water table and a slowly permeable subsoil. They are common on the flood plains of most of the small streams and on those of Sandy Creek, the Little Shenango River, and the Shenango River.

Papakating soils are very poorly drained. They have a moderately slowly permeable subsoil and a year-round high water table. These soils are in low spots on flood plains and in backwater locations. They are usually the first soils to be flooded and the last from which the floodwater recedes.

Red Hook soils are moderately well drained. They have a seasonal high water table and a rapidly permeable substratum. These soils are most common along the larger streams but also occur as small areas along the smaller streams. Usually they are covered with floodwater for shorter periods of time than either Wayland or Papakating soils.

Most significant of the minor soils are the well-drained Chenango soils, flooded, which are on sandy natural levees along the larger streams.

Most of the soils in this association either are too wet to be cultivated regularly, or they occur as such small spots that cultivation is not practical. The wettest areas are in pasture or woodland, and only the less poorly drained spots are cultivated. Wetness and flooding are continuing hazards.

Use and Management of the Soils

This section deals with the soils of the county in relation to various uses and methods of management. It explains the system of capability classification used by the Soil Conservation Service and discusses the use of the soils for crops and pasture, for forest products, and for the elements of wildlife habitat. It provides data on engineering properties of the soils and interpretations of these properties as they affect road construction and conservation engineering, and it explains the limitations of the soils for uses related to community development and recreation.

Management of Farmland

Removing excess water, controlling erosion, and maintaining fertility and tilth are common needs in the management of farmland in Mercer County.

Many of the soils of the county have a high water table because of a fragipan that restricts downward movement of water. Such soils have a shallow root zone. Plowing and planting have to be delayed because of wetness. Most of these wet soils can be drained effectively by an underground tile system, but those that have a fine textured or moderately fine textured subsoil, which retards lateral movement of water, have to be drained by means of open ditches.

Stripcropping is one of the common practices used to control erosion. This is the practice of growing a clean-tilled crop, such as corn or soybeans, and a close-growing hay crop in alternate strips 100 to 200 feet wide. Stripcropping is most effective if the strips are level or on the contour (fig. 4). A diversion, an erosion control device that often works well with stripcropping, is a single grassed ridge, constructed on the contour, that intercepts water and carries it to a suitable outlet, thus protecting areas downslope from erosion. A field terrace consists of a series of level ridges, a foot to 2 feet high, constructed across a field. A terrace must have a suitable outlet, such as a pasture or a grassed waterway, into which excess water can drain.

Harvesting clean-tilled crops in such a way as to leave as much residue as possible on or in the soil is another practice that helps to control erosion. The residue protects the soils during the critical periods of autumn, winter, and the early part of spring. A cover crop of small grain or vetch seeded with a row crop is another means of protecting the soil during these critical periods.

The use of lime and fertilizer is common, because most of the soils are acid and most are deficient in some of the plant nutrients. Results are best if applications are based on soil tests and crop needs.

The cropping systems commonly followed are those typical of dairy farming. They can be described in terms of high-intensity, medium-intensity, and low-intensity rotations. A high-intensity rotation usually supplies enough organic matter and provides adequate protection against erosion if the erosion hazard is not more than moderate. An example of a high-intensity rotation is 1 year of corn, 1 year of small grain, and 2 years of hay. A medium-intensity rotation usually supplies enough organic matter and provides adequate protection against erosion if the erosion hazard is moderately severe. An example of a medium-intensity rotation is 1 year of corn, 1 year of small grain, and 3 years of hay. A low-intensity rotation that keeps the surface covered most of the time is needed if the erosion hazard is severe. An example of a low-intensity rotation is 1 year of corn, 1 year of small grain, and 4 or 5 years of hay.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment.

***Figure 4.*—Contour strips of corn and hay on Canfield silt loam.**

The grouping does not take into account major and generally expensive land-forming that would change slope, depth, or other characteristics of the soils; it does not take into consideration possible but unlikely major reclamation projects; and it does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

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, 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, require special conservation practices, or both.

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None of the soils of this county are class V.)

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

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

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (None of the soils of this county are in class VIII.)

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 can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIw-4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within a subclass.

In the following pages, the capability units in this county are described and suggestions for the use and management of the soils are given. The names of the soil series represented are mentioned in the description of each capability unit, but the listing of the series name does not necessarily indicate that all the soils of a series are in the same capability unit. The capability classification of any given soil can be learned by referring to the "Guide to Mapping Units."

CAPABILITY UNIT I-1

Unadilla silt loam is the only soil in this unit. This is a well-drained, nearly level soil that has a substratum of sandy loam stratified with layers of sand and gravel. The available moisture capacity is high, and permeability is moderately rapid.

This soil is suited to all the common crops.

Growing cover crops, utilizing crop residue, and including hay in crop rotations are ways of maintaining the organic-matter content and preserving tilth.

CAPABILITY UNIT IIe-1

This unit consists of well-drained, gently sloping Chenango soils. These soils have a surface layer of silt loam or gravelly loam over a substratum of stratified sand and gravel. The available moisture capacity is low, and permeability is rapid. The natural fertility is low. The erosion hazard is moderate.

These soils are suited to cultivation if protected from erosion.

Contour stripcropping and diversions help to control erosion. A high-intensity crop rotation provides organic matter and preserves tilth if all crop residue is utilized, tillage is kept to a minimum, and cover crops are grown as needed.

CAPABILITY UNIT IIe-2

This unit consists of moderately well drained, gently sloping Braceville and Canfield soils. These soils are underlain by a fragipan that restricts the movement of water. The erosion hazard is moderate, and wetness is a minor limitation. The available moisture capacity is moderate.

These soils are suited to cultivation if runoff is controlled.

Contour stripcropping and diversions help control erosion. A high-intensity crop rotation provides organic matter and preserves tilth if all crop residue is utilized, tillage is kept to a minimum, and cover crops are grown as needed. Tile drainage of wet spots facilitates management.

CAPABILITY UNIT IIw-1

This unit consists of moderately well drained, nearly level Braceville and Canfield soils. These soils are underlain by a fragipan that restricts the movement of water. Wetness is a moderate limitation, and the erosion hazard is slight. The available moisture capacity is moderate.

These soils are suited to cultivation.

Tile drainage of wet spots facilitates management. Growing cover crops, utilizing crop residue, keeping tillage to a minimum, and using a high-intensity crop rotation are ways of maintaining organic-matter content and preserving tilth.

CAPABILITY UNIT IIw-2

This unit consists of poorly drained to somewhat poorly drained, nearly level Red Hook soils. The uppermost part of these soils is silt loam, and the substratum is gravelly sandy loam. Flooding from overflowing streams is a hazard, but flooding usually occurs late in winter or in spring and so does little damage to crops. The water table is usually high in spring. Wetness is the main limitation.

Drainage of wet spots by open drainage ditches facilitates management. Growing cover crops, utilizing crop residue, keeping tillage to a minimum, and using a high-intensity crop rotation are ways of maintaining the organic-matter content and preserving tilth.

CAPABILITY UNIT IIw-3

Ravenna silt loam, 0 to 3 percent slopes, is the only soil in this unit. This is a somewhat poorly drained soil. It has a seasonal high water table of long duration. A fragipan restricts internal movement of water. Wetness is a serious limitation, but the hazard of erosion is slight.

This soil is suited to general farm crops.

Tile drainage facilitates management. A medium-intensity crop rotation maintains organic-matter content and preserves tilth.

CAPABILITY UNIT IIs-1

This unit consists of well-drained, nearly level and gently sloping Chenango soils. These soils have a surface layer of fine sandy loam, gravelly loam, or silt loam, and a substratum of stratified sand and gravel. The available moisture capacity is low. The natural fertility is low.

These soils are suited to all the common crops.

Growing cover crops, utilizing crop residues, keeping tillage to a minimum, and using a high-intensity crop rotation are ways of increasing the organic-matter content, improving tilth, and conserving moisture.

CAPABILITY UNIT IIIe-1

This unit consists of well-drained, sloping Chenango soils. These soils have a gravelly loam or silt loam surface layer and a substratum of stratified sand and gravel. The erosion hazard is moderately severe. The available moisture capacity is low. The natural fertility is low.

These soils are suited to many crops if protected from erosion (fig. 5).

Stripcropping and diversions can be used to control runoff. Growing cover crops, utilizing crop residue, keeping tillage to a minimum, and using a medium-intensity crop rotation are ways of increasing the organic-matter content, improving tilth, conserving moisture, and controlling erosion.

CAPABILITY UNIT IIIe-2

This unit consists of moderately well drained, sloping Braceville and Canfield soils. These soils have a surface layer of silt loam or gravelly loam and a substratum of gravelly loam and gravelly sandy loam. They also have a fragipan that restricts the movement of water. The erosion hazard is moderately severe, but the wetness limitation is moderate. The water table is seasonally high.

These soils are suited to most general crops if protected from erosion.

Stripcropping and diversions help to control erosion and reduce seasonal wetness. A medium-intensity crop rotation that includes cover crops helps to preserve tilth. All crop residue should be utilized, and tillage kept to a minimum. Tile drainage is generally impractical.

CAPABILITY UNIT IIIe-3

Lordstown silt loam, 5 to 15 percent slopes, is the only soil in this unit. This is a well-drained, sloping soil that has a substratum of channery loam and is moderately deep to sandstone bedrock. The root zone is restricted, and the erosion hazard is moderately severe. The available moisture capacity is low to moderate.

Stripcropping and a medium-intensity crop rotation lessen the erosion hazard. The bedrock may hinder construction of diversions. Growing cover crops and leaving crop residues on the surface are ways of supplying organic matter and conserving moisture.

CAPABILITY UNIT IIIe-4

Ravenna silt loam, 3 to 8 percent slopes, moderately eroded, is the only soil in this unit. This is a somewhat poorly drained soil underlain by a fragipan that restricts the movement of water. The erosion hazard and the wetness limitation are moderate. The water table is seasonally high for a large part of each year.

Stripcropping and diversions lessen the erosion hazard and the seasonal wetness. A medium-intensity crop rotation and cover crops supply organic matter and help preserve tilth. All crop residue should be utilized, and tillage kept to a minimum.

CAPABILITY UNIT IIIw-1

Frenchtown silt loam, 0 to 3 percent slopes, is the only soil in this unit. This is a poorly drained, nearly level soil underlain by a fragipan that restricts the

Figure 5.—**Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded. Hay is ready for baling. This soil is in capability unit IIIe–1.**

movement of water. Wetness is a serious limitation. The water table is high for a large part of each year.

If drained, this soil can be used for general crops, but crops that tolerate wetness are most successful.

Underground tile drainage is generally effective. A medium-intensity crop rotation provides organic matter and preserves tilth.

CAPABILITY UNIT IIIw–2

Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded, is the only soil in this unit. This is a somewhat poorly drained soil underlain by a fragipan that restricts the movement of water. It has a seasonal high water table of long duration. Wetness is a serious limitation, but the erosion hazard is moderate.

Tile drainage effectively removes the excess water. Stripcropping and diversions lessen the erosion hazard. A medium-intensity crop rotation supplies organic matter and preserves tilth if all crop residue is utilized, tillage is kept to a minimum, and cover crops are grown as needed.

CAPABILITY UNIT IIIw–3

Caneadea silt loam is the only soil in this unit. This is a somewhat poorly drained, gently sloping soil that has a subsoil and substratum of sticky silty clay loam. The moderately fine textured subsoil restricts the movement of water. Wetness is a serious limitation. The available moisture capacity is high. The natural fertility is high.

Drainage makes it possible to grow general crops, but crops that tolerate wetness are more suitable.

Land shaping and open ditches are effective ways of improving surface drainage. A medium-intensity crop rotation provides organic matter and preserves tilth if all crop residue is utilized, tillage is kept to a minimum, and cover crops are grown as needed.

CAPABILITY UNIT IIIw–4

Wayland silt loam, coarse variant, is the only soil in this unit. This is a somewhat poorly drained, nearly level soil that is flooded each year by overflowing streams. The subsoil and the substratum consist of stratified sand, gravel, silt, and clay. Flooding and wetness are major limitations. Floods usually take place late in winter or in spring. The water table is high for a large part of each year.

Open drainage ditches and land shaping are needed for removal of surface water, and in some places tile drainage is needed. Diversions, dikes, and gated outlets may be needed for control of flooding. General crops that tolerate wetness, grown in a medium-intensity rotation, supply the residue needed to preserve tilth.

CAPABILITY UNIT IIIw-5

This unit consists of very poorly drained to somewhat poorly drained, nearly level to gently sloping Halsey and Red Hook soils. These soils have a silt loam surface layer over a subsoil and substratum of gravelly loam or gravelly sandy loam. The soils have a moderately slowly permeable subsoil. Extreme wetness and a water table that is high for a large part of each year are major limitations. The available moisture capacity is moderate to high. The fertility is moderate. Some areas of Halsey soils are in depressions, and some of the depressions do not have outlets.

Drainage makes it possible for general crops to grow, but crops that tolerate wetness are most suitable.

Drainage by open ditches or underground tile is effective if outlets can be found. Stripcropping and diversions are needed to help control erosion on the gently sloping soils. A medium-intensity crop rotation supplies organic matter and preserves tilth if all crop residue is utilized, tillage is kept to a minimum, and cover crops are grown as needed.

CAPABILITY UNIT IIIw-6

Frenchtown and Luray silt loams, an undifferentiated group, makes up this unit. This is a group of very poorly drained to poorly drained, nearly level soils that have a subsoil of silt loam to silty clay loam. The Frenchtown soils have a slowly permeable fragipan in the lower part of the subsoil. Wetness is a serious limitation. Both soils have a seasonal high water table of long duration. The available moisture capacity is moderate. The fertility is moderate. Drainage outlets are scarce.

If drained by open ditches or underground tile, these soils can be used for general crops. Crops that tolerate wetness are the most suitable.

A medium-intensity crop rotation provides organic matter and helps to preserve tilth.

CAPABILITY UNIT IVe-1

This unit consists of well drained, moderately steep Chenango soils. These soils have a surface layer of silt loam or gravelly loam and a subsoil of gravelly loam or gravelly sandy loam. The erosion hazard is severe. These soils are open, friable, and rapidly permeable. The available moisture capacity is low.

Stripcropping and diversions help to control erosion. A low-intensity crop rotation provides the residues needed to keep the soil in good condition, if tillage is kept to a minimum.

CAPABILITY UNIT IVe-2

This unit consists of well drained to moderately well drained, sloping to moderately steep Chenango and Canfield soils. These soils have a surface layer of silt loam to gravelly loam and a subsoil of gravelly loam to gravelly sandy loam. The Chenango soils have an open, friable subsoil and are rapidly permeable. The Canfield soils have a slowly permeable fragipan in the lower part of the subsoil. For both, the erosion hazard is severe but the wetness limitation is moderate.

The Canfield soils can be protected against erosion by means of stripcropping or diversions. The topography of the Chenango soils does not lend itself to these practices. A low-intensity crop rotation provides organic matter, preserves tilth, and helps to control erosion, if all crop residue is utilized and tillage is kept to a minimum. Drainage of wet spots facilitates management.

CAPABILITY UNIT IVe-3

Lordstown silt loam, 15 to 25 percent slopes, is the only soil in this unit. This is a well drained, moderately steep soil that has a subsoil of silt loam or channery silt loam and is moderately deep over sandstone bedrock. The bedrock generally restricts the root zone, and the erosion hazard is severe in cultivated areas. The available moisture capacity is low to moderate.

A low-intensity rotation that provides protection most of the time helps to control erosion. Stripcropping and diversions are also beneficial. The bedrock may hinder construction of diversions. Crop residues provide the organic matter needed to keep the soil in good condition.

CAPABILITY UNIT IVe-4

Ravenna silt loam, 8 to 15 percent slopes, moderately eroded, is the only soil in this unit. This is a somewhat poorly drained soil that has a subsoil of silt loam and a slowly permeable fragipan in the lower part of the subsoil. The wetness limitation and the erosion hazard are severe. The water table is high for a large part of the year.

Stripcropping and diversions help to control erosion and wetness. The wetness limitation can be reduced by drainage. A low-intensity crop rotation provides cover for protection against erosion and the crop residues needed to maintain tilth. Tillage should be kept to a minimum.

CAPABILITY UNIT IVw-1

Papakating silt loam is the only soil in this unit. This is a frequently flooded, very poorly drained, nearly level soil that has a subsoil of clay loam and a substratum of sandy loam. Annual flooding and a seasonal high water table of very long duration are severe limitations. Flooding usually occurs in winter or spring.

If drained, this soil is suited to general crops that tolerate wetness.

Surface drainage can be improved by land-forming and, if outlets are available, by means of open ditches. A low-intensity crop rotation provides the residue needed to maintain tilth.

CAPABILITY UNIT VIe-1

This unit consists of well drained to moderately well drained, moderately steep Chenango and Canfield soils. The Chenango soils have a surface layer of gravelly loam and a subsoil of gravelly loam or gravelly sandy loam. These soils are rapidly permeable. The Canfield soils have a surface layer of silt loam and a subsoil of dense, slowly permeable gravelly loam. They have a seasonal high water table of brief duration. For both soils, the erosion hazard is severe.

The erosion hazard is so severe that cultivation is not advisable. Continuous hay or pasture affords protection against erosion.

CAPABILITY UNIT VIe-2

This unit consists of somewhat poorly drained, sloping to moderately steep Ravenna soils. These soils have a slowly permeable fragipan in the lower part of the subsoil. The erosion hazard is very severe. The water table is seasonally high for a large part of the year.

The erosion hazard is so severe that cultivation is not advisable. Continuous hay or pasture affords cover and protection. Plants that tolerate wetness are most successful.

CAPABILITY UNIT VIs-1

Ravenna very stony silt loam, 0 to 15 percent slopes, is the only soil in this unit. This soil has a dense lower subsoil and a seasonally high water table of long duration. Stones 1 to 3 feet in diameter cover up to 5 percent of the surface layer. There are also a few boulders more than 3 feet in diameter. The stones generally prohibit the use of farm machinery.

This soil is suited to pasture crops that tolerate wetness. Other uses are woodland and wildlife habitat. Drainage is very difficult because of the stones.

CAPABILITY UNIT VIIs-1

This unit consists of sloping to very steep Lordstown soils. Stones 1 to 3 feet in diameter and some boulders

TABLE 1.—*Estimated productivity*

[In columns A are productivity ratings for normal management, and in columns B are ratings for improved management.

Soils	Corn				Oats	
	Grain (100=95 bu. per acre)		Silage (100=19 tons per acre)		(100=55 bu. per acre)	
	A	B	A	B	A	B
Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded	55	110	55	110	60	120
Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded	50	100	50	100	55	115
Braceville silt loam, 0 to 3 percent slopes	55	105	55	105	60	110
Braceville silt loam, 3 to 8 percent slopes, moderately eroded	55	110	55	110	60	120
Braceville silt loam, 8 to 15 percent slopes, moderately eroded	50	100	50	100	55	115
Caneadea silt loam	65	85	65	85	70	125
Canfield silt loam, 0 to 3 percent slopes	50	95	50	95	55	105
Canfield silt loam, 3 to 8 percent slopes, moderately eroded	50	100	50	100	55	100
Canfield silt loam, 8 to 15 percent slopes, moderately eroded	45	90	45	90	50	100
Canfield silt loam, 8 to 15 percent slopes, severely eroded	40	85	40	85	45	90
Canfield silt loam, 15 to 25 percent slopes, moderately eroded	40	85	40	85	45	90
Canfield silt loam, 25 to 35 percent slopes						
Chenango fine sandy loam, flooded	85	125	85	125	80	130
Chenango fine sandy loam, low terrace	85	125	85	125	80	130
Chenango gravelly loam, 0 to 3 percent slopes	60	120	60	120	70	115
Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded	55	115	55	115	65	125
Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded	50	110	50	110	60	120
Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded	40	80	40	80	50	100
Chenango gravelly loam, moderately eroded, rolling	45	90	45	90	55	115
Chenango gravelly loam, moderately eroded, hilly						
Chenango silt loam, 0 to 3 percent slopes	65	125	65	125	70	130
Chenango silt loam, 3 to 8 percent slopes, moderately eroded	60	120	60	120	65	125
Chenango silt loam, 8 to 15 percent slopes, moderately eroded	55	115	55	115	60	120
Chenango silt loam, 15 to 25 percent slopes, moderately eroded	50	105	50	105	55	115
Frenchtown silt loam, 0 to 3 percent slopes		65		65		75
Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded		80		80		90
Frenchtown very stony silt loam, 0 to 8 percent slopes						
Frenchtown and Luray silt loams		65		65		
Halsey silt loam		65		65		
Lordstown silt loam, 5 to 15 percent slopes	45	75	45	75	50	100
Lordstown silt loam, 15 to 25 percent slopes	40	65	40	65	50	100
Lordstown very stony silt loam, 8 to 25 percent slopes						
Lordstown very stony silt loam, 25 to 45 percent slopes						
Mine dumps						
Muck and peat						
Papakating silt loam		65		65		
Ravenna silt loam, 0 to 3 percent slopes	40	80	40	80	45	85
Ravenna silt loam, 3 to 8 percent slopes, moderately eroded	45	85	45	85	50	95
Ravenna silt loam, 8 to 15 percent slopes, moderately eroded	40	80	40	80	45	90
Ravenna silt loam, 8 to 15 percent slopes, severely eroded						
Ravenna silt loam, 15 to 25 percent slopes, moderately eroded						
Ravenna very stony silt loam, 0 to 15 percent slopes						
Red Hook silt loam, flooded	50	95	50	95	55	105
Red Hook silt loam, low terrace	50	95	50	95	55	105
Red Hook silt loam, 3 to 8 percent slopes, moderately eroded		80		80		90
Strip mine spoil, gently sloping						
Strip mine spoil, moderately steep						
Strip mine spoil, steep						
Unadilla silt loam	100	135	100	135	100	130
Urban land						
Wayland silt loam, coarse variant		80		80		105

more than 3 feet in diameter cover as much as 5 percent of the surface. These stones and the slope prohibit machine cultivation. The erosion hazard is very severe.

These soils are suitable for recreation, wildlife habitat, and timber.

CAPABILITY UNIT VIIs-2

Frenchtown very stony silt loam, 0 to 8 percent slopes, is the only soil in this unit. Up to 5 percent of the surface of this soil is covered with stones 1 to 3 feet in diameter. The stones hinder drainage and prohibit machine cultivation.

This soil is suitable for recreation, wildlife habitat, and timber.

Productivity ratings

Table 1 shows estimates of the relative productivity of the soils for the field crops and forage crops commonly grown in Mercer County, and also the relative suitability of the soils for fruit trees. The ratings are based on interviews with farmers and on observations of representatives of the Soil Conservation Service and the Extension Service.

ratings for field and forage crops

The absence of data indicates that the soil is not suited to the specified crop at the specified level of management]

Wheat		Potatoes		Hay				Pasture				Suitability for orchards
(100=30 bu. per acre)		(100=490 bu. per acre)		Alfalfa-grass mixture (100=3.0 tons per acre)		Grass-legume mixture (100=2.5 tons per acre)		Bluegrass (100=100 cow-acre-days)		Tall grass (100=100 cow-acre-days)		
A	B	A	B	A	B	A	B	A	B	A	B	
70	135	65	110	70	125	70	125	70	145	105	210	Fair.
65	125	60	95	60	115	70	120	70	140	90	195	Fair.
70	130	65	105	65	125	70	120	70	140	100	210	Fair.
70	135	65	115	70	130	70	125	70	145	105	220	Fair.
65	125	60	100	60	120	70	120	70	137	90	205	Fair.
- - -	- - -	- - -	- - -	- - -	- - -	80	130	80	150	100	185	Poor.
60	115	50	90	45	100	70	115	70	135	90	170	Fair.
60	120	55	100	50	105	70	120	70	140	90	175	Fair.
55	110	50	90	45	105	70	115	70	135	90	170	Fair.
50	105	- - -	- - -	40	100	60	110	60	130	75	170	Fair.
50	105	- - -	- - -	40	95	65	110	65	130	80	160	Fair.
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	50	110	- - -	- - -	
90	140	85	135	90	145	85	130	85	150	135	245	Good.
90	140	85	135	90	145	85	130	85	150	135	245	Good.
80	120	75	120	80	135	70	130	70	150	120	230	Good.
75	135	70	115	75	135	65	125	65	140	110	230	Good.
70	130	65	110	70	130	60	115	60	135	105	220	Good.
60	100	- - -	- - -	60	120	55	110	55	130	90	205	Good.
65	125	- - -	- - -	65	125	60	115	60	135	100	210	Good.
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	50	110	- - -	- - -	
80	140	75	125	80	145	70	130	70	150	120	245	Good.
75	135	70	120	75	140	65	125	65	145	110	240	Good.
70	130	65	115	70	135	60	115	60	135	105	230	Good.
65	125	- - -	- - -	65	130	60	115	60	135	100	220	Good.
- - -	80	- - -	- - -	- - -	- - -	40	70	40	80	50	95	
- - -	95	- - -	- - -	- - -	- - -	45	90	45	105	55	125	
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	40	- - -	- - -	- - -	
- - -	- - -	- - -	- - -	- - -	- - -	40	70	40	80	50	95	
- - -	- - -	- - -	- - -	- - -	- - -	30	60	30	70	40	85	
55	105	55	85	65	115	85	100	85	115	105	195	Fair.
50	95	- - -	- - -	60	105	80	100	80	115	100	175	Fair.
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	50	- - -	- - -	- - -	
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- - -	- - -	- - -	- - -	- - -	- - -	50	65	50	70	60	90	
- - -	- - -	- - -	- - -	- - -	- - -	50	95	50	110	60	135	Poor.
55	100	- - -	- - -	40	85	55	105	55	125	70	155	Poor.
50	95	- - -	- - -	40	85	55	105	55	125	70	155	Poor.
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	50	115	- - -	- - -	
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	50	115	- - -	- - -	
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	50	- - -	- - -	- - -	
60	115	50	90	45	100	70	115	70	130	85	170	Fair.
60	115	50	90	45	100	70	115	70	130	85	170	Fair.
- - -	- - -	- - -	- - -	- - -	- - -	60	110	60	130	75	160	Poor.
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	
100	140	100	135	100	145	100	130	100	150	150	245	Good.
- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	
- - -	115	- - -	- - -	- - -	- - -	95	115	95	135	120	165	

Each productivity rating indicates the estimated productivity of the soil for a particular crop in relation to a standard index of 100. The standard index represents the average acre yield under normal management on the most productive soils in the county during an average growing season. The yield represented by the standard index is given at the head of the column for each crop.

Productivity ratings are given for two levels of management. Those in columns A represent yields to be expected under normal management; those in columns B, yields to be expected under improved management.

Under normal management—

1. Erosion control practices are applied in a haphazard manner or not at all.
2. The cropping system does not regularly include soil-improving crops.
3. Fertilization and liming are not based on soil tests or crop needs.
4. Drainage is not practiced, or the drainage system in incomplete.

Under improved management—

1. Erosion control practices are applied regularly.
2. A cropping system that restores fertility is used regularly.
3. Drainage systems are complete and properly installed.
4. Lime and fertilizer requirements are determined by soil tests and crop needs.

Use of the Soils for Woodland [2]

Mercer County once had a dense cover of trees, but clearing land for farming and cutting timber for commercial purposes have eliminated the virgin stands. At present, 36 percent of the county is commercial woodland, all of it second or third growth (*21*). Approximately 54 percent of the commercial forest consists of sawtimber and about 8 percent of poletimber (*21*).

The principal forest types (*18*) in the existing stands and the approximate percentage of total woodland in the county (*21*) are as follows:

	Pct.
White pine-hemlock	11

Fifty percent or more of the stand is eastern

[2] By V. C. Miles, woodland specialist, Soil Conservation Service.

Table 2.—*Interpretations*

Series and map symbols	Site quality		Species suitability	
	Sugar maple, black cherry, ash, oak	Yellow-poplar	To favor in existing stands	For planting or seeding
Braceville: BrB2, BrC2, BvA, BvB2, BvC2.	Very good	Very good	Red oak, yellow-poplar, ash, black cherry.	White pine, yellow-poplar, black cherry, larch, Norway spruce.
Caneadea: Ca	Very good	Very good	Red oak, yellow-poplar, ash, sugar maple, black cherry.	White pine, yellow-poplar, larch, Norway spruce.
Canfield:				
CdA, CdB2, CdC2, CdC3	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, black cherry.	Yellow-poplar, white pine, larch, Norway spruce, black cherry.
CdD2, CdE	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, black cherry.	Yellow-poplar, white pine, larch, Norway spruce, black cherry.
Chenango:				
Cf, Ch, ClA, ClB2, ClC2	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, white pine, black cherry.	Yellow-poplar, white pine, larch, black cherry, Norway spruce.
ClD2	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, white pine, black cherry.	Yellow-poplar, white pine, larch, black cherry, Norway spruce.
CnC2	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, white pine, black cherry.	Yellow-poplar, white pine, larch, black cherry, Norway spruce.

white pine, red pine, or hemlock, singly or in combination.

	Pct.
Oak-hickory	29
Fifty percent or more of the stand is upland oaks or hickory, singly or in combination. The yellow-poplar-oak forest type is included.	
Elm-ash-red maple	32
Fifty percent or more of the stand is elm, ash, or red maple, singly or in combination.	
Maple-beech-birch	16
Fifty percent or more of the stand is sugar maple, beech, or yellow birch, singly or in combination. The black cherry forest type is included.	
Aspen-birch	12
Fifty percent or more of the stand is aspen, paper birch, gray birch, or pin cherry, singly or in combination.	

In general, the soils in this county are capable of supporting a good growth of red oak, yellow-poplar, ash, and white pine. Presently, many stands are made up predominantly of red maple, beech, elm, yellow birch, and scarlet oak.

Seventy-five percent of the existing woodland in the county is made up of soils that are excellent, very good, or good as woodland sites. Three percent is made up of soils that are fair as woodland sites, and 22 percent of soils that are poor.

Returns from excellent to good sites generally justify spending money on management, but the potential yield, the species, the quality of the stand, and the potential market have to be considered. The species and the number of poor-quality stems make the expenditure inadvisable for some areas, and converting such areas to their potential capacity may not be economically justifiable.

Returns from fair sites are the most difficult to estimate. To determine what intensity of management is justifiable, it is necessary to evaluate the stands thoroughly, both as to species and as to quality, and to investigate the potential market.

Returns from poor sites generally do not justify any expenditure for woodland management. Nevertheless, woodland is probably the best use for such sites, because they cannot be used profitably as cropland or grassland.

Table 2 rates the soils of the county as to site quality, species suitability, and hazards.

for woodland management

Hazards				
Erosion	Equipment limitations	Seedling mortality	Plant competition	Windthrow
Slight	Slight	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Moderate	Moderate	Severe for conifers; moderate for hardwoods	Slight.
Slight	Slight	Slight	Severe for conifers; moderate for hardwoods	Slight.
Moderate	Moderate	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Slight	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Moderate	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Slight	Slight	Severe for conifers; moderate for hardwoods	Slight.

TABLE 2.—*Interpretations for*

Series and map symbols	Site quality		Species suitability	
	Sugar maple, black cherry, ash, oak	Yellow-poplar	To favor in existing stands	For planting or seeding
Chenango—Continued				
CnD2	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, white pine, black cherry.	Yellow-poplar, white pine, larch, black cherry, Norway spruce.
CoA, CoB2, CoC2	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, white pine, black cherry.	Yellow-poplar, white pine, larch, black cherry, Norway spruce.
CoD2	Excellent	Excellent	Red oak, yellow-poplar, sugar maple, ash, white pine, black cherry.	Yellow-poplar, white pine, larch, black cherry, Norway spruce.
Frenchtown: FeA, FeB2, FhB	Excellent	Excellent	Ash, sugar maple, red oak, yellow-poplar, black cherry.	White pine, yellow-poplar, larch, Norway spruce.
Frenchtown and Luray: Fr	Excellent for pin oak; fair for all others.		Pin oak, red maple	White pine, white spruce
Halsey: Ha	Excellent for pin oak; poor for all others.		Pin oak, red maple, sycamore.	White pine, white spruce
Lordstown:				
LoC	Good		Sugar maple, ash, red oak, hemlock.	White pine, red pine, larch, Norway spruce.
LoD, LrD, LrE	Good		Sugar maple, ash, red oak, hemlock.	White pine, red pine, larch, Norway spruce.
Mine dumps: Md For revegetation purposes, consult "A Guide for Revegetating Bituminous Strip Mine Spoil in Pennsylvania." (*11*)				
Muck and peat: Mp Not suited for growing commercial tree crops.				
Papakating: Pa	Excellent for pin oak; poor for all others.		Pin oak, red maple, ash	White pine, white spruce
Ravenna:				
RaA, RaB2, RaC2, RaC3	Very good	Very good	Red oak, yellow-poplar, sugar maple, ash, black cherry.	Yellow-poplar, white pine, larch, Norway spruce.
RaD2	Very good	Very good	Red oak, yellow-poplar, sugar maple, ash, black cherry.	Yellow-poplar, white pine, larch, Norway spruce.
ReC	Very good	Very good	Red oak, yellow-poplar, sugar maple, ash, black cherry.	Yellow-poplar, white pine, larch, Norway spruce.
Red Hook: Rf, Rh, RoB2	Good		White pine, hemlock, sugar maple, ash.	White pine, larch, white spruce.

woodland management—Continued

Hazards				
Erosion	Equipment limitations	Seedling mortality	Plant competition	Wind-throw
Slight	Moderate	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Slight	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Moderate	Slight	Severe for conifers; moderate for hardwoods	Slight.
Slight	Severe	Severe	Severe for conifers; severe for hardwoods	Moderate.
Slight	Severe	Severe	Severe for conifers; severe for hardwoods	Severe.
Slight	Severe	Severe	Severe for conifers; severe for hardwoods	Severe.
Slight	Slight	Slight	Moderate for conifers; slight for hardwoods	Slight.
Slight	Moderate	Slight	Moderate for conifers; slight for hardwoods	Slight.
Slight	Severe	Severe	Severe for conifers; severe for hardwoods	Severe.
Slight	Moderate	Slight	Severe for conifers; severe for hardwoods	Slight.
Moderate	Moderate	Slight	Severe for conifers; severe for hardwoods	Slight.
Slight	Moderate	Slight	Severe for conifers; severe for hardwoods	Slight.
Slight	Moderate	Slight	Severe for conifers; moderate for hardwoods	Moderate.

TABLE 2.—*Interpretations for*

Series and map symbols	Site quality		Species suitability	
	Sugar maple, black cherry, ash, oak	Yellow-poplar	To favor in existing stands	For planting or seeding
Strip mine spoil: StB, StC, StE. For revegetation purposes, consult "A Guide for Revegetating Bituminous Strip Mine Spoil in Pennsylvania." (*11*)				
Unadilla: Un	Good		Sugar maple, white pine, hemlock, ash.	White pine, larch, Norway spruce.
Urban land: Ur. Not suited for the growing of commercial tree crops.				
Wayland, coarse variant: Wa	Excellent for pin oak; fair for all others.		Pin oak, red maple	White pine, white spruce

Site quality is an indication of the ability of a soil to produce timber. It is based on site index, which is defined as the average height of the dominant and codominant trees in a stand at the age of 50 years. Using the site indexes, a forester can estimate how much timber a given stand will yield at a given age.

The site indexes for yellow-poplar and upland oak, on sample plots in this county and adjacent counties, were used to establish the site quality ratings in table 2. Information on yields of yellow-poplar was obtained from E.F. McCarthy, Central States Experiment Station. Data on oaks were compiled by G.L. Schnur (*14*).

Table 3 shows the relationship between site quality ratings and site indexes and probable yields.

TABLE 3.—*Relationship of site quality ratings, site indexes, and yields*

Site quality rating	Site index		Yield (Bd. ft. per acre at age 50)	
	Yellow-poplar	Upland oaks	Yellow-poplar	Upland oaks [1]
Excellent	95+	85+	32, 150	13, 750+
Very good	85–94	75–84	24, 400	13, 750
Good	75–84	65–74	17, 620	9, 750
Fair	65–74	55–64	11, 400	6, 300
Poor	55–64	54–	5, 600	3, 250–

[1] Published data for oaks do not go beyond site index 80.

The site indexes for white pine, sugar maple, ash, and larch vary somewhat but follow about the same pattern as those of yellow-poplar and oak. Information on site indexes for other species can be obtained from the Soil Conservation Service and the Pennsylvania Department of Forests and Waters.

Species suitability shows which of the native species should be encouraged and what species are suitable for planting. The trees listed are those that grow rapidly and have high economic value. The objectives of management determine which of the suitable species are planted or selected for management.

The hazards that have to be considered in managing woodland are erosion, equipment limitation, seedling mortality, plant competition, and windthrow.

The erosion hazard indicates the intensity of practices needed to control erosion. A rating of slight means that few if any practices are needed. A rating of moderate means that measures are needed to control erosion in skid trails and logging roads immediately after wood crops are harvested. A rating of severe means that harvesting and other operations should be done across the slope so far as possible; that skid trails and logging roads should have the slightest gradient possible; that water disposal systems must be carefully maintained during logging; and that measures are needed to control erosion, especially gullying, in skid trails and logging roads immediately after logging.

Equipment limitation refers to characteristics of the soil and the topography that restrict or prohibit the use of equipment for harvesting trees and planting seedlings. Slope, stoniness, and wetness are principal limiting characteristics. A rating of slight means that there are very few limitations. A rating of moderate means that there are some stones and boulders, moderately steep slopes, or wetness for part of the year. A rating of severe means that because of steep slopes, stoniness, or prolonged wetness, track-type equipment is best for general use and winches or other special equipment may be needed.

Seedling mortality refers to the loss of seedlings, either naturally occurring or planted, as a result of unfavorable soil characteristics. A rating of slight means that no *woodland management*—Continued

Hazards				
Erosion	Equipment limitations	Seedling mortality	Plant competition	Windthrow
Slight	Slight	Slight	Moderate for conifers; slight for hardwoods	Slight.
Slight	Severe	Severe	Severe for conifers; severe for hardwoods	Moderate.

more than 25 percent of the seedlings will die. A rating of moderate means that the loss will be between 25 and 50 percent, and a rating of severe, that the loss will be more than 50 percent.

Plant competition refers to the rate at which brush, grass, and undesirable trees are likely to invade woodland stands. A rating of slight means that competition does not prevent adequate natural regeneration and early growth or interfere with the development of planted seedlings. A rating of moderate means that competition delays natural regeneration and interferes with the establishment and early growth of seedlings but does not prevent the development of fully stocked normal stands. A rating of severe means that competition prevents adequate restocking, either natural or artificial, without intensive site preparation, weeding, and other treatment.

Windthrow represents an evaluation of the factors that control the development of tree roots and, consequently, the possibility that the wind will uproot trees. A rating of slight means that normally no trees are blown down by wind. A rating of moderate means that some trees can be expected to be blown down when the soil is very wet and the wind high. A rating of severe means that many trees can be expected to be blown down if the soil is wet and the wind moderate or high.

Engineering Uses of the Soils [3]

This section describes the soil properties that affect construction and maintenance of roads and airports, pipelines, building foundations, water storage facilites, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties most important in engineering are permeability, shear strength, density, shrink-swell potential, water-holding capacity, grain-size distribution, plasticity, and reaction.

Information on these and related soil properties is furnished in tables 4, 5, and 6. Engineers, contractors, farmers, and others can use these estimates and interpretations of soil properties to do the following:

1. Plan and design agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Select locations for highways, airports, pipelines, and underground cables.
3. Locate sources of sand, gravel, or rock suitable as construction material.
4. Select areas for industrial, commercial, residential, and recreational development.

With the soil map for identification, the engineering interpretations reported here can be used for many purposes. In addition, sampling and testing should be done where engineering works involve heavy loads and where excavations are deeper than those depths supplied in the tables. The soil map is useful for these further investigations and for indicating future problems.

Some words that soil scientists use may be unfamiliar to engineers, and other words may have special meaning in soil science. These are defined in the Glossary at the end of the survey.

Engineering classification systems

County commissioners, town planners, farmers, and others who do not have an engineering background must understand the AASHO or Unified classifications to use advantageously the information in this engineering section.

[3] This section prepared by JOHN K. ROBB, civil engineer, Soil Conservation Service, Harrisburg, Pa.

TABLE 4.—*Engineering*

[Tests performed by the Pennsylvania Department of Highways Soil Testing Laboratory, Harrisburg, Pennsylvania,

Soil name, sample number, and location of sample	Parent material	Report No.	Depth from surface	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
			In.	*Lb./cu. ft.*	*Pct.*
Braceville gravelly loam S63 Pa. 43-30-1 and 2. 2 mi. SW. of Mercer, E. Lackawannock T. (Modal profile)	Acid stratified sands and gravel of glacial outwash.	BM-45526 BM-45527	12-25 36-50	122 124	12 10
Caneadea silt loam S63 Pa. 43-28-1 and 2. 0.4 mi. S. of intersection 43036, S. Pymatuning T. (Modal profile)	Calcareous lacustrine deposits.	BK-41037 BK-41038	8-25 41-63	111 115	14 14
Canfield silt loam S63 Pa. 43-3-2 and 7. 3 mi. SW. of Mercer, Kutarnick farm, E. Lackawannock T. (Modal profile)	Acid Wisconsin glacial till composed primarily of sandstone and shale.	BK-16521 BK-16522	10-18 71-89	116 128	15 10
Chenango gravelly loam S63 Pa. 43-1-3 and 5. 2 mi. SW. of Mercer on Rt. 158, E. Lackawannock T. (Modal profile)	Acid glacial outwash from gray sandstone and shale.	BK-16517 BK-16518	14-22 29-53	124 129	12 10
Frenchtown silt loam S63 Pa. 43-5-2 and 6. 1 mi. SE. of Lamonts Corners, Hickory T. (Modal profile)	Moderately alkaline Wisconsin glacial till consisting mostly of gray sandstone and shale.	BK-16525 BK-16526	10-16 49-70	114 124	16 12
Papakating silt loam S63 Pa. 43-32-1 and 2. 100 ft. S. and 40 ft. W. of bridge on T694, Sandy Creek T. Finer texture than the modal profile.	Alluvium from glacial drift.	BM-41142 BM-43846	6-34 34-48	83 104	33 16
Ravenna silt loam S63 Pa. 43-6-4 and 7. 0.6 mi. N. of North Liberty, 0.4 mi. N. of intersection of Rt. Pa. 258 with Rt. 43022, Liberty T. (Modal profile)	Acid Wisconsin glacial till of gray sandstone and shale.	BK-16527 BK-16528	18-33 55-70	124 126	12 12
Wayland silt loam, coarse variant S63 Pa. 43-12-1 and 2. 0.5 mi. E. of intersection of T484 and Rt. 43078, Wolf Creek T. (Modal profile)	Mixed alluvium from sandstone, shale, and limestone glacial till.	BK-32217 BK-32218	4-18 25-36	115 119	15 12

[1] Based on AASHO Designation: T 99-57 (*2*).

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

test data

in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis[2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—							
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO	Unified[3]
										Pct.			
--------	89	79	72	59	37	35	25	13	9	22	3	A-4(0)	SM
--------	92	88	85	78	48	44	30	14	9	19	1	A-4(3)	SM
--------	99	98	97	94	84	82	70	48	35	36	13	A-6(9)	ML-CL
--------	100	98	97	94	86	84	72	47	35	33	10	A-4(8)	ML-CL
--------	92	88	83	77	63	60	46	25	16	27	5	A-4(6)	ML-CL
--------	100	84	73	58	36	34	26	14	10	20	3	A-4(0)	SM
100	63	50	44	35	23	21	15	7	5	22	1	A-1-b(0)	GM
100	57	38	29	15	7	6	4	3	2	18	[4] NP	A-1-a(0)	GP-GM
--------	94	92	90	87	79	76	57	32	21	29	8	A-4(8)	ML-CL
--------	84	76	71	65	53	51	39	21	14	24	6	A-4(4)	ML-CL
--------	--------	--------	100	97	84	82	66	42	32	62	19	A-7-5(15)	MH
--------	--------	99	99	95	37	34	25	13	9	27	0	A-4(0)	SM
--------	94	88	85	78	54	51	39	24	18	24	7	A-4(4)	ML-CL
--------	85	76	72	67	50	47	38	24	18	24	7	A-4(3)	SM-SC
--------	--------	--------	100	92	51	48	34	18	13	25	2	A-4(3)	ML
--------	97	85	80	67	31	28	20	11	8	23	NP	A-2-4(0)	SM

[3] SCS and BPR have agreed that any soil having a plasticity index within two points of the A-line is to be given a borderline classification. ML–CL is an example of such a borderline classification.

[4] NP means nonplastic.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Percentage passing sieve—			
				No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Ft.	*In.*					
Braceville: BrB2, BrC2, BvA, BvB2, BvC2.	1½–3	0–12	Gravelly loam	70–95	60–90	45–90	25–85
		12–25	Gravelly loam	70–95	60–90	45–90	25–85
		25–50	Gravelly sandy loam (upper part is fragipan).	51–100	36–100	23–98	9–48
Caneadea: Ca	½–1½	0–8	Silt loam	95–100	90–100	90–100	85–100
		8–41	Silty clay loam	95–100	90–100	90–100	85–100
		41–63	Silty clay loam	95–100	90–100	90–100	80–95
Canfield: CdA, CdB2, CdC2, CdC3, CdD2, CdE.	1½–3	0–10	Silt loam	80–95	75–95	65–90	45–85
		10–25	Silt loam	80–95	75–95	65–90	45–85
		25–71	Loam (fragipan)	70–85	65–85	55–75	35–50
Chenango: Cf, Ch, ClA, ClB2, ClC2, ClD2, CnC2, CnD2, CoA, CoB2, CoC2, CoD2.	3+	0–14	Gravelly loam	40–85	30–75	20–65	5–45
		14–29	Gravelly loam, gravelly sandy loam.	40–85	30–75	20–65	5–45
		29–53	Sand and gravel	40–85	30–80	20–40	5–15
Frenchtown: FeA, FeB2, FhB, Fr For Luray part of Fr, see Luray series.	0–½	0–10	Silt loam	90–100	90–100	90–100	80–95
		10–16	Silt loam	90–100	90–100	90–100	80–95
		16–49	Silt loam (fragipan)	75–90	70–85	65–80	50–60
Halsey: Ha	0	0–6	Silt loam	65–80	60–75	60–75	55–65
		6–26	Loam, gravelly loam	40–60	25–35	20–30	15–25
		26–36	Sandy loam	30–60	20–30	5–25	1–15
Lordstown: LoC, LoD, LrD, LrE	3+	0–5	Silt loam	80–95	80–90	70–85	60–75
		5–22	Silt loam	80–95	80–90	70–85	60–75
		22–40	Loam (fractured bedrock at 1½ to 3½ ft.)	45–70	40–65	35–55	20–40
Luray	0	0–13	Silt loam	95–100	95–100	95–100	95–100
		13–48	Silty clay loam	95–100	95–100	95–100	95–100
Mine dumps: Md All characteristics variable.							
Muck and peat: Mp	0	--------	Muck	--------	--------	--------	--------
Papakating: Pa	0	0–6	Silt loam	85–100	80–100	75–95	55–90
		6–30	Clay loam and loam	85–100	80–100	75–95	55–90
		30–50	Sandy loam	70–100	70–100	75–95	25–85
Ravenna: RaA, RaB2, RaC2, RaC3, RaD2, ReC.	½–1½	0–8	Silt loam	85–95	85–90	80–90	55–85
		8–18	Silt loam	85–95	85–90	80–90	55–85
		18–55	Silt loam and gritty silt loam (fragipan).	70–90	60–90	50–90	30–80
Red Hook: Rf, Rh, RoB2	½–2	0–8	Silt loam	80–90	75–90	70–85	60–75
		8–24	Loam	75–90	70–85	65–80	60–75
		24–50	Gravelly sandy loam	70–85	55–70	35–60	20–40
Strip mine spoil: StB, StC, StE. All characteristics variable.							
Unadilla: Un	3+	0–4	Silt loam	90–95	85–95	80–90	60–85
		4–28	Silt loam	90–95	85–95	80–90	60–85
		28–40	Sandy loam	70–80	50–65	35–50	20–30
Urban land: Ur All characteristics variable.							
Wayland, coarse variant: Wa	0–1½	0–4	Silt loam	100	100	90–100	35–70
		4–18	Silt loam	100	100	90–100	35–70
		18–36	Gravelly sandy loam and sandy loam, stratified.	55–85	45–80	30–65	5–30

properties of soils

Classification		Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for steel pipes
Unified	AASHO							
		In./hr.	*In./in. of soil*	*pH*	*Pct.*	*Lb./cu. ft.*		
SM, ML	A–2, A–4	2. 0–6. 3	0. 15–0. 18	4. 5–5. 5	----------	----------	Low	Moderate.
SM, ML	A–2, A–4	0. 63–2. 0	0. 12–0. 16	4. 5–6. 0	10–16	110–125	Low	Moderate.
SM, GM, GP–GM	A–1, A–4, A–2	0. 2–0. 63	0. 04–0. 06	4. 5–6. 0	10–12	115–130	Low	Moderate.
ML, CL	A–4, A–6	0. 63–2. 0	0. 16–0. 18	6. 0–7. 0	----------	----------	Moderate	High.
ML, CL, MH, CH	A–4, A–6, A–7	<0. 2	0–15. 0. 20	6. 6–7. 8	14–20	100–110	Moderate to high.	High.
ML–CL	A–4, A–6, A–7	<0. 2	0. 15–0. 20	6. 5–7. 8	10–20	100–120	Moderate	High.
ML, SM	A–4, A–6	0. 63–2. 0	0. 18–0. 20	5. 0–7. 0	----------	----------	Low	Moderate.
ML, SM, ML–CL	A–4, A–6	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	12–15	115–120	Low	Moderate.
SM, GM, SM–SC	A–4, A–2	<0. 2	0. 12–0. 14	4. 5–6. 5	9–11	125–130	Low	Moderate.
GW–GM, SM, GM	A–2, A–4	2. 0–6. 3	0. 14–0. 17	4. 0–5. 5	----------	----------	Low	Low.
GW–GM, SM, GM	A–1, A–4	2. 0–6. 3	0. 13–0. 15	4. 5–5. 5	10–12	124–130	Low	Low.
GP–GM, SP–SM	A–1, A–2	>6. 3	0. 06–0. 08	4. 5–5. 5	10–12	125–135	Low	Low.
ML, CL	A–4	0. 63–2. 0	0. 17–0. 20	5. 0–6. 0	----------	----------	Low	High.
ML–CL, ML, CL	A–4, A–6	0. 2–2. 0	0. 17–0. 20	5. 0–6. 5	15–20	105–115	Low	High.
ML–CL, SM–SC	A–4	<0. 2	0. 06–0. 10	6. 6–7. 8	11–13	120–130	Low	High.
ML, OL	A–4	0. 63–2. 0	0. 15–0. 17	5. 0–6. 5	----------	----------	Low	High.
GM, GC, SM	A–1, A–2	0. 2–0. 63	0. 15–0. 17	5. 5–6. 5	17–21	100–110	Low	High.
SM, GM, SP, GW, GP	A–1, A–2	0. 63–6. 3	0. 05–0. 08	6. 0–7. 0	10–12	125–130	Low	High.
ML	A–4	0. 63–2. 0	0. 16–0. 18	5. 0–5. 5	----------	----------	Low	Low.
ML	A–4	0. 63–2. 0	0. 14–0. 16	5. 0–5. 5	15–20	105–110	Low	Low.
GM, GM–SM	A–2, A–4	2. 0–6. 3	0. 05–0. 08	5. 0–5. 5	10–15	115–125	Low	Low.
ML	A–4	0. 63–2. 0	0. 20	5. 0–6. 5	----------	----------	Low	High.
ML, MH	A–4, A–6	0. 2–0. 63	0. 14	6. 0–7. 0	15	110	Moderate	High.
----------	----------	----------	----------	----------	----------	----------	High to moderate.	High.
ML, CL	A–4, A–6	0. 63–2. 0	0. 16–0. 18	5. 5–6. 0	----------	----------	Moderate	High.
MH, ML–CL	A–4, A–7	0. 2–0. 63	0. 16–0. 18	5. 5–6. 5	15–30	80–100	Moderate	High.
SM–SC, SM, ML	A–2, A–4	0. 63–2. 0	0. 08–0. 10	5. 5–7. 0	10–16	105–125	Low	High.
ML, CL	A–4	0. 63–2. 0	0. 18–0. 22	4. 5–5. 5	----------	----------	Low	High.
ML–CL, ML	A–4	0. 63–2. 0	0. 18–0. 22	4. 5–5. 5	12–17	110–125	Low	High.
ML–CL, SM–SC, SM	A–2, A–4	<0. 2	0. 06–0. 10	4. 5–5. 5	10–13	120–130	Low	High.
ML	A–4	0. 63–2. 0	0. 12–0. 18	6. 0–7. 0	----------	----------	Moderate	High.
ML	A–4	0. 63–2. 0	0. 14–0. 16	5. 5–6. 5	15–18	110–115	Moderate	High.
SM–SC, SM	A–1, A–4, A–2	0. 2–6. 3	0. 06–0. 08	5. 5–6. 5	10–15	120–125	Low	High.
ML	A–4	0. 63–2. 0	0. 18–0. 20	4. 5–5. 5	----------	----------	Low	Moderate.
ML	A–4	0. 63–2. 0	0. 18–0. 20	5. 0–6. 0	12–18	110–120	Low	Moderate.
SM–SC, SM	A–2	2. 0–6. 3	0. 10–0. 12	5. 0–6. 0	10–12	120–125	Low	Low.
ML, CL, SM	A–4	0. 63–2. 0	0. 18–0. 20	5. 5–6. 5	----------	----------	Low	High.
ML, SM, CL	A–4, A–6	<0. 20	0. 18–0. 20	6. 0–7. 0	15–28	90–115	Low to moderate.	High.
SM, SW-GM, SP-SM	A–1, A–2, A–4	0. 2–0. 63	0. 08–0. 10	6. 0–7. 0	11–13	115–120	Low	High.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill
Braceville: BrB2, BrC2, BvA, BvB2, BvC2	Fair	Moderate	Poor	Fair	Good
Caneadea: Ca	Poor	High	Fair	Unsuitable	Poor
Canfield: CdA, CdB2, CdC2, CdC3, CdD2, CdE	Fair	Moderate	Good	Unsuitable	Fair
Chenango:					
Cf	Good	Low	Fair	Fair	Good
Ch, ClA, ClB2, ClC2, ClD2, CnC2, CnD2, CoA, CoB2, CoC2, CoD2.	Good	Low	Poor	Good	Good
Frenchtown: FeA, FeB2, FhB, Fr (For Luray component of Fr, see Luray series.)	Poor	High	Fair	Unsuitable	Fair
Halsey: Ha	Poor	High	Fair	Fair	Fair
Lordstown: LoC, LoD, LrD, LrE	Good	Low	Fair	Unsuitable	Good
Luray	Poor	High	Poor	Unsuitable	Poor
Mine dumps: Md. All characteristics variable; requires onsite investigation.					
Muck and peat: Mp	Unsuitable	High	Unsuitable; good for mulch or organic material.	Unsuitable	Unsuitable
Papakating: Pa	Poor	High	Fair	Unsuitable	Poor

interpretations

Soil features affecting—						
Highway location	Pipeline construction and maintenance	Impoundments: Reservoir area	Impoundments: Embankment	Agricultural drainage	Irrigation	Terraces, diversions, or waterways
Seasonal high water table; moderate frost heave potential.	Seasonal high water table; unstable walls.	Pervious substratum.	Piping hazard; fair stability.	Moderately slow permeability; seasonal high water table.	Moderately slow permeability; seasonal high water table.	Seasonal high water table; complex slopes; erodible on steep slopes.
Seasonal high water table; high frost heave potential.	Seasonal high water table; high corrosion potential.	Features generally favorable.	Unstable material.	Seasonal high water table; slow permeability.	Slow permeability; seasonal high water table.	Seasonal high water table.
Seasonal high water table; moderate frost heave potential.	Seasonal high water table.	Features generally favorable.	Fair stability	Slow permeability; seasonal high water table.	Seasonal high water table; slow permeability.	Seasonal high water table; erodible on steep slopes.
Flood hazard; cut slopes are droughty.	Flood hazard	Flood hazard; pervious material.	Fair stability; piping hazard.	Not needed	Rapid permeability; flood hazard.	Not applicable.
Cut slopes are droughty.	Unstable walls	Pervious material.	Piping hazard; fair stability.	Not needed	Rapid permeability.	Irregular topography; erodible on steep slopes.
High water table; frost heaving.	High water table; high corrosion potential.	Features generally favorable.	Fair stability; piping hazard.	Slow permeability; high water table; surface stoniness (FhB); lack of outlets.	Slow permeability; high water table.	High water table; surface stoniness (FhB).
High water table; frost heaving.	High water table; high corrosion potential; subject to caving.	Pervious substratum.	Good stability; piping hazard.	High water table; natural outlets inadequate in places.	High water table; generally not irrigated.	High water table.
Moderate depth to bedrock; surface stoniness (LrD, LrE); erodible on steep slopes.	Moderate depth to bedrock.	Moderate depth to bedrock; pervious substratum and bedrock.	Limited amount of material; surface stoniness (LrD, LrE).	Not needed	Low available moisture capacity; moderate depth to bedrock.	Moderate depth to bedrock; surface stoniness (LrD, LrE); erodible on steep slopes.
High water table; moderate frost heave potential.	High water table; high corrosion potential.	Features generally favorable.	Unstable; piping hazard.	High water table; natural outlets inadequate in places.	High water table.	Not applicable.
High water table; subsidence.	High water table; subsidence; high corrosion potential.	Subsidence	Subsidence; instability.	High water table; subsidence; outlet problems.	High water table.	Not applicable.
High water table; flood hazard.	High water table; flood hazard; high corrosion potential.	Flood hazard; pervious layers in substratum.	Fair stability; subject to piping.	High water table; lack of outlets; flood hazard.	High water table; flood hazard.	Not applicable.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill
Ravenna: RaA, RaB2, RaC2, RaC3, RaD2, ReC	Poor	High	Fair (RaA, RaB2, RaC2, RaC3, RaD2); poor (ReC).	Unsuitable	Fair
Red Hook:					
Rf	Poor	Moderate	Good	Poor	Fair
Rh, RoB2	Poor	High	Fair	Poor	Fair
Strip mine spoil: StB, StC, StE. All characteristics variable; requires onsite investigation.					
Unadilla: Un	Good	Low	Good	Fair	Good
Urban land: Ur All characteristics variable; requires onsite investigation.					
Wayland, coarse variant: Wa	Poor	High	Fair	Unsuitable	Fair

The two systems most commonly used in classifying soils for engineering purposes are the AASHO system, developed by the American Association of State Highway Officials, and the Unified system, developed by the Corps of Engineers and used by engineers of the Soil Conservation Service and the Department of Defense.

Under the AASHO system (*2*), soil materials are classified according to properties that affect their use in highway construction. Soils are classified in seven groups, from A–1 to A–7, according to grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, and in group A–7 are clay soils that have low strength when wet. The best soils for subgrade are therefore classified as A–1, the next best as A–2, and so on to class A–7, the poorest soils for subgrade. If laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7; and A–7–5, and A–7–6.

Within each group, the relative engineering value of soil material can be indicated by group index numbers. Group indexes range from 0 for the best material to 20 for the poorest. Laboratory data are needed to establish group indexes.

In the Unified system (*25*), soil materials are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soil materials are classified in 15 groups. There are 8 classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; 6 classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and 1 class of highly organic soils, identified as Pt.

Table 4 gives the engineering classifications of tested soils according to both systems, including the group index of the AASHO classification. Table 5 gives estimated classifications of all the soils of the county according to both systems.

Engineering test data

Table 4 gives engineering test data for samples of some of the major soil types in Mercer County. The table shows where samples were taken from, the depth of sampling, and the results of tests made to determine particle-size distribution, moisture-density relations, and liquid and plastic limits.

Moisture-density data are important in earthwork, for as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material *interpretations*—Continued

Soil features affecting—						
Highway location	Pipeline construction and maintenance	Impoundments		Agricultural drainage	Irrigation	Terraces, diversions, or waterways
		Reservoir area	Embankment			
Seasonal high water table; erodible on steep slopes.	Seasonal high water table; high corrosion potential.	Features generally favorable.	Features generally favorable.	Seasonal high water table; slow permeability.	Seasonal high water table; slow permeability.	Seasonal high water table; erodible on steep slopes.
Flood hazard; seasonal high water table.	Flood hazard; seasonal high water table; fair stability; high corrosion potential.	Flood hazard; pervious substratum.	Flood hazard; fair stability.	Seasonal high water table; flood hazard; moderately slow permeability.	Seasonal high water table; flood hazard.	Seasonal high water table; flood hazard; erodible on steep slopes.
Seasonal high water table.	Seasonal high water table; unstable walls; high corrosion potential.	Pervious substratum.	Fair stability.	Seasonal high water table; moderately slow permeability.	Seasonal high water table; moderately slow permeability.	Seasonal high water table; erodible on steep slopes.
Features generally favorable.	Features generally favorable.	Pervious layers in substratum.	Fair stability; piping hazard.	Not needed.	High available moisture capacity.	Fair stability; erodible on steep slopes.
Flood hazard; high water table.	High water table; flood hazard; high corrosion potential.	Flood hazard; pervious substratum.	Fair stability; piping hazard, wet.	Flood hazard; high water table; lack of outlets.	High water table; flood hazard.	Not applicable.

increases until the optimum moisture content is reached. After that, the dry density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density.

Mechanical analysis shows the proportions of soil particles of various sizes in a particular soil sample. Soil particles that do not pass through the No. 200 sieve are sand and other coarser materials. Particles that are larger than 0.002 millimeter in diameter and pass through the No. 200 sieve are silt. Particles that are smaller than 0.002 millimeter in diameter and pass through the No. 200 sieve are clay. The clay fraction was determined by the hydrometer method, rather than the pipette method, which most soil scientists use to determine the clay content of soil samples.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from semisolid to plastic. If the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the soil material changes from semisolid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is plastic.

The AASHO and Unified classifications are explained under the heading "Engineering classification systems."

Estimated engineering properties

Estimates of soil properties significant in engineering are given in table 5. The estimates were based on the test data in table 4, on test data from other counties, and on information from other parts of this survey.

Depth to a seasonal high water table is included in table 5 because a number of the soils have a seasonal water table high enough to limit their use for highways and for other construction. Depth to bedrock is not included, because in all the soils except those of the Lordstown series, bedrock is at a depth of more than 3½ feet and so does not interfere with engineering uses. In the Lordstown soils, the depth to bedrock is 1½ to 3½ feet.

Permeability refers to the movement of water downward through undisturbed soil. Optimum moisture content is the percentage of moisture at which the soil can be compacted to maximum density. Shrink-swell potential indicates the change in volume to be expected as the moisture content of a soil changes. Corrosion potential refers to the likelihood of damage to steel pipes.

Engineering interpretations

Information useful to engineers and others who plan to use soil material in construction of highways, farm facilities, and pipelines is given in table 6. The ratings and interpretations in table 6 are based on the estimates of soil properties in table 5; on available test data, including those in table 4; and on field experience. Detrimental or undesirable features are emphasized; but very important desirable features are listed also.

The rating of the soil as to suitability for winter grading is based mainly on the occurrence of a seasonal high water table, which interferes with moving, mixing, and compacting the soil material when temperatures are below freezing.

A high water table also governs the rating of a soil for susceptibility to frost action. The wetter a soil, the more it tends to heave when temperatures are low.

A soil that has a surface layer relatively free of gravel, loamy in texture, and high in organic matter is rated good as a source of topsoil.

A soil that has a significant amount of relatively clean gravel in the solum or substratum is rated good as a source of sand and gravel.

To be rated good as a source of road fill, a soil must be moderately well drained or well drained and at least moderately deep.

A high water table, stones, slopes, a flood hazard, and instability are detrimental features that have to be considered in selecting locations for highways.

A high water table, corrosion potential, wall stability, and depth to bedrock are features to be considered in pipeline construction.

The rate of permeability, which is an indication of the amount of water that will be lost through seepage, is a soil feature of major importance in the selection of the reservoir area for a pond. The embankment or dam is affected by stability, compaction characteristics, and permeability of the soil material.

Irrigation systems, drainage terraces, diversions, and waterways are affected by slope, permeability, depth to the water table, stoniness, and the flood hazard.

TABLE 7.—*Soil limitations*

Map symbols	Soils	Onsite disposal of effluent from septic tanks	Sewage lagoons	Homes of 3 stories or less, with basements
BrB2	Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonal high water table; moderately slow permeability.	Severe: rapid permeability in substratum.	Moderate: seasonal high water table.
BrC2	Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonal high water table; moderately slow permeability.	Severe: rapid permeability in substratum.	Moderate: seasonal high water table; slope.
BvA	Braceville silt loam, 0 to 3 percent slopes.	Severe: seasonal high water table; moderately slow permeability.	Severe: rapid permeability in substratum.	Moderate: seasonal high water table.
BvB2	Braceville silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonal high water table; moderately slow permeability.	Severe: rapid permeability in substratum.	Moderate: seasonal high water table.
BvC2	Braceville silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonal high water table; moderately slow permeability.	Severe: rapid permeability in substratum; slope.	Moderate: seasonal high water table; slope.
Ca	Caneadea silt loam	Severe: seasonal high water table.	Slight	Severe: seasonal high water table.
CdA	Canfield silt loam, 0 to 3 percent slopes.	Severe: seasonal high water table; slow permeability.	Slight	Moderate: seasonal high water table.
CdB2	Canfield silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonal high water table; slow permeability.	Moderate: slope	Moderate: seasonal high water table.
CdC2	Canfield silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonal high water table; slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.
CdC3	Canfield silt loam, 8 to 15 percent slopes, severely eroded.	Severe: seasonal high water table; slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.
CdD2	Canfield silt loam, 15 to 25 percent slopes, moderately eroded.	Severe: seasonal high water table; slow permeability; slope.	Severe: slope	Severe: slope
CdE	Canfield silt loam, 25 to 35 percent slopes.	Severe: slope	Severe: slope	Severe: slope

Use of the Soils in Community Development

This section provides information that can help officials and organizations who plan community development to avoid improper use of soils. The amount of detail that can be given is restricted by the map scale; therefore, more detailed field investigations are necessary to determine condition of the soil at a specific site.

Table 7 shows the degrees and kinds of limitations for community development uses of all the soils of Mercer County. Degrees of limitation are slight, moderate, and severe. Slight indicates that the soil generally has few limitations for the use being considered. Moderate indicates that the soil requires special measures to overcome or correct the limitations. Severe indicates that the limitations are very difficult or expensive to correct or overcome. The degrees of limitation are based on soil features that control the ease or difficulty of making improvements. Location and other economic features that often enter into decisions on land use were not considered.

The uses considered and the soil features evaluated in setting the degree of limitation are as follows:

Onsite disposal of effluent from septic tanks is affected by permeability, slope, depth to bedrock, and position of water table. In soils underlain by cavernous limestone, effluent that seeps through rock crevices or solution channels may contaminate underground water. The size of the drainage field and the type of disposal system that can be used depend on the kind and degree of limitation. A soil that has a severe limitation should be investigated carefully. If the system is in use for only a short time each year, as for a summer camp, the limitation can be considered to be of a lesser degree than table 7 shows.

Use for sewage lagoons is affected by permeability of the substratum, slope, depth to bedrock, and flood hazard.

The limitations for homesites apply to houses that are no more than three stories high and have basements that require excavation to a depth of less than 8 feet. The soil features that affect this use are depth to the seasonal high water table, depth to and kind of bedrock, slope,

for community development

Lawns and landscaping	Streets and parking lots for subdivisions	Sanitary land fills by the trench method	Cemeteries
Slight	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table; moderately slow permeability.
Moderate: slope	Severe: slope	Moderate: seasonal high water table; moderately slow permeability; slope.	Moderate: seasonal high water table; slope; moderately slow permeability.
Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table; moderately slow permeability.
Slight	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table; moderately slow permeability.
Moderate: slope	Severe: slope	Moderate: seasonal high water table; moderately slow permeability; slope.	Moderate: seasonal high water table; slope; moderately slow permeability.
Slight	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Slight	Moderate: seasonal high water table.	Severe: slow permeability	Severe: slow permeability.
Slight	Moderate: seasonal high water table; slope.	Severe: slow permeability	Severe: slow permeability.
Moderate: slope	Severe: slope	Severe: slow permeability	Severe: slow permeability.
Severe: eroded; slope	Severe: slope	Severe: slow permeability	Severe: eroded; slow permeability.
Severe: slope	Severe: slope	Severe: slope; slow permeability.	Severe: slope; slow permeability.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 7.—*Soil limitations for*

Map symbols	Soils	Onsite disposal of effluent from septic tanks	Sewage lagoons	Homes of 3 stories or less, with basements
Cf	Chenango fine sandy loam, flooded.	Severe: flooding	Severe: flooding; rapid permeability.	Severe: flooding
Ch	Chenango fine sandy loam, low terrace.	Severe: flooding	Severe: flooding; rapid permeability.	Severe: flooding
ClA	Chenango gravelly loam, 0 to 3 percent slopes.	Slight [1]	Severe: rapid permeability	Slight
ClB2	Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded.	Slight [1]	Severe: rapid permeability	Slight
ClC2	Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded.	Moderate: slope [1]	Severe: slope; rapid permeability.	Moderate: slope
ClD2	Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded.	Severe: slope [1]	Severe: slope; rapid permeability.	Severe: slope
CnC2	Chenango gravelly loam, moderately eroded, rolling.	Moderate: slope [1]	Severe: slope; rapid permeability.	Moderate: slope
CnD2	Chenango gravelly loam, moderately eroded, hilly.	Severe: slope [1]	Severe: slope; rapid permeability.	Severe: slope
CoA	Chenango silt loam, 0 to 3 percent slopes.	Slight [1]	Severe: rapid permeability	Slight
CoB2	Chenango silt loam, 3 to 8 percent slopes, moderately eroded.	Slight [1]	Severe: rapid permeability	Slight
CoC2	Chenango silt loam, 8 to 15 percent slopes, moderately eroded.	Moderate: slope [1]	Severe: slope	Moderate: slope
CoD2	Chenango silt loam, 15 to 25 percent slopes, moderately eroded.	Severe: slope [1]	Severe: slope	Severe: slope
FeA	Frenchtown silt loam, 0 to 3 percent slopes.	Severe: high water table	Slight	Severe: high water table
FeB2	Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: high water table	Moderate: slope	Severe: high water table
FhB	Frenchtown very stony silt loam, 0 to 8 percent slopes.	Severe: high water table	Moderate: slope	Severe: high water table
Fr	Frenchtown and Luray silt loams.	Severe: high water table	Slight	Severe: high water table
Ha	Halsey silt loam	Severe: high water table	Severe: rapidly permeable substratum.	Severe: high water table
LoC	Lordstown silt loam, 5 to 15 percent slopes.	Severe: moderate depth to bedrock.	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock.
LoD	Lordstown silt loam, 15 to 25 percent slopes.	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.

community development—Continued

Lawns and landscaping	Streets and parking lots for subdivisions	Sanitary land fills by the trench method	Cemeteries
Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding.
Slight	Slight	Severe: flooding	Severe: flooding.
Slight	Slight	Slight [1]	Slight.
Slight	Moderate: slope	Slight [1]	Slight.
Moderate: slope	Severe: slope	Moderate: slope [1]	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope [1]	Severe: slope.
Moderate: slope	Severe: slope	Moderate: slope [1]	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope [1]	Severe: slope.
Slight	Slight	Slight [1]	Slight.
Slight	Moderate: slope	Slight [1]	Slight.
Moderate: slope	Severe: slope	Moderate: slope [1]	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope [1]	Severe: slope.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Moderate: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock.	Severe: moderate depth to bedrock.
Severe: slope	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.	Severe: moderate depth to bedrock; slope.

TABLE 7.—*Soil limitations for*

Map symbols	Soils	Onsite disposal of effluent from septic tanks	Sewage lagoons	Homes of 3 stories or less, with basements
LrD	Lordstown very stony silt loam, 8 to 25 percent slopes.	Severe: moderate depth to bedrock; slope.	Severe: slope; moderate depth to bedrock.	Severe: slope; moderate depth to bedrock.
LrE	Lordstown very stony silt loam, 25 to 45 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Md	Mine dumps. Variable; requires onsite investigation.			
Mp	Muck and peat	Severe: high water table	Severe: organic soil; high water table.	Severe: high water table; unstable.
Pa	Papakating silt loam	Severe: high water table; flooding.	Severe: flooding	Severe: high water table; flooding.
RaA	Ravenna silt loam, 0 to 3 percent slopes.	Severe: seasonal high water table.	Slight	Severe: seasonal high water table.
RaB2	Ravenna silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonal high water table.	Moderate: slope	Severe: seasonal high water table.
RaC2	Revenna silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonal high water table.	Severe: slope	Severe: seasonal high water table.
RaC3	Ravenna silt loam, 8 to 15 percent slopes, severely eroded.	Severe: seasonal high water table.	Severe: slope	Severe: seasonal high water table.
RaD2	Ravenna silt loam, 15 to 25 percent slopes, moderately eroded.	Severe: slope	Severe: slope	Severe: slope
ReC	Ravenna very stony silt loam, 0 to 15 percent slopes.	Severe: seasonal high water table.	Severe: slope	Severe: seasonal high water table.
Rf	Red Hook silt loam, flooded	Severe: flooding; moderately slow permeability.	Severe: flooding	Severe: flooding
Rh	Red Hook silt loam, low terrace.	Severe: flooding; moderately slow permeability.	Severe: flooding	Severe: flooding
RoB2	Red Hook silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: moderately slow permeability.	Severe: rapid permeability in substratum.	Moderate: seasonal high water table.
StB	Strip mine spoil, gently sloping.	Variable	Moderate: slope	Variable
StC	Strip mine spoil, moderately steep.	Severe: slope	Severe: slope	Severe: slope
StE	Strip mine spoil, steep	Severe: slope	Severe: slope	Severe: slope
Un	Unadilla silt loam	Slight	Severe: moderately rapid permeability in substratum.	Slight
Ur	Urban land. Variable; requires onsite investigation.			
Wa	Wayland silt loam, coarse variant.	Severe: high water table; flooding.	Severe: flooding	Severe: high water table; flooding.

[1] Possibility of pollution of ground water, springs, and lakes.

community development—Continued

Lawns and landscaping	Streets and parking lots for subdivisions	Sanitary land fills by the trench method	Cemeteries
Severe: slope	Severe: slope; moderate depth to bedrock.	Severe: moderate depth to bedrock.	Severe: moderate depth to bedrock; stoniness.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: seasonal high water table.	Severe: slope	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: eroded; slope	Severe: slope	Severe: seasonal high water table.	Severe: eroded; seasonal high water table.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonal high water table; stoniness.	Severe: seasonal high water table; slope.	Severe: seasonal high water table.	Severe: seasonal high water table; stoniness.
Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding.
Slight	Moderate: flooding	Moderate: flooding	Moderate: flooding.
Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: coarse fragments	Variable	Variable	Variable.
Severe: slope; coarse fragments.	Severe: slope	Severe: slope	Severe: slope.
Severe: slope; coarse fragments.	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Slight.
Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.

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and flood hazard. Depth to bedrock and depth to the water table are less significant if the buildings have no basements.

For lawns and landscaping, a sufficient amount of soil material suitable for trees and other plants is needed. Soil features that affect this use are depth to seasonal high water table, slope, depth to bedrock, texture, stones or rocks, and flood hazard. Needs for lime and fertilizer were not considered.

Streets and parking lots for subdivisions are affected by depth to the seasonal high water table, slope, depth to and kind of bedrock, and flood hazard. For roads outside subdivisions, slope is a less serious limitation.

Sanitary land fill by the trench method refers to the disposal of trash and garbage. The main requirement is enough soil material to cover the refuse and garbage; the importation of fill or cover material was not considered. Soil features that affect this use are depth to and kind of bedrock, flood hazard, seasonal high water table, and stones or rocks. Sinkholes in limestone should not be used for refuse disposal, because of the risk of contaminating ground water. Esthetic, economic, and sociological factors were not considered.

Use of soils for cemeteries is affected by depth to seasonal water table, depth to and kind of bedrock, flood hazard, rockiness, stoniness, and soil texture.

TABLE 8.—*Soil limitations*

Map symbol	Soil	Campsites		Buildings without basements
		Tents	Trailers	
BrB2	Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded.	Moderate: seasonal high water table; gravelly.	Moderate: seasonal high water table; slope; gravelly.	Slight
BrC2	Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded.	Moderate: seasonal high water table; gravelly; slope.	Severe: slope	Moderate: slope
BvA	Braceville silt loam, 0 to 3 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Slight
BvB2	Braceville silt loam, 3 to 8 percent slopes, moderately eroded.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Slight
BvC2	Braceville silt loam, 8 to 15 percent slopes, moderately eroded.	Moderate: seasonal high water table; slope.	Severe: slope	Moderate: slope
Ca	Caneadea silt loam	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
CdA	Canfield silt loam, 0 to 3 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Slight
CdB2	Canfield silt loam, 3 to 8 percent slopes, moderately eroded.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope	Slight
CdC2	Canfield silt loam, 8 to 15 percent slopes, moderately eroded.	Moderate: seasonal high water table; slope.	Severe: slope	Moderate: slope
CdC3	Canfield silt loam, 8 to 15 percent slopes, severely eroded.	Moderate: seasonal high water table; slope.	Severe: slope	Moderate: slope
CdD2	Canfield silt loam, 15 to 25 percent slopes, moderately eroded.	Severe: slope	Severe: slope	Severe: slope
CdE	Canfield silt loam, 25 to 35 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Cf	Chenango fine sandy loam, flooded.	Moderate: flooding	Moderate: flooding	Severe: flooding
Ch	Chenango fine sandy loam, low terrace.	Slight	Slight	Slight

Use of the Soils for Recreational Facilities

The information in this section can be used to make preliminary selection of sites for recreational facilities. Onsite investigation of each specific site is needed.

Table 8 shows the degrees and kinds of limitations of the soils for seven recreational uses. The degrees of limitation are slight, moderate, and severe. Slight indicates that the soil generally has few limitations for the use specified. Moderate indicates that the soil requires special measures to overcome or correct the limitations. Severe indicates that the limitations are very difficult or expensive to correct or overcome. The soil features considered in rating the limitations are depth to bedrock, depth to a seasonal high water table, slope, surface texture, stoniness, and frequency of flooding. Capacity to support vegetation is an additional factor to be considered for certain uses. Factors other than soil properties were not evaluated.

The uses for which the soils were evaluated are as follows:

Campsites are areas intended for camping in tents and small trailers and for the accompanying outdoor activities. The sites are expected to be used frequently during the camping season. They should need little preparation except for leveling and shaping the tent sites and parking places. They must be suitable for heavy foot traffic, horse traffic, and vehicular traffic. The capacity of the soil to support vegetation is an extra feature to be considered.

for recreational uses

Paths and trails	Picnic and play areas (extensive use)	Athletic fields (intensive use)	Golf fairways
Moderate: gravelly	Slight	Severe: gravelly	Moderate: gravelly.
Moderate: gravelly	Moderate: slope	Severe: slope; gravelly	Moderate: gravelly; slope.
Slight	Slight	Moderate: seasonal high water table; moderately slow permeability.	Slight.
Slight	Slight	Moderate: seasonal high water table; slope; moderately slow permeability.	Slight.
Slight	Moderate: slope	Severe: slope	Moderate: slope.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight.
Slight	Slight	Moderate: seasonal high water table; slope; slow permeability.	Slight.
Slight	Moderate: slope	Severe: slope	Moderate: slope.
Slight	Moderate: slope	Severe: slope	Severe: erosion.
Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: flooding	Moderate: flooding	Moderate: flooding.
Slight	Slight	Slight	Slight.

TABLE 8.—*Soil limitations*

Map symbol	Soil	Campsites		Buildings without basements
		Tents	Trailers	
ClA	Chenango gravelly loam, 0 to 3 percent slopes.	Moderate: gravelly	Moderate: gravelly	Slight
ClB2	Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded.	Moderate: gravelly	Moderate: gravelly; slope	Slight
ClC2	Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded.	Moderate: gravelly; slope	Severe: slope	Moderate: slope
ClD2	Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded.	Severe: slope	Severe: slope	Severe: slope
CnC2	Chenango gravelly loam, moderately eroded, rolling.	Moderate: slope; gravelly	Severe: slope	Moderate: slope
CnD2	Chenango gravelly loam, moderately eroded, hilly.	Severe: slope	Severe: slope	Severe: slope
CoA	Chenango silt loam, 0 to 3 percent slopes.	Slight	Slight	Slight
CoB2	Chenango silt loam, 3 to 8 percent slopes, moderately eroded.	Slight	Moderate: slope	Slight
CoC2	Chenango silt loam, 8 to 15 percent slopes, moderately eroded.	Moderate: slope	Severe: slope	Moderate: slope
CoD2	Chenango silt loam, 15 to 25 percent slopes, moderately eroded.	Severe: slope	Severe: slope	Severe: slope
FeA	Frenchtown silt loam, 0 to 3 percent slopes.	Severe: high water table	Severe: high water table	Severe: high water table
FeB2	Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: high water table	Severe: high water table	Severe: high water table
FhB	Frenchtown very stony silt loam, 0 to 8 percent slopes.	Severe: high water table	Severe: high water table	Severe: high water table
Fr	Frenchtown and Luray silt loams.	Severe: high water table	Severe: high water table	Severe: high water table
Ha	Halsey silt loam	Severe: high water table	Severe: high water table	Severe: high water table
LoC	Lordstown silt loam, 5 to 15 percent slopes.	Moderate: slope	Severe: slope	Moderate: slope
LoD	Lordstown silt loam, 15 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope
LrD	Lordstown very stony silt loam, 8 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope
LrE	Lordstown very stony silt loam, 25 to 45 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Md	Mine dumps	Severe: slope	Severe: slope	Severe: slope
Mp	Muck and peat	Severe: high water table	Severe: high water table	Severe: high water table

for recreational uses—Continued

Paths and trails	Picnic and play areas (extensive use)	Athletic fields (intensive use)	Golf fairways
Moderate: gravelly	Moderate: gravelly	Severe: gravelly	Moderate: gravelly.
Moderate: gravelly	Moderate: gravelly	Severe: gravelly	Moderate: gravelly.
Moderate: gravelly	Moderate: slope; gravelly	Severe: slope; gravelly	Moderate: gravelly; slope.
Moderate: gravelly	Severe: slope	Severe: slope; gravelly	Severe: slope.
Moderate: gravelly	Moderate: slope	Severe: slope; gravelly	Moderate: slope; gravelly.
Moderate: slope; gravelly	Severe: slope	Severe: slope; gravelly	Severe: slope.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight.
Slight	Moderate: slope	Severe: slope	Moderate: slope.
Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Slight	Moderate: slope	Severe: slope	Moderate: slope; moderate depth to bedrock.
Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope; stony	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.

TABLE 8.—*Soil limitations*

Map symbol	Soil	Campsites		Buildings without basements
		Tents	Trailers	
Pa	Papakating silt loam	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
RaA	Ravenna silt loam, 0 to 3 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
RaB2	Ravenna silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
RaC2	Ravenna silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonal high water table.	Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope.
RaC3	Ravenna silt loam, 8 to 15 percent slopes, severely eroded.	Severe: seasonal high water table.	Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope.
RaD2	Ravenna silt loam, 15 to 25 percent slopes, moderately eroded.	Severe: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Severe: slope
ReC	Ravenna very stony silt loam 0 to 15 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope.
Rf	Red Hook silt loam, flooded	Severe: seasonal high water table; flooding.	Severe: seasonal high water table; flooding.	Severe: flooding
Rh	Red Hook silt loam, low terrace.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
RoB2	Red Hook silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
StB	Strip mine spoil, gently sloping.	Variable	Variable	Variable
StC	Strip mine spoil, moderately steep.	Variable	Variable	Variable
StE	Strip mine spoil, steep	Severe: slope	Severe: slope	Severe: slope
Un	Unadilla silt loam	Slight	Slight	Slight
Ur	Urban land	Variable	Variable	Variable
Wa	Wayland silt loam, coarse variant.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table

for recreational uses—Continued

Paths and trails	Picnic and play areas (extensive use)	Athletic fields (intensive use)	Golf fairways
Severe: high water table.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope.
Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Severe: erosion.
Moderate: seasonal high water table; slope.	Severe: slope.	Severe: seasonal high water table; slope.	Severe: slope.
Moderate: seasonal high water table; stoniness.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope; stony.
Moderate: seasonal high water table.	Moderate: seasonal high water table; flooding.	Severe: seasonal high water table.	Moderate: seasonal high water table; flooding.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Variable.	Variable.	Variable.	Variable.
Variable.	Variable.	Variable.	Variable.
Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Slight.	Slight.	Slight.	Slight.
Variable.	Variable.	Variable.	Variable.
Severe: high water table.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.

The limitations for buildings without basements apply to seasonal and year-round cottages, washrooms and bathhouses, picnic shelters, and service buildings. Depth to bedrock and depth to the water table are more significant if the buildings have basements. The capacity of the soil to support vegetation is an extra feature to be considered.

Paths and trails are intended for cross-country hiking, horseback riding, and nonintensive uses that allow people to move at random. It is assumed that the areas are to be used in their natural state and that little disturbance of the soil will be needed. Swamps, marshes, peat bogs, and sand dunes have severe limitations.

For picnic grounds and play areas, the presence of trees or lakes as well as favorable soil features are likely to affect the choice of sites. Only soil features are reflected in the ratings of limitations given in table 8. The capacity of the soil to support vegetation is also to be considered.

The limitations for athletic fields apply to playgrounds for intensive use as well as to facilities for baseball, football, badminton, and other organized games. Such areas are subjected to intensive foot traffic. Nearly level terrain, good drainage, and a firm surface layer are generally needed. The most desirable areas are free of rock outcrops and coarse fragments. The capacity to support a good vegetative cover is important.

The limitations for golf fairways are based on the assumption that the areas will be used for turf, shrubs, and trees and that no topsoil will be added. Traps and roughs are not considered part of the fairways.

Landscape Plantings

Table 9 is a guide to the selection of trees, shrubs, and vines for use in landscaping homes, communities, and recreational areas. (The drainage class of a given soil can be found in the series description.)

TABLE 9.—*Guide for landscape plantings*

[The letter "X" indicates species is suitable for the specified use]

DECIDUOUS TREES

Common and botanical names	Drainage suitability range	Shade tolerant	Uses				Potential height	Growth rate
			Shade	Ornament	Wildlife			
					Food	Cover		
							Ft.	
Ash, white (Fraxinus americana)	Good to somewhat poor	No	X	X	X		50+	Rapid.
Basswood (Tilia americana)	Good to somewhat poor	Yes	X				50+	Rapid.
Beech (Fagus grandifolia)	Good to somewhat poor	Yes	X	X	X	X	50+	Slow.
Birch:								
Paper (Betula papyrifera)	Good to somewhat poor	No		X	X		50+	Rapid.
Yellow (B. lutea)	Good to somewhat poor	No		X	X		50+	Moderate.
Blackgum (Nyssa sylvatica)	Good to somewhat poor	No	X	X	X		50+	Slow.
Butternut (Juglans cinerea)	Good to moderately good	No	X	X	X		50+	Rapid.
Catalpa (Catalpa speciosa)	Good to somewhat poor	No		X			50+	Moderate.
Cherry, black (Prunus serotina)	Good to moderately good	No			X		50+	Moderate.
Chestnut, Chinese (Castanea mollissima)	Good to moderately good	No		X	X		25–50	Rapid.
Crabapple, flowering (Malus spp.)	Good to moderately good	No		X	X		15–25	Moderate.
Cucumbertree (Magnolia acuminata)	Good to somewhat poor	Yes	X	X	X		50+	Moderate.
Dogwood, flowering (Cornus florida)	Good to somewhat poor	Yes		X	X		25	Slow.
Ginkgo (Ginkgo biloba) [1]	Good to moderately good	No	X	X			50+	Moderate.
Hackberry (Celtis occidentalis)	Good to moderately good	No		X	X		25–50	Moderate.
Hawthorn (Crataegus spp.) [2]	Good to somewhat poor	No		X	X		15	
Horsechestnut (Aesculus hippocastanum)	Good to moderately good	No	X	X			50+	Moderate.
Locust:								
Black (Robinia pseudoacacia)	Good to moderately good	No			X	X	50+	Rapid.
Honeylocust (Gleditsia triacanthos)	Good to moderately good	No	X	X	X	X	50+	Rapid.
Maple:								
Red (Acer rubrum)	Good to poor	No	X	X			50+	Rapid.
Silver (A. saccharinum)	Good to somewhat poor	No	X				50+	Rapid.
Sugar (A. saccharum)	Good to somewhat poor	Yes	X	X	X	X	50+	Rapid.
Mountain-ash (Sorbus spp.)	Good to somewhat poor	No		X	X		25–50	Rapid.
Mulberry, white (Morus alba)	Good to somewhat poor	No		X	X		25–50	Rapid.
Oak:								
Pin (Quercus palustris)	Good to somewhat poor	No	X	X	X		50+	Moderate.
Red (Q. rubra)	Good to somewhat poor	No	X	X	X		50+	Rapid.
Scarlet (Q. coccinia)	Good to somewhat poor	No	X		X		50+	Moderate.
White (Q. alba)	Good to moderately good	No	X		X		50+	Slow.
Sassafras (Sassafras albidum)	Good to moderately good	No	X	X	X	X	25–50	Moderate.
Serviceberry, or Juneberry (Amelanchier canadensis).	Good to moderately good	Yes	X	X	X		25–50	Moderate.
Sycamore (Plantanus occidentalis)	Good to somewhat poor	No	X				50+	Moderate.
Tuliptree (Liriodendron tulipifera)	Good to somewhat poor	No	X				50+	Rapid.
Walnut, black (Juglans nigra)	Good to moderately good	No			X		50+	Rapid.
Willow:								
Pussy (Salix discolor)	Good to poor	No		X			25	Rapid.
Weeping (S. babylonica)	Good to poor	No	X	X			25–50	Rapid.

See footnotes at end of table.

TABLE 9.—*Guide for landscape plantings*—Continued

EVERGREEN TREES

Common and botanical names	Drainage suitability range	Shade tolerant	Uses: Shade	Uses: Ornament	Uses: Wildlife Food	Uses: Wildlife Cover	Uses: Screen	Uses: Hedge	Uses: Critical area	Uses: Windbreak	Potential height	Growth rate
											Ft.	
Arborvitae:												
American (Thuja occidentalis).	Good to somewhat poor.	No	---	X	---	X	X	X	---	X	50+	Slow.
Oriental (T. orientalis).	Good to somewhat poor.	No	---	X	---	X	X	X	---	X	25–50	Slow.
Cedar, common (Juniperus communis).	Good to moderately good.	No	---	---	X	X	---	---	X	---	25	Slow.
Hemlock, eastern (Tsuga canadensis).	Good to moderately good.	Yes	---	X	X	X	X	X	---	X	50+	Moderate.
Larch:												
European (Larix decidua).	Good to moderately good.	No	X	---	---	---	---	---	---	---	50+	Rapid.
Japanese (L. leptolepis).	Good to moderately good.	No	X	---	---	---	---	---	X	---	50+	Rapid.
Pine:												
Austrian (Pinus nigra).	Good to moderately good.	No	X	X	X	---	X	---	---	X	50+	Rapid.
Red (P. resinosa)	Good to moderately good.	No	X	---	X	---	X	---	---	X	50+	Rapid.
White (P. strobus)	Good to poor	Yes	X	X	X	X	X	---	---	X	50+	Rapid.
Spruce:												
Norway (Picea abies)	Good to somewhat poor.	Yes	X	X	X	---	X	X	---	X	50+	Moderate.
White (P. glauca)	Good to somewhat poor.	Yes	X	X	X	---	X	X	---	X	50+	Moderate.

DECIDUOUS SHRUBS

Common and botanical names	Drainage suitability range	Shade tolerant	Uses: Ornament	Uses: Barrier	Uses: Wildlife Food	Uses: Wildlife Cover	Uses: Screen	Uses: Hedge	Uses: Critical area	Uses: Windbreak	Normal height
											Ft.
Autumn olive, cardinal (Elaeagnus umbellata).	Good to moderately good.	No	X	X	X	X	X	---	X	X	10–15
Azalea:											
Flame (Rhododendron calendulaceum).	Good	Yes	X	---	---	---	---	---	---	---	10–15
Wild honeysuckle (R. nudiflorum).	Good	Yes	X	---	---	---	---	---	---	---	5–10
Barberry, thunberg (Berberis thunbergi).	Good to moderately good	No	X	X	X	---	---	X	---	---	6–10
Bayberry (Myrica caroliniensis)	Good to moderately good	No	X	---	X	---	---	X	X	---	6–10
Blackhaw (Viburnum prunifolium).	Good to somewhat poor	Yes	---	---	X	---	---	---	---	---	15–20
Blueberry, low bush (Vaccinum augustifolium).	Good	Yes	---	---	X	X	---	---	---	---	2–6
Coralberry (Symphoricarpos orbiculatus).	Good to somewhat poor	No	---	---	X	X	---	---	X	---	2–6
Cranberry, highbush (Viburnum trilobum).	Good to somewhat poor	No	---	X	X	---	---	X	---	---	10–15
Dogwood:											
Grey stem (Cornus racemosa)	Good to poor	Yes	---	---	X	---	X	---	X	---	10
Red-osier (C. stolonifera)	Good to poor	Yes	---	X	X	---	X	X	---	---	10
Elderberry:											
Common (Sambucus canadensis).	Good to poor	No	---	---	X	---	---	---	---	---	6–10
Scarlet (S. pubens)	Good to poor	No	---	X	X	---	---	---	---	---	6–10

See footnotes at end of table.

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TABLE 9.—*Guide for landscape plantings*—Continued

DECIDUOUS SHRUBS

Common and botanical names	Drainage suitability range	Shade tolerant	Uses								Normal height
			Ornament	Barrier	Wildlife		Screen	Hedge	Critical area	Windbreak	
					Food	Cover					
Honeysuckle:											*Ft.*
Amur (Lonicera maacki)	Good to moderately good.	Yes		X	X		X		X		10–15
Tatarian (L. tatarica)	Good to moderately good.	Yes		X	X		X		X		10–15
Holly, mountain (Nemopanthos mucronata).	Good to poor	Yes		X	X						6–10
Privet, Amur (Ligustrum amurense).	Good to moderately good.	No			X		X		X	X	15–20
Spicebush (Lindera benzoin)	Good to somewhat poor	Yes			X						10–15
Sumac:											
Shining (Rhus copallina)	Good to moderately good.	No	X		X				X		10–20
Fragrant (R. aromatica)	Good to moderately good.	No	X		X		X				3
Smooth (R. glabra)	Good to moderately good.	No	X		X				X		10–15
Staghorn (R. typhina)	Good to moderately good.	No	X		X		X		X		10–20
Willow, purple-ozier (Salix purpurea).	Good to poor										15–20
Winterberry (Ilex verticillata)	Good to poor	Yes	X		X						10
Witch-hazel (Hamamelis virginiana).	Good to somewhat poor	Yes			X	X					10–20

EVERGREEN SHRUBS

Common and botanical names	Drainage suitability range	Shade tolerant	Ornament	Barrier	Food	Cover	Screen	Hedge	Critical area	Windbreak	Normal height
Azalea (Rhododendron spp.)	Good	Yes	X		X						5–10
Laurel, mountain (Kalmia latifolia).	Good to somewhat poor	Yes	X		X	X					5–15
Pine, mugo (Pinus mugo)	Good to moderately good	No	X		X			X	X		10
Rhododendron (Rhododendron maximum).	Good to somewhat poor	Yes	X		X	X	X				10–15
Yew:											
Japanese (Taxus cuspidata)	Good	Yes	X		X		X	X		X	[3]
Medium (T. media)	Good	Yes	X		X		X	X		X	[3]

VINES AND OTHER PLANTS FOR GROUND COVER

Common and botanical names	Drainage suitability range	Shade tolerant	Uses				Normal height or length	Normal height of ground cover
			Ornament	Wildlife		Critical area		
				Food	Cover			
Fern	Good to poor	Yes	X				*Ft.* 1–3	*Ft.* 1–3
Honeysuckle (Lonicera Japonica)	Good to somewhat poor	Yes		X	X	X	20+	2
Ivy, English (Hedera helix)	Good to moderately good	Yes	X			X		1+
Juniper, spreading (Juniperus horizontalis)	Good to somewhat poor	No	X	X	X	X		3
Myrtle (Vinca minor)	Good to moderately good	Yes	X					¾
Pachysandra (Pachysandra terminalis)	Good to moderately good	Yes	X					¾
Teaberry (Gaultheria procumbens)	Good to somewhat poor	Yes		X				½
Virginia creeper (Parthenocissus quinquefolia).	Good to moderately good	Yes		X	X		15+	

[1] Plant males only. [2] Also suitable for a screen. [3] Variable.

Soil Interpretations for Wildlife Habitat

The wildlife population of an area depends on the availability of food, cover, and water in suitable combinations. The nature, abundance, and distribution of vegetation that affords food and cover depend on the soils. The natural pattern of vegetation in a given area will fulfill the habitat requirements of particular kinds of wildlife. Altering natural conditions by draining wet areas, farming, and managing forests changes the pattern of vegetation and thus alters the habitat. Habitat for a particular kind of wildlife can be created, improved, or maintained by establishing or protecting suitable vegetation and developing water supplies.

Mercer County supports a wide variety and a good population of wildlife. Hunting for deer and small game is excellent throughout the county. Thirteen hundred and twenty-four acres of State Game Land is open to the public for hunting. Three streams that have a total length of nearly 36 miles afford fishing both for warm-water species and for trout. Three other streams that total an additional 68 miles are excellent for warm-water species, as is also Sandy Lake, which has an area of 150 acres.

Table 10 rates the suitability of each soil in Mercer County for eight elements of wildlife habitat and for three kinds of wildlife. The ratings are based on criteria and definitions contained in "Rating Northeastern Soils for their Suitability for Wildlife Habitat" (*1*). Each rating reflects only the characteristics of the individual soil.

Climate, the present use of the soil, the distribution of wildlife and human populations, the existing vegetation, and the nature of the surrounding soils were not considered. Onsite inspection is needed to determine whether a particular site is suitable.

TABLE 10.—*Suitability of the soils for wildlife habitat*

[A rating of 1 means well suited; 2 means suited; 3 means poorly suited; 4 means unsuited. Ratings based on "Rating Northeastern Soils for their Suitability for Wildlife Habitat" (*1*)]

Map symbol	Soils	Wildlife habitat elements								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
BrB2	Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	3	1	1	4
BrC2	Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	3	1	1	4
BvA	Braceville silt loam, 0 to 3 percent slopes.	2	1	1	1	3	3	3	3	1	1	3
BvB2	Braceville silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	3	1	1	4
BvC2	Braceville silt loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
Ca	Caneadea silt loam	2	1	1	1	3	3	3	3	1	1	3
CdA	Canfield silt loam, 0 to 3 percent slopes.	2	1	1	1	3	3	3	3	1	1	3
CdB2	Canfield silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	3	1	1	4
CdC2	Canfield silt loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
CdC3	Canfield silt loam, 8 to 15 percent slopes, severely eroded.	3	2	2	1	3	4	4	4	2	2	4
CdD2	Canfield silt loam, 15 to 25 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
CdE	Canfield silt loam, 25 to 35 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
Cf	Chenango fine sandy loam, flooded.	2	1	2	2	3	4	4	4	1	2	4
Ch	Chenango fine sandy loam, low terrace.	2	1	2	2	3	4	4	4	1	2	4

TABLE 10.—*Suitability of the soils for wildlife habitat*—Continued

Map symbol	Soils	Wildlife habitat elements								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
ClA	Chenango gravelly loam, 0 to 3 percent slopes.	1	1	1	1	3	4	4	4	1	1	4
ClB2	Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
ClC2	Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
ClD2	Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	3	2	4
CnC2	Chenango gravelly loam, moderately eroded, rolling.	2	2	1	1	3	4	4	4	1	2	4
CnD2	Chenango gravelly loam, moderately eroded, hilly.	3	2	1	1	3	4	4	4	2	2	4
CoA	Chenango silt loam, 0 to 3 percent slopes.	1	1	1	1	3	4	4	4	1	1	4
CoB2	Chenango silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
CoC2	Chenango silt loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
CoD2	Chenango silt loam, 15 to 25 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
FeA	Frenchtown silt loam, 0 to 3 percent slopes.	3	3	2	2	2	1	1	1	3	2	1
FeB2	Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded.	3	3	2	2	2	3	4	1	3	2	3
FhB	Frenchtown very stony silt loam, 0 to 8 percent slopes.	4	3	2	2	2	3	4	2	3	2	4
Fr	Frenchtown and Luray silt loams.	3	3	2	2	2	1	1	1	3	2	1
Ha	Halsey silt loam	4	3	3	1	1	1	1	1	3	1	1
LoC	Lordstown silt loam, 5 to 15 percent slopes.	2	2	2	2	2	4	4	4	2	2	4
LoD	Lordstown silt loam, 15 to 25 percent slopes.	3	2	2	2	2	4	4	4	2	2	4
LrD	Lordstown very stony silt loam, 8 to 25 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
LrE	Lordstown very stony silt loam, 25 to 45 percent slopes.	4	4	2	2	2	4	4	4	3	3	4
Md	Mine dumps. Variable.	---	---	---	---	---	---	---	---	---	---	---
Mp	Muck and peat. Variable.	---	---	---	---	---	---	---	---	---	---	---
Pa	Papakating silt loam	4	3	3	1	1	1	1	1	3	1	1
RaA	Ravenna silt loam, 0 to 3 percent slopes.	3	3	2	2	2	2	2	2	3	2	2
RaB2	Ravenna silt loam, 3 to 8 percent slopes, moderately eroded.	3	3	2	2	2	3	2	2	3	2	2
RaC2	Ravenna silt loam, 8 to 15 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4
RaC3	Ravenna silt loam, 8 to 15 percent slopes, severely eroded.	3	3	2	2	2	4	4	4	3	2	4
RaD2	Ravenna silt loam, 15 to 25 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4
ReC	Ravenna very stony silt loam, 0 to 15 percent slopes.	4	3	2	2	2	4	4	4	3	2	4

TABLE 10.—*Suitability of the soils for wildlife habitat*—Continued

Map symbol	Soils	Wildlife habitat elements								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Rf	Red Hook silt loam, flooded	3	2	2	1	2	1	1	1	2	1	1
Rh	Red Hook silt loam, low terrace	3	2	2	1	2	1	1	1	2	1	1
RoB2	Red Hook silt loam, 3 to 8 percent slopes, moderately eroded.	3	2	2	1	2	1	4	1	3	2	2
StB	Strip mine spoil, gently sloping. Variable.											
StC	Strip mine spoil, moderately steep. Variable.											
StE	Strip mine spoil, steep. Variable.											
Un	Unadilla silt loam	1	1	1	1	3	4	4	4	1	1	4
Ur	Urban land. Variable.											
Wa	Wayland silt loam, coarse variant.	2	1	1	1	3	3	3	3	1	1	3

In table 10 a rating of 1 means well suited. Wildlife habitat generally is easily created, improved, or maintained; there are few or no limitations that affect management; and satisfactory results are probable.

A rating of 2 means suited. Habitat can be created, improved, or maintained in most places; the limitations affecting management are moderate; and moderately intensive management and fairly frequent attention will bring satisfactory results.

A rating of 3 means poorly suited. Although habitat can be created, improved, or maintained in most places, the limitations are rather severe; management is difficult and expensive and requires intensive effort; and results are not always satisfactory.

A rating of 4 means unsuited. It is impractical or impossible to create, improve, or maintain wildlife habitat; and satisfactory results are improbable.

The elements of habitat for which the soils are rated are defined as follows:

Grain and seed crops.—These are domestic grains or seed-producing annual herbaceous plants that are planted to produce food for wildlife. Examples are corn, sorghum, wheat, millet, buckwheat, soybeans, and sunflower.

Grasses and legumes.—These are domestic perennial grasses and herbaceous legumes, established by planting, that furnish wildlife cover and food. Examples are fescues, bromegrass, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants.—These are native or introduced perennial grasses or forbs (weeds) that provide food and cover principally for upland wildlife. They are established mainly through natural processes. Examples are ragweed, wheatgrass, wild rye, oatgrass, pokewood, strawberry, beggarweed, goldenrod, and dandelion.

Hardwood woody plants.—These are deciduous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs, and foliage used extensively as food for wildlife. These plants commonly are established through natural processes, but they also may be planted. Examples are oak, beech, cherry, hawthorn, dogwood, viburnum, holly, maple, birch, poplar, grape, honeysuckle, blueberry, brier, greenbrier, raspberry, and rose.

Coniferous woody plants.—These are cone-bearing trees and shrubs that are important mainly as cover but also furnish some food in the form of browse, seeds, and cones. These plants are commonly established through natural processes, but they also may be planted. Examples are pine, spruce, white-cedar, hemlock, fir, red-cedar, juniper, and yew.

Wetland food and cover plants.—These are annual and perennial wild herbaceous plants that grow in moist and wet sites and afford food and cover mainly for wetland wildlife. Examples are smartweed, wild millet, bulrushes, sedge, wildrice, switchgrass, reed canarygrass, and cattails. Submerged or floating aquatic plants are not included.

Shallow water developments.—These are impounded or excavated areas in which the water generally is not more than 5 feet deep. The water is impounded or controlled by low dams or levees, dugouts, level ditches, or other devices.

Excavated ponds.—These are dugout areas or combinations of dugout and dammed areas that hold water of suitable quality, adequate depth, and ample supply for the production of fish. An example is a pond that has at least one-fourth of an acre of surface area, an average depth of at least 6 feet over at least one-fourth of the area, and a dependably high water table or some other source of unpolluted water of low acidity.

The three kinds of wildlife are defined as follows:

Open-land wildlife.—These are birds and mammals that frequent crop fields, meadows, pastures, and nonforested, overgrown lands. They include bobwhite quail, ringneck pheasants, mourning doves, woodcocks, cottontail rabbits, meadowlarks, killdeer, and field sparrows.

Woodland wildlife.—These are birds and mammals that frequent wooded areas. They include ruffed grouse, wild turkeys, deer, squirrels, raccoons, wood thrushes, warblers, and vireos.

Wetland wildlife.—These are birds and mammals that frequent marshes and swamps. They include ducks, geese, herons, snipes, rails, coots, muskrats, mink, and beaver.

Descriptions of the Soils

In this section the soils of Mercer County are described in detail. The procedure is to describe first the soil series and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs.

Each series description contains a short description of a soil profile considered typical of the series and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. If the profile of a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent from the name of the mapping unit. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and some are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 11. At the back of this publication is the "Guide to Mapping Units," which lists the mapping units in the county and shows the capability unit each is in and the pages on which the mapping units and the capability units are described.

TABLE 11.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded	3, 410	0. 8	Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded	15, 150	3. 5
Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded	640	. 1	Frenchtown very stony silt loam, 0 to 8 percent slopes	830	. 2
Braceville silt loam, 0 to 3 percent slopes	1, 190	. 3	Frenchtown and Luray silt loams	8, 870	2. 0
Braceville silt loam, 3 to 8 percent slopes, moderately eroded	9, 160	2. 1	Halsey silt loam	14, 610	3. 4
Braceville silt loam, 8 to 15 percent slopes, moderately eroded	1, 310	. 3	Lordstown silt loam, 5 to 15 percent slopes	580	. 1
Caneadea silt loam	590	. 1	Lordstown silt loam, 15 to 25 percent slopes	480	. 1
Canfield silt loam, 0 to 3 percent slopes	3, 590	. 8	Lordstown very stony silt loam, 8 to 25 percent slopes	1, 270	. 3
Canfield silt loam, 3 to 8 percent slopes, moderately eroded	34, 360	7. 9	Lordstown very stony silt loam, 25 to 45 percent slopes	3, 630	. 8
Canfield silt loam, 8 to 15 percent slopes, moderately eroded	19, 970	4. 6	Mine dumps	170	(1)
Canfield silt loam, 8 to 15 percent slopes, severely eroded	840	. 2	Muck and peat	2, 320	. 5
Canfield silt loam, 15 to 25 percent slopes, moderately eroded	5, 360	1. 2	Papakating silt loam	7, 640	1. 8
Canfield silt loam, 25 to 35 percent slopes	1, 350	. 3	Ravenna silt loam, 0 to 3 percent slopes	32, 170	7. 4
Chenango fine sandy loam, flooded	810	. 2	Ravenna silt loam, 3 to 8 percent slopes, moderately eroded	123, 320	28. 3
Chenango fine sandy loam, low terrace	450	. 1	Ravenna silt loam, 8 to 15 percent slopes, moderately eroded	7, 910	1. 8
Chenango gravelly loam, 0 to 3 percent slopes	1, 110	. 3	Ravenna silt loam, 8 to 15 percent slopes, severely eroded	480	. 1
Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded	10, 510	2. 4	Ravenna silt loam, 15 to 25 percent slopes, moderately eroded	2, 090	. 5
Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded	5, 440	1. 2	Ravenna very stony silt loam, 0 to 15 percent slopes	2, 390	. 5
Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded	1, 560	. 4	Red Hook silt loam, flooded	1, 800	. 4
Chenango gravelly loam, moderately eroded, rolling	3, 820	. 9	Red Hook silt loam, low terrace	620	. 1
Chenango gravelly loam, moderately eroded, hilly	1, 240	. 3	Red Hook silt loam, 3 to 8 percent slopes, moderately eroded	7, 870	1. 8
Chenango silt loam, 0 to 3 percent slopes	480	. 1	Strip mine spoil, gently sloping	520	. 1
Chenango silt loam, 3 to 8 percent slopes, moderately eroded	2, 870	. 7	Strip mine spoil, moderately steep	1, 040	. 2
Chenango silt loam, 8 to 15 percent slopes, moderately eroded	1, 350	. 3	Strip mine spoil, steep	2, 910	. 7
Chenango silt loam, 15 to 25 percent slopes, moderately eroded	330	. 1	Unadilla silt loam	120	(1)
Frenchtown silt loam, 0 to 3 percent slopes	56, 270	12. 9	Urban land	710	. 2
			Wayland silt loam, coarse variant	26, 990	6. 2
			Water	300	. 1
			Gravel pits	980	. 2
			Quarries	60	(1)
			Total	435, 840	99. 9

[1] Less than 0.05 percent. These items total 0.1 percent.

Braceville Series

The Braceville series consists of moderately well drained soils that developed on thick deposits of sand and gravel. They occur along major drainageways in Mercer County and on moraines in the southeastern part of the county. These soils have a moderately slowly permeable fragipan in the lower part of the subsoil. The water table is within 18 to 30 inches of the surface for a month or two in spring.

In a typical profile, the plow layer is dark grayish-brown gravelly loam about 9 inches thick. The upper part of the subsoil is yellowish-brown gravelly loam over dark-brown gravelly loam. Below a depth of 25 inches is a fragipan of yellowish-brown gravelly sandy loam. The substratum, which is at a depth of 36 inches, is predominantly dark-brown gravelly sandy loam.

Some fields of Braceville soils have been cultivated but are now idle or are planted to trees. The seasonal high water table and the moderately slow movement of water through the fragipan are limitations for many uses.

Representative profile of Braceville gravelly loam in a gently sloping strawberry field 2 miles southwest of Mercer. This is the profile from which Pennsylvania Department of Highways soil test samples S63 Pa-43-30-1 and 2 were collected.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) gravelly loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; many roots; 15 percent gravel; strongly acid (pH 5.4); abrupt, smooth boundary. 8 to 10 inches thick.

B1—9 to 12 inches, yellowish-brown (10YR 5/4) gravelly loam; moderate, fine, subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; common roots; 15 percent gravel; very strongly acid (pH 5.0); clear, wavy boundary. 2 to 5 inches thick.

B2—12 to 25 inches, dark-brown (7.5YR 4/4) gravelly loam; weak, medium to coarse, subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; common roots; 20 to 25 percent gravel; medium acid (pH 5.6); abrupt, wavy boundary. 10 to 22 inches thick.

Bx—25 to 36 inches, yellowish-brown (10YR 5/4) gravelly loam; mottled with yellowish brown (10YR 5/4) on faces of platy peds and in ¼-inch, vertical, grayish-brown (10YR 5/2) bands between prisms; strong, coarse, prismatic structure and weak, medium to thick, platy structure; brittle, friable when removed but firm in place, nonsticky and slightly plastic when wet; few clay films in pores, and patchy clay films on platy peds; roots common along prism faces; 25 to 30 percent gravel; medium acid (pH 5.8); clear, wavy boundary. 8 to 18 inches thick.

C—36 to 50 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; mottled with yellowish brown (10YR 5/4) on prism faces and in yellowish-red (5YR 4/6), ¼-inch, vertical bands adjacent to prism faces; strong, very coarse, prismatic structure; friable to firm when moist, nonsticky and slightly plastic when wet; 15 percent gravel; very strongly acid (pH 4.6).

The Ap horizon is dark brown (7.5YR 3/2) to very dark grayish brown (10YR 3/2). In undisturbed areas, a 1- to 3-inch, black or very dark brown, granular A1 horizon overlies a 3- to 5-inch, brown or yellowish-brown, granular A2 horizon. The texture of the A horizon is gravelly loam to silt loam. The gravel content ranges from 10 to 25 percent.

The B1 horizon is dark brown to yellowish brown, (hue 7.5YR or 10YR, value 3 to 5, and chroma 3 to 5). The structure is moderate, medium, granular to moderate, medium, subangular blocky. The gravel content ranges from 10 to 25 percent.

The B2 horizon is dark brown to yellowish brown, (hue 7.5YR or 10YR, value to 3 to 5, and chroma 3 to 4). The texture is gravelly loam to silt loam. The structure is weak, medium, prismatic to moderate, medium to coarse, subangular blocky. The gravel content ranges from 10 to 25 percent.

The depth to the Bx horizon (fragipan) ranges from 20 to 32 inches. The texture is gravelly loam to gravelly loamy sand.

The depth to the C horizon ranges from 30 to 55 inches.

Braceville soils lack the horizon of clay accumulation that is typical of the Canfield soils. Braceville soils differ from Red Hook soils in having no mottles within 20 inches of the surface. They differ from Chenango soils in having mottles above a depth of 40 inches.

Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded (BrB2).—This soil has the profile described as typical for the series. Included in mapping were some areas of nearly level and sloping Braceville soils, of Red Hook soils in depressions, and of gently sloping Canfield soils.

Because several inches of the surface layer has been lost through erosion, the plow layer now consists partly of the brighter colored subsoil. The erosion hazard is moderate in cultivated areas. The water table is seasonally high, and movement of water through the fragipan is moderately slow. Drainage improves tilth and workability.

Most of this soil is cultivated. The seasonal high water table and the restricted permeability of the fragipan limit the use of this soil for sewage disposal fields and building sites. (Capability unit IIe-2)

Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded (BrC2).—In this soil the subsoil is thinner and the fragipan is nearer the surface than in the soil that has the typical profile. Areas still in woodland are comparatively uneroded. Included in mapping were small areas of severely eroded Braceville soils, of Chenango soils, and of Canfield soils.

The erosion hazard is severe in cultivated areas. The water table is seasonally high, and movement of water through the fragipan is moderately slow. Erosion control practices and drainage are needed.

Most of this soil is cultivated. The slope, the seasonal high water table, and the restricted permeability of the fragipan limit the use of this soil for sewage disposal fields and for building sites. (Capability unit IIIe-2)

Braceville silt loam, 0 to 3 percent slopes (BvA).—This soil is similar to the soil described as having the profile that is typical for the series, but the surface is silt loam and the depth to the fragipan is slightly greater. Included in mapping were some areas of gently sloping Braceville soils, of Halsey soils in depressions, and of nearly level Canfield and Chenango soils.

This Braceville soil has a seasonal high water table and moderately slow movement of water through the fragipan. Drainage would improve soil tilth and workability.

Most of this soil is cultivated. The seasonal high water table and the restricted permeability of the fragipan limit use for sewage disposal fields and for building sites. (Capability unit IIw-1)

Braceville silt loam, 3 to 8 percent slopes, moderately eroded (BvB2).—This soil is similar to the soil described as having the profile that is typical for the series, but the surface is silt loam. Because several inches of the surface layer has been lost through erosion, the plow layer now consists partly of the brighter colored subsoil. Included in mapping were areas of nearly level and sloping Braceville soils, of Red Hook soils in depressions, and of gently sloping Canfield soils.

The hazard of erosion is moderate in cultivated areas. The water table is seasonally high, and movement of water through the fragipan is moderately slow. Drainage will improve tilth and workability.

Most of this soil is cultivated. The seasonal high water table and the restricted permeability of the fragipan limit use for sewage disposal fields and for building sites. (Capability unit IIe-2)

Braceville silt loam, 8 to 15 percent slopes, moderately eroded (BvC2).—In this soil the subsoil is thinner and the fragipan is nearer the surface than in the soil described as having the profile that is typical for the series. Included in mapping were areas of severely eroded Braceville soils, of Chenango soils, and of Canfield soils. Areas still in woodland are comparatively uneroded.

The hazard of erosion is severe in cultivated areas. The water table is seasonally high, and water moves slowly through the fragipan. Erosion control practices and drainage are needed.

Much of this soil is cultivated. The slope, the seasonal high water table, and the restricted permeability of the fragipan limit use for sewage disposal fields and for building sites. (Capability unit IIIe-2)

Caneadea Series

The Caneadea series consists of somewhat poorly drained soils that developed in thick deposits of calcareous silt and clay. These soils have a slowly permeable subsoil and have a water table within 6 to 18 inches of the surface for several months each year.

A typical profile has an 8-inch plow layer of very dark grayish-brown silt loam. The subsoil is dark grayish-brown silty clay loam that is firm when moist and sticky when wet. The substratum, below a depth of 41 inches, is slightly calcareous, dark grayish-brown silty clay loam. It is firm when moist and sticky when wet. When broken, the natural aggregates in the subsoil and substratum are brown.

Most fields of Caneadea soils in this county have been cultivated, but some are now idle. The seasonal high water table and the slow internal movement of water are limitations for many uses.

Representative profile of Caneadea silt loam, in a nearly level cultivated field, near the Ohio line, 5 miles northwest of Transfer. This is the profile from which Pennsylvania Department of Highways test samples S63 Pa 43-28-1 and 2 were collected.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; many roots; neutral (pH 6.8); abrupt, smooth boundary. 7 to 9 inches thick.

B21tg—8 to 25 inches, silty clay loam; ped faces dark grayish brown (2.5Y 4/2); interior of peds brown (10YR 4/3) with many, medium, distinct, dark grayish-brown (2.5Y 4/2) mottles; moderate, medium to coarse, prismatic structure that breaks to moderate, medium to coarse, blocky structure; firm when moist, sticky and plastic when wet; common roots; common, thin, patchy clay films; neutral (pH 7.0); gradual, wavy boundary. 15 to 20 inches thick.

B22tg—25 to 41 inches, silty clay loam; ped faces dark grayish brown (2.5Y 4/2); ped interiors brown (10YR 4/3) with many, medium, distinct, dark grayish-brown (2.5Y 4/2) mottles; moderate, medium to coarse, prismatic structure that breaks to moderate, coarse, blocky structure; firm when moist, sticky and plastic when wet; few roots along prism faces; thin, continuous clay films; mildly alkaline (pH 7.6); clear, wavy boundary. 10 to 20 inches thick.

Cg—41 to 63 inches +, silty clay loam; dark grayish-brown (2.5Y 4/2) ped faces; interiors of peds brown (10YR 4/3) with many, medium, distinct, dark grayish-brown mottles; moderate, coarse, prismatic structure that breaks to weak, medium, blocky structure and to weak, thick, platy structure; firm when moist, sticky and plastic when wet; few roots along prism faces to a depth of 50 inches; thin, continuous clay films; slightly calcareous.

The Ap horizon is very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). In unplowed areas there is a 2- to 3-inch A1 horizon of very dark gray (2.5Y 3/1 or 10YR 3/1) to black (10YR 2/1) silt loam and a 3- to 5-inch A2 horizon of gray (10YR 5/1) or grayish-brown (10YR 5/2) silt loam.

In the B21tg horizon, the ped faces are dark grayish brown (10YR 4/2 or 2.5Y 4/2) to grayish brown (10YR 5/2). The ped interiors are brown (10YR 4/3) to yellowish brown (10YR 5/4). The mottles in this horizon include dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or strong brown (7.5YR 5/6). The texture ranges from silty clay loam to silt loam.

The B22tg horizon has about the same range in color as the B21tg horizon.

The depth to the C horizon ranges from 32 to 45 inches. In this horizon the ped faces are gray (N 5/0) to dark grayish brown (2.5Y 4/2 or 10YR 4/2) or grayish brown (10YR 5/2). The ped interiors and the mottles are about the same color as those in the B horizon. The texture of the C horizon ranges from silty clay loam to silty clay.

The solum is generally neutral or slightly acid in reaction. Coarse fragments are rare. The C horizon is neutral in places.

Caneadea soils have a finer textured solum than Frenchtown soils, and they lack the fragipan that is characteristic of Frenchtown soils. Luray and Halsey soils have a black surface layer, and Halsey soils have more sand and gravel in the solum than Caneadea soils.

Caneadea silt loam (Ca).—This nearly level soil occurs mainly in the western part of the county. Included in the areas mapped are areas of Caneadea soils that are free of mottles to a depth of 18 to 20 inches, of Caneadea soils that have slopes up to 12 percent, and of nearly level Frenchtown soils.

In this Caneadea soil, surface runoff is slow, the water table is seasonally high, and internal movement of water is slow. Drainage improves tilth and workability.

The seasonal high water table and the restricted permeability of the subsoil limit use of this soil for building sites or sewage disposal fields. (Capability unit IIIw-3)

Canfield Series

The Canfield series consists of moderately well drained soils that developed in thick deposits of glacial till. These soils have a slowly permeable fragipan in the lower part of the subsoil. The water table is within 18 to 30 inches of the surface for a month or two in spring.

A typical profile has a 10-inch surface layer of dark grayish-brown silt loam. The upper part of the subsoil is yellowish-brown to brown, firm silt loam. The lower part is very firm, brittle, gray to brown silt loam to gravelly loam mottled with gray and yellowish brown. The substratum, below a depth of 71 inches, is dark grayish-brown, friable gravelly sandy loam.

Many fields of Canfield soils in this county have been cultivated, but some are now idle or have been planted to trees. The seasonal high water table and the slow permeability of the fragipan are limitations for many uses.

Representative profile of Canfield silt loam, 3 to 8 percent slopes, moderately eroded, in a hayfield, 3 miles southwest of Mercer. This is the profile sampled for soil characterization by Pennsylvania State University (S63 Pa 43-3) and the one from which the Pennsylvania Department of Highways test samples S63 Pa 43-3-2 and 7 were taken.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and nonplastic when wet; 5 percent gravel up to 3 inches in diameter; neutral (pH 6.8); clear, smooth boundary. 7 to 11 inches thick.

B21t—10 to 18 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; firm when moist; slightly sticky and slightly plastic when wet; thin discontinuous clay films; 10 percent gravel up to 2 inches in diameter; strongly acid (pH 5.1); clear, wavy boundary. 4 to 10 inches thick.

B22t—18 to 25 inches, brown (10YR 5/3) silt loam; many, medium, distinct, light brownish-gray (10YR 6/2) and brown (7.5YR 5/4) mottles; moderate, fine and medium, subangular blocky structure; firm when moist, sticky and slightly plastic when wet; thin, discontinuous clay films; 10 percent gravel up to 2 inches in diameter; very strongly acid (pH 4.8); clear, wavy boundary. 3 to 9 inches thick.

Bx1g—25 to 40 inches, silt loam; gray (5Y 6/1) prism faces; brown (10YR 5/3) interiors with common, fine and medium, distinct, light brownish-gray (10YR 6/2) and brown (7.5YR 5/4) mottles; strong, coarse, prismatic structure that breaks to moderate, thick, platy and blocky structure; brittle; very firm in place and firm if displaced when moist, slightly sticky and slightly plastic when wet; thick films of clay and silt on prism faces; thin discontinuous clay films and some dark-brown coatings on faces of plates and blocks; 10 percent gravel up to 3 inches in diameter; very strongly acid (pH 4.9); gradual, wavy boundary. 10 to 18 inches thick.

Bx2g—40 to 62 inches, loam; light brownish-gray (2.5Y 6/2) prism faces; grayish-brown (10YR 5/2) interiors with common, fine, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4) mottles; some common black coatings on prism faces; moderate, very coarse (12 inches wide), prismatic structure that breaks to strong, thick, platy and blocky structure; brittle; very firm in place and firm if displaced when moist, slightly sticky and slightly plastic when wet; thin patches of clay films on ped faces and in pore linings; 15 percent gravel up to 3 inches in diameter; medium acid (pH 5.9); gradual, wavy boundary. 16 to 25 inches thick.

Bx3—62 to 71 inches, yellowish-brown (10YR 5/4) loam; many, medium, distinct, light brownish-gray (2.5Y 6/2) and brown (7.5YR 5/4) mottles; weak, coarse, prismatic structure that breaks to moderate, thick, platy and blocky structure; brittle; firm in place and friable if displaced when moist, slightly sticky and slightly plastic when wet; few thin patches of clay films on ped faces; 15 percent gravel up to 3 inches in diameter; slightly acid (pH 6.0); gradual, wavy boundary. 5 to 12 inches thick.

C—71 to 89 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam; massive; friable when moist, nonsticky and nonplastic when wet; few clay films in pores and bridging between pebbles; 20 percent coarse fragments of gravel up to 2 inches in diameter; medium acid (pH 5.9).

In wooded areas there is a 3- to 6-inch A1 horizon of very dark grayish-brown or dark grayish-brown silt loam and a 3- to 8-inch A2 horizon of brown or yellowish-brown silt loam.

The B21t horizon is yellowish brown to brown or light yellowish brown (hue 10YR, value 5 or 6, and chroma 3 or 4). The structure is dominantly moderate, medium, subangular blocky but in places is weak, medium, platy. The reaction is strongly acid to medium acid.

The B22t horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4), and the mottles are gray (10YR 6/1), light brownish gray (10YR 6/2), or brown (7.5YR 5/4). The structure of this horizon is dominantly moderate, medium and fine, subangular blocky but ranges to moderate, medium and fine, blocky and in some places tends toward platy. The reaction is strongly acid or very strongly acid.

The depth to the fragipan (Bx horizon) ranges from 14 to 30 inches. The interiors of the prisms in this horizon range from grayish brown (10YR 5/2) to yellowish brown (10YR 5/4) in color and have mottles of brown (7.5YR 5/4), gray (10YR 6/1), or light brownish gray (10YR 6/2). The faces of the prisms have a coating of gray (2.5Y 6/1 or 10YR 6/1) silty material, one-eighth to three-eighths of an inch thick. The structure of the fragipan is mainly prismatic but in some places is moderate to strong, medium and thick, platy and in a few places is moderate, medium, blocky. The reaction of the Bx horizon ranges from very strongly acid to slightly acid.

The C horizon ranges from dark grayish brown to brown or light olive brown (hue 10YR or 2.5Y, value 4 to 5, and chroma 2 to 4). In texture it ranges from sandy loam to loam or silt loam. This horizon generally lacks the large prisms and distinct platiness that characterize the fragipan. The reaction ranges from strongly acid to slightly acid.

The content of coarse fragments is normally 5 to 10 percent in the horizons above the fragipan and 10 to 20 percent in the pan and in the C horizon.

Canfield soils differ from Braceville soils in having a horizon of clay accumulation and a finer textured substratum. Ravenna soils have gray ped surfaces in the upper part of the horizon of lime accumulation, and Chenango soils are free of gray colors to a depth of 40 inches.

The Canfield soils in Mercer County appear to be transitional between typical Canfield soils, which have a horizon of clay accumulation above the fragipan, and Cambridge soils, which do not. (No Cambridge soils were correlated in this county.) Areas of typical Canfield soils are to be found in the southern part of the county, but some areas of these soils in the northern part of the county lack a distinct horizon of clay accumulation above the fragipan.

Canfield silt loam, 0 to 3 percent slopes (CdA).—The profile of this soil is similar to the one described for the series, but the fragipan is further below the surface than it is in the typical profile. Included in mapping were small areas of gently sloping Canfield soils, of nearly level Braceville soils, of Ravenna soils, and of Chenango soils.

Water moves slowly through the fragipan in this Canfield soil. The water table is seasonally high. Drainage improves workability and tilth.

Most of this soil is cultivated. The seasonal high water table and the restricted permeability of the fragipan limit the use of this soil for building sites and for sewage disposal fields. (Capability unit IIw-1)

Canfield silt loam, 3 to 8 percent slopes, moderately eroded (CdB2).—This soil has the profile described as typical for the series. Included in mapping were areas of nearly level and sloping Canfield soils, of gently sloping Ravenna soils, and of gently sloping Braceville soils.

Because several inches of the original surface layer has been lost through erosion, the plow layer now consists partly of the brighter colored subsoil. Water moves slowly through the fragipan. The water table is seasonally high. The erosion hazard is moderate in cultivated areas.

Most of this soil is cultivated (fig. 6). Tilth and workability are improved by drainage. The seasonal high water table and the restricted permeability of the fragipan limit the use of this soil for building sites and for sewage disposal fields. (Capability unit IIe–2)

Canfield silt loam, 8 to 15 percent slopes, moderately eroded (CdC2).—The profile of this soil is similar to the one described for the series, but the subsoil is thinner than that in the typical profile and the fragipan is closer to the surface. Included in mapping were comparatively uneroded areas of woodland, besides areas of severely eroded Canfield soils, of gently sloping and moderately steep Canfield soils, of sloping Ravenna soils, and of sloping Braceville soils.

Water moves slowly through the fragipan in this Canfield soil. The water table is seasonally high. In cultivated areas the erosion hazard is severe. Erosion control and drainage of wet spots are needed.

Most of this soil is cultivated. The slope, the seasonal high water table, and the restricted permeability of the fragipan are limitations that affect the use of this soil for building sites and sewage disposal fields. (Capability unit IIIe–2)

Canfield silt loam, 8 to 15 percent slopes, severely eroded (CdC3).—The profile of this soil differs from the one described for the series in that the subsoil is thinner, the fragipan is closer to the surface, and the surface layer contains considerably more of the brighter colored subsoil. Included in mapping were areas of moderately eroded Canfield soils and of severely eroded Braceville soils.

Water moves slowly through the fragipan in this Canfield soil. The water table is seasonally high. Control of erosion and improvement of tilth are needed.

All of this soil has been cultivated. The slope, the past erosion, the seasonal high water table, and the restricted permeability of the fragipan are limitations that affect many uses. (Capability unit IVe–2)

Canfield silt loam, 15 to 25 percent slopes, moderately eroded (CdD2).—The profile of this soil is similar to the one described for the series, but the subsoil is thinner than that in the typical profile and the fragipan is closer to the surface and less well developed. Areas that have not been cleared are comparatively uneroded. Included in mapping were areas of severely eroded Canfield soils, of sloping and steep Canfield soils, of moderately steep Lordstown soils, and of nearly level Wayland soils, coarse variant, which are in narrow drainageways.

Water moves slowly through the fragipan in this Canfield soil. The water table is seasonally high. In cultivated areas, the erosion hazard is severe.

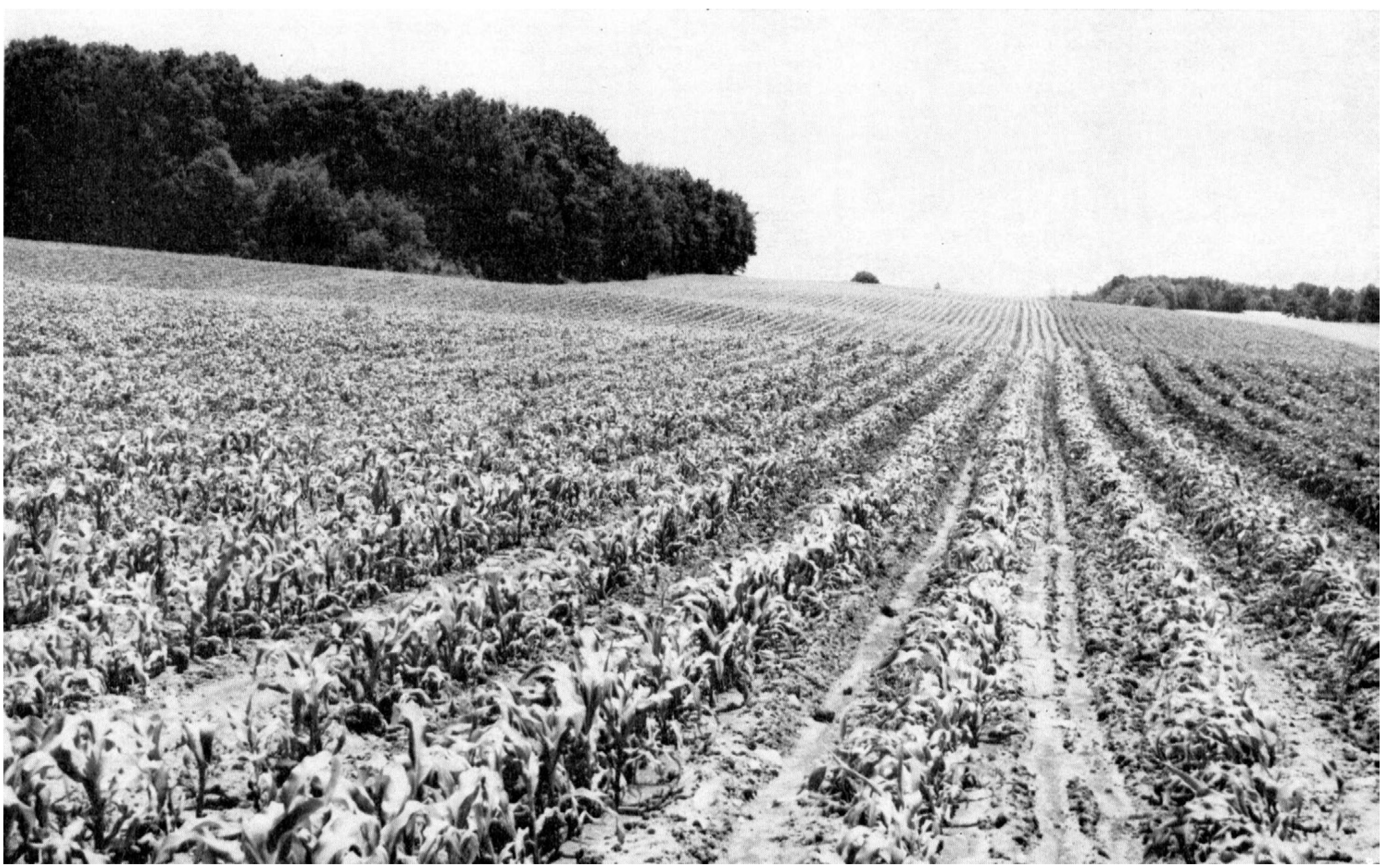

***Figure 6.*—Corn and potatoes on Canfield silt loam, 3 to 8 percent slopes, moderately eroded.**

Less than half of this soil has been cultivated. Cultivated areas need to be protected by long rotations that consist largely of hay or pasture, or by other methods of erosion control. The slope, the seasonal high water table, and the fragipan are limitations that affect nonfarm uses. (Capability unit IVe-2)

Canfield silt loam, 25 to 35 percent slopes (CdE).—The profile of this soil is similar to the one described for the series, but the subsoil is thinner than that in the typical profile and the fragipan is closer to the surface and less well developed. Included in mapping were areas of moderately steep Lordstown soils, of moderately steep Chenango soils, and of nearly level Wayland soils in drainageways.

The water table is seasonally high. In cultivated areas the erosion hazard is severe.

This soil is suitable for pasture, woodland, or wildlife habitat. Little of it is cultivated. The water table, the hazard of erosion, and the steep slopes are limitations that affect nonfarm uses. (Capability unit VIe-1)

Chenango Series

The Chenango series consists of well-drained soils that developed over thick deposits of sand and gravel. Soils of this series occur along the major drainageways in Mercer County and on moraines in the southeastern part of the county.

A typical profile has a 14-inch surface layer of dark-brown to brown gravelly loam. The upper 8 inches of the subsoil is friable, brown gravelly loam, and the lower 7 inches is friable, dark-brown gravelly sandy loam. The substratum, which is at a depth of about 29 inches, consists of unconsolidated brown sand and gravel.

Most areas of Chenango soils in this county have been farmed, but some are now idle. Rapid permeability, low available moisture capacity, low fertility, rapid leaching of plant nutrients, and an erosion hazard where the slopes are complex are limitations for many uses.

Representative profile of a gently sloping, moderately eroded Chenango gravelly loam in woodland, 2 miles south of Mercer. This is the profile sampled for soil characterization by Pennsylvania State University (S63 Pa 43-1) and the site from which Pennsylvania Department of Highways test samples S63 Pa 43-1-3 and 5 were taken.

A1—0 to 6 inches, dark-brown (10YR 3/3) gravelly loam; weak, medium, platy structure that breaks to weak, fine, granular structure; very friable when moist, nonsticky and nonplastic when wet; 20 percent gravel; extremely acid (pH 4.4); abrupt, smooth boundary. 6 to 10 inches thick.

A2—6 to 14 inches, brown (7.5YR 5/4) gravelly loam; weak, fine, granular structure; friable when moist, slightly sticky and nonplastic when wet; 25 percent gravel; strongly acid (pH 5.3); clear, wavy boundary. 3 to 9 inches thick.

B2—14 to 22 inches, brown (7.5YR 5/4) gravelly loam; weak, fine and medium, subangular blocky structure; friable when moist, slightly sticky and slighty plastic when wet; few, thin, patchy clay films; 25 percent gravel; very strongly acid (pH 4.8); gradual, wavy boundary. 7 to 20 inches thick.

B3—22 to 29 inches, dark-brown (7.5YR 4/4) gravelly sandy loam with brown (10YR 5/3) patches; weak, fine and medium, subangular blocky structure; friable when moist, slightly sticky and nonplastic when wet; few thin patches of clay film in pores; 30 percent gravel; very strongly acid (pH 4.8); gradual, wavy boundary. 0 to 12 inches thick.

C—29 to 53 inches +, brown (10YR 5/3), unconsolidated sand and gravel; friable when moist, nonsticky and nonplastic when wet; 60 percent coarse fragments of granite and gneiss and weathered, leached limestone; some silt accumulation and some thin clay accumulation on tops of fragments; strongly acid (pH 5.4).

The A1 horizon is dark brown or very dark brown to very dark grayish brown (hue 10YR, value 2 to 3, and chroma 2 to 3). The structure ranges from weak, fine, granular to weak, medium and thin, platy. The texture is dominantly gravelly loam but is silt loam or fine sandy loam in some places.

The A2 horizon ranges from brown or strong brown to yellowish brown (hue 7.5YR or 10YR, value 4 to 5, and chroma 3 to 6). The texture of this horizon ranges from gravelly sandy loam to gravelly silt loam.

The Ap horizon in cultivated areas is very dark grayish brown to dark grayish brown or dark brown (hue 7.5YR or 10YR, value 3 to 4, and chroma 2 to 3).

The B2 horizon is brown to strong brown (hue 7.5YR, value 4 to 5, and chroma 4 to 6). The structure of this horizon ranges from weak subangular blocky to moderate granular. The texture generally ranges from gravelly loam to gravelly sandy loam but may be silt loam in some places. The gravel content ranges from 10 to 35 percent.

The B3 horizon is brown to dark brown (hue 7.5YR, value 4 to 5, and chroma 3 to 4). The texture of this horizon ranges from gravelly loamy sand to gravelly loam.

The depth to the C horizon ranges from 20 to 40 inches. This horizon usually consists of strata of gravelly and sandy material and is many feet thick. The gravel content ranges from 40 to 80 percent.

The reaction is very strongly acid to strongly acid to a depth of at least 5 feet.

Chenango soils do not have the fragipan that is characteristic of Canfield and Braceville soils. They are much deeper to bedrock than Lordstown soils. They have a coarser textured solum than Unadilla soils.

Chenango fine sandy loam, flooded (0 to 3 percent slopes) (Cf).—This soil has much less gravel in the uppermost 15 to 20 inches than the soil described as having the profile typical of the series. Included in mapping were areas of Chenango silt loam, flooded, and of Red Hook silt loam, flooded.

Unless protected by large structures, this soil is flooded by stream overflow every 1 to 3 years. Floods usually occur late in winter or early in spring and so do not damage crops.

This soil is rapidly permeable to air and water. The available moisture capacity is low.

This soil is suited to crops, and most of it is cultivated. Hay or cover crops in the crop rotation help to maintain tilth. The flood hazard is a limitation for many nonfarm uses. (Capability unit IIs-1)

Chenango fine sandy loam, low terrace (0 to 3 percent slopes) (Ch).—This soil has considerably less gravel in the uppermost 15 to 20 inches than the soil described as having the profile typical of the series. Included in mapping were areas of nearly level Chenango gravelly loam, of nearly level Chenango silt loam, low terrace, and of Red Hook silt loam, low terrace.

This Chenango soil is along the major streams but above the flood plains. It is flooded occasionally, during major storms. Floods usually occur late in winter or early in spring and so do not damage crops.

This soil is rapidly permeable to air and water. The available moisture capacity is low.

This soil is suited to crops, and most of it is cultivated. Hay or cover crops in the crop rotation help to maintain tilth. The flood hazard is a limitation for many nonfarm uses. (Capability unit IIs-1)

Chenango gravelly loam, 0 to 3 percent (ClA).—This soil has a slightly thicker surface layer and, commonly, a thicker profile than the soil described as having the profile typical for the series. It occurs mainly on the floors of the larger valleys. Included in mapping were small areas of nearly level Braceville soils, of gently sloping Chenango soils, and of Chenango soils on low terraces.

This soil tends to be droughty. It is rapidly permeable to air and water. The available moisture capacity is low. The hazard of erosion is slight.

Most of this soil is cultivated. Contamination of ground water by unfiltered waste is possible if a sewage disposal field is laid in this rapidly permeable soil. (Capability unit IIs-1)

Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded (ClB2).—This soil has the profile described as typical for the Chenango series. Several inches of the original surface layer has been lost through erosion, and the present plow layer consists partly of the brighter colored subsoil. Areas still wooded are comparatively uneroded. Included in mapping were small areas of nearly level and sloping Chenango soils, of Chenango silt loam, and of Braceville soils.

This Chenango soil tends to be droughty. It is rapidly permeable to air and water. The available moisture capacity is low. In cultivated areas, the hazard of erosion is moderate.

Most of this soil is cultivated. Contamination of ground water by unfiltered waste is possible if a sewage disposal field is laid in this rapidly permeable soil. (Capability unit IIe-1)

Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded (ClC2).—This soil has a thinner surface layer than the one described as having the profile typical for the series, and it is shallower to sand and gravel. Several inches of the original surface layer has been lost through erosion, and the plow layer now consists partly of the brighter colored subsoil. Included in mapping were small areas of sloping Chenango soils that are severely eroded, of gently sloping and moderately steep Chenango soils, and of sloping Braceville soils.

This Chenango soil tends to be droughty. It is rapidly permeable to air and water. The available moisture capacity is low. In cultivated areas, the hazard of erosion is moderate.

Most of this soil is cultivated. Contamination of ground water by unfiltered waste is possible if a sewage disposal field is laid in this rapidly permeable soil. (Capability unit IIIe-1)

Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded (ClD2).—This soil has a thinner subsoil and is shallower to sand and gravel than the soil described as having the profile typical for the series. Areas still in woodland are comparatively uneroded. Included in mapping were small areas of sloping Chenango soils and of severely eroded Chenango soils.

This Chenango soil tends to be droughty. It is rapidly permeable to air and water. The available moisture capacity is low.

Nearly half the acreage has been cultivated, but now most of it is idle or planted to trees. Long rotations that consist mostly of hay crops help to control erosion in cultivated areas. The slope is a limitation for use as building sites and for waste disposal. (Capability unit IVe-1)

Chenango gravelly loam, moderately eroded, rolling (8 to 15 percent slopes) (CnC2).—This soil has a thinner subsoil and is shallower to sand and gravel than the soil described as having the profile typical for the series. Areas still in woodland are comparatively uneroded. Included in mapping were areas of Braceville soils in depressions, of severely eroded Chenango soils, and of sloping Chenango soils.

This soil is rapidly permeable to air and water. The available moisture capacity is low.

Many areas of this soil have been cultivated. Long rotations that consist mostly of hay help to control erosion in cultivated areas. The complex slopes make it difficult to apply other erosion control practices (fig. 7). Contamination of ground water is possible if this rapidly permeable soil is used for sewage disposal. (Capability unit IVe-2)

Chenango gravelly loam, moderately eroded, hilly (15 to 25 percent slopes) (CnD2).—This soil has a thinner subsoil and is shallower to sand and gravel than the soil described as having the profile typical for the series. Areas still wooded are comparatively uneroded. Included in mapping were areas of Braceville soils in depressions, of severely eroded Chenango soils, and of moderately steep Chenango soils.

This soil is rapidly permeable to air and water. The available moisture capacity is low. The hazard of erosion is very severe, and the complex slopes make it difficult to apply erosion control practices.

Many areas of this soil have been cultivated, but most are now idle or have been planted to trees. Woodland, wildlife habitat, and pasture are suitable uses. The slope limits nonfarm uses. (Capability unit VIe-1)

Chenango silt loam, 0 to 3 percent slopes (CoA).—This soil has a slightly thicker surface layer than the soil described as having the typical profile, and it is deeper to sand and gravel. It occurs mainly on the floors of the larger valleys. Included in mapping were areas of nearly level Braceville soils, of Unadilla soils, of nearly level Chenango gravelly loam, of gently sloping Chenango soils, and of Chenango soils on low terraces.

This soil is rapidly permeable to air and water. The available moisture capacity is low. The hazard of erosion is slight.

Most of this soil is cultivated. Contamination of ground water by unfiltered waste is possible if a sewage disposal field is laid in this rapidly permeable soil. (Capability unit IIs-1)

Chenango silt loam, 3 to 8 percent slopes, moderately eroded (CoB2).—Except for the texture of the surface layer, the profile of this soil is like the one described as typical for the series. Several inches of the original surface layer has been lost through erosion, and the plow layer now consists partly of the brighter colored subsoil. Wooded areas are comparatively uneroded. Included in mapping

Figure 7.—**Chenango gravelly loam, moderately eroded, rolling. Complex topography makes erosion control difficult.**

were areas of nearly level and sloping Chenango soils, of gently sloping Chenango gravelly loam, and of gently sloping Braceville soils.

This Chenango soil has rapid permeability to air and water. The available moisture capacity is low. In cultivated areas, the hazard of erosion is moderate.

Most of this soil is cultivated. Contamination of ground water by unfiltered waste is possible if a sewage disposal field is laid in this rapidly permeable soil. (Capability unit IIe–1)

Chenango silt loam, 8 to 15 percent slopes, moderately eroded (CoC2).—This soil has a thinner subsoil and is shallower to sand and gravel than the soil described as having the profile typical for the series. Several inches of the original surface layer has been lost through erosion, and the plow layer now consists partly of the brighter colored subsoil. Wooded areas are comparatively uneroded. Included in mapping were small areas of severely eroded, sloping Chenango soils, of gently sloping and moderately steep Chenango soils, and of Braceville soils.

This Chenango soil has rapid permeability to air and water. The available moisture capacity is low. The hazard of erosion is moderate in cultivated areas.

Most of this soil is cultivated. Contamination of ground water is possible if this rapidly permeable soil is used for sewage disposal. (Capability unit IIIe–1)

Chenango silt loam, 15 to 25 percent slopes, moderately eroded (CoD2).—This soil has a thinner subsoil than the soil described as having the typical profile, and it is shallower to sand and gravel. Wooded areas are comparatively uneroded. Included in mapping were small areas of sloping Chenango soils, of severely eroded, moderately steep Chenango soils, and of moderately steep Chenango gravelly loam.

This soil has rapid permeability to air and water. The available moisture capacity is low. In cultivated areas, the hazard of erosion is severe. Long rotations that consist mostly of hay help to control erosion.

Approximately half of this soil has been cleared, but much of this acreage is now idle or has been planted to trees. The slope limits use for building sites or for waste disposal. (Capability unit IVe–1)

Frenchtown Series

The Frenchtown series consists of poorly drained soils that developed on thick deposits of firm glacial till. These soils have a slowly permeable fragipan in the lower part of the subsoil. The water table is within 6 inches of the surface for several months each year, and runoff from nearby soils also accumulates.

A typical profile has a surface layer of dark grayish-brown silt loam about 10 inches thick. The upper part of the subsoil is light brownish-gray, firm silt loam that has yellowish-brown and dark grayish-brown mottles. The lower part is a fragipan of dark-gray and grayish-brown, mottled silt loam. The fragipan is about 30 inches thick. The substratum consists of friable, grayish-brown silt loam.

About 75 percent of the acreage of Frenchtown soils has been cleared and cultivated. Some areas are now idle or have been planted to trees. The high water table and the slow movement of water through the fragipan are limitations that affect many uses.

Representative profile of Frenchtown silt loam in a nearly level pasture 4 miles east of Sharon. This is the profile sampled by the Pennsylvania State University for soil characterization (S63 Pa 43-5). It is also the site from which Pennsylvania Department of Highways test samples S63 Pa 43-5-2 and 6 were taken.

Ap—0 to 10 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, medium, granular structure; friable when moist, nonsticky and nonplastic when wet; a little gravel up to 2 inches in diameter; medium acid (pH 6.0); clear, smooth boundary. 9 to 11 inches thick.

B2tg—10 to 16 inches, light brownish-gray (2.5Y 6/2) silt loam; many, fine and medium, distinct, yellowish-brown (10YR 5/6) and dark grayish-brown (10YR 4/2) mottles; moderate, medium and coarse, prismatic structure that breaks to moderate, medium, blocky structure; firm when moist, slightly sticky and plastic when wet; thin patchy clay films and some bridging between grains; a little gravel up to 3 inches in diameter; slightly acid (pH 6.1); clear, wavy boundary. 6 to 15 inches thick.

Bx1g—16 to 30 inches, silt loam; dark-gray (5Y 4/1) prism faces; common black coatings on ped faces; many, medium, distinct, light-gray (2.5Y 7/2) and brown (10YR 5/3) mottles; moderate, coarse, prismatic structure that breaks to moderate, thick, platy and blocky structure; brittle, very firm when moist, slightly sticky and slightly plastic when wet; thick continuous clay films on prism faces; a little gravel up to 3 inches in diameter; neutral (pH 7.2); gradual, wavy boundary. 11 to 17 inches thick.

Bx2g—30 to 41 inches, silt loam; grayish-brown (2.5Y 5/2) prism faces; few black coatings on ped faces; many, medium, distinct, gray (N 5/0) and yellowish-brown (10YR 5/4) mottles; moderate, coarse, prismatic structure that breaks to moderate, thick, platy and moderate, medium, blocky structure; brittle, very firm in place, firm if displaced when moist, slightly sticky and slightly plastic when wet; thick continuous clay and silt films on prism faces; a little gravel up to 2 inches in diameter; mildly alkaline (pH 7.6); gradual, wavy boundary. 9 to 15 inches thick.

Bx3g—41 to 49 inches, silt loam; gray (5Y 6/1) prism faces; olive-brown (2.5Y 4/3) interiors with many, medium, distinct, light yellowish-brown (2.5Y 6/4) and yellowish-brown (10YR 5/4) mottles; a few black coatings on ped faces; moderate, coarse, prismatic structure that breaks to moderate, thick and medium, platy and moderate, medium, blocky structure; brittle firm in place, less firm if displaced when moist sticky and plastic when wet; thick continuous clay and silt films on ped faces; a little gravel up to 2 inches in diameter; mildly alkaline (pH 7.7); gradual, wavy boundary. 5 to 11 inches thick.

Cg—49 to 70 inches, +, grayish-brown (2.5Y 5/2) gritty silt loam; many, medium, distinct, gray (N 5/0) and brown (10YR 5/3) mottles; weak, very coarse, prismatic structure; friable when moist, slightly sticky and slightly plastic when wet; few patchy clay films; 5 percent gravel up to 1 inch in diameter; mildly alkaline (pH 7.8).

The Ap horizon is very dark gray to dark grayish brown (hue 10YR or 2.5Y, value 3 to 4, and chroma 1 to 2). In unplowed areas a 2- to 5-inch silt loam A1 horizon is at the surface. This A1 horizon is very dark gray to dark gray (hue 10YR or 2.5Y, value 3 to 4, and chroma 1). The structure of the Ap or A1 horizon is predominantly weak, medium, granular, but weak, thin, platy structure has been observed. In places an A2g horizon occurs below the A1 or Ap horizon. The color of this horizon ranges from dark grayish brown to light brownish gray (hue 10YR or 2.5Y, value 4 to 6, and chroma 1). The structure ranges from weak, fine, granular to weak, thin to medium, platy.

In the B2tg horizon, the ped faces are gray or grayish brown to light gray (hue 10YR or 2.5Y, value 5 to 6, and chroma 1 to 2), and the interiors of the peds have many mottles of light brownish gray (2.5Y 6/2 and 10YR 6/2), gray (10YR 6/1), light gray (N 6/0), brown (7.5YR 4/4 and 10YR 4/3), and strong brown (7.5YR 5/6). The structure of the B2tg is moderate, fine, subangular blocky to moderate, medium and coarse, prismatic breaking to fine, medium, blocky and subangular blocky.

The depth to the Bx horizon is 15 to 25 inches. The ped faces are dark gray or grayish brown to light gray (hue 2.5Y or 5Y, value 4 to 6, and chroma 1 to 2). The ped interiors have many mottles of gray (N 5/0), light brownish gray (2.5YR 6/2), brown (10YR 5/3), and strong brown (7.5YR 5/6). The structure is moderate, very coarse, prismatic to moderate, thin to thick, platy and moderate, fine, blocky. The texture of the Bx horizon is loam to silt loam.

The reaction of the A, B2t, and Bx1 horizons increases with depth and ranges from strongly acid to neutral.

The coarse fragment content of the horizons above the fragipan is less than 15 percent. The Bx and C horizons are 5 to 30 percent coarse fragments.

Frenchtown soils differ from Ravenna and Red Hook soils in being dominantly gray just below the A horizon, from Halsey soils in having a horizon of clay accumulation, and from Caneadea and Luray soils in having a fragipan.

Frenchtown silt loam, 0 to 3 percent slopes (FeA).—This soil has the profile described as typical for the series. Included in mapping were some areas of nearly level Ravenna, Halsey, and Caneadea soils and some of gently sloping Frenchtown soils.

The water table is high, and water moves slowly through the fragipan. Drainage improves tilth and workability.

Much of this soil has been cultivated, but some is now idle. The high water table and the restricted permeability of the fragipan limit many nonfarm uses. (Capability unit IIIw-1)

Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded (FeB2).—This soil has a slightly thinner subsoil and is shallower to the fragipan than the soil described as having the typical profile. Several inches of the surface layer has been lost through erosion, and the plow layer now consists partly of the brighter colored subsoil. Included in mapping were areas of gently sloping Ravenna soils, of nearly level and sloping Frenchtown soils, and of severely eroded, gently sloping Frenchtown soils.

The water table is high, and water moves slowly through the fragipan. Drainage improves tilth and workability. The erosion hazard is moderate.

Most of this soil has been cultivated. The high water table and the slow movement of water through the fragipan limit many nonfarm uses. (Capability unit IIIw-2)

Frenchtown very stony silt loam, 0 to 8 percent slopes (FhB).—Except for the stones on the surface, this soil is like the one described as having the profile that is typical for the series. The stones are round and are from 6 inches to 3 feet in diameter. They cover as much as 5 percent of the surface. Included in mapping were areas of nearly level Frenchtown soils and of very stony Ravenna soils.

The water table is high, and water moves slowly through the fragipan. The stones make it impossible to use farm machinery, and removal of the stones would be expensive.

This soil can be used as pasture or woodland. Practically none of it is cultivated. The stones, the high water table, and the restricted permeability of the fragipan limit its uses. (Capability unit VIIs-2)

Frenchtown and Luray silt loams (Fr).—Most areas of this mapping unit are about 75 percent Frenchtown silt loam and 25 percent Luray silt loam, but some are almost entirely one or the other of these soils. Also included in mapping were small areas of Halsey silt loam.

The Frenchtown silt loam in this mapping unit is level or has slightly convex slopes. Both the surface layer and the subsoil are grayer than those in the typical profile, and both are mottled with red. The fragipan and the substratum are like those of the soil described as having the typical profile.

The Luray silt loam in this unit is level or depressional. It has the profile described as typical for the Luray series.

These soils have a high water table most of the year. Areas that can be drained can be used for general farm crops. Those that cannot be drained are better suited to pasture, woodland, or wildlife habitat. The high water table and the restricted permeability limit nonfarm uses. (Capability unit IIIw-6)

Halsey Series

The Halsey series consists of poorly drained to very poorly drained soils that developed on thick deposits of sand and gravel along the major drainageways in the county and on moraines in the eastern and southeastern part of the county. These soils receive runoff from nearby soils, and they have a water table near the surface several months each year.

A typical profile has a surface layer of black to very dark gray silt loam about 6 inches thick. The upper part of the subsoil is grayish-brown, friable loam mottled with yellowish red and strong brown, and the lower part is gray, firm gravelly loam mottled with strong brown. The substratum is gray, friable sandy loam mottled with dark grayish brown.

Approximately half the acreage of Halsey soils in Mercer County has been cultivated, but some areas have been abandoned or planted to trees. The high water table is a limitation that affects many uses of these soils.

Representative profile of Halsey silt loam, in a nearly level woodland, half a mile south of the Crawford County line, near U. S. Highway 19.

A11—0 to 2 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; 5 percent gravel up to 1 inch in diameter; strongly acid (pH 5.2); abrupt, wavy boundary. 1 to 4 inches thick.

A12—2 to 6 inches, very dark gray (10YR 3/1) silt loam; many, medium, prominent, yellowish-red (5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 5 percent gravel up to 1 inch in diameter; strongly acid (pH 5.2); clear, wavy boundary. 3 to 7 inches thick.

IIB1g—6 to 12 inches, grayish-brown (10YR 5/2) loam; many, medium, prominent, yellowish-red (5YR 5/6) mottles in ped interiors; common, medium, prominent, strong-brown (7.5YR 5/6) mottles on ped surfaces; weak, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; few clay films in pores; 10 percent gravel up to 1 inch in diameter; medium acid (pH 6.0); clear, wavy boundary. 4 to 8 inches thick.

IIB2g—12 to 26 inches, gray (10YR 5/1) gravelly loam; many, coarse, prominent, strong-brown (7.5YR 5/6) mottles in ped interiors, but mostly on ped faces; very coarse, prismatic structure that breaks to weak, medium and coarse, subangular blocky structure; firm when moist, slightly sticky and plastic when wet; thin patchy clay films; 15 percent gravel up to 1 inch in diameter; medium acid (pH 5.6); gradual, wavy boundary. 10 to 20 inches thick.

IIICg—26 to 36 inches +, gray (10YR 5/1) sandy loam; many, medium to fine, distinct, dark grayish-brown (10YR 4/2) and brown (10YR 4/4) mottles; weak, very coarse, prismatic structure with massive interiors; friable when moist, nonsticky and nonplastic when wet; 10 percent coarse fragments up to 2 inches in diameter; neutral (pH 6.6).

The color of the A horizon ranges from black (10YR 2/1) to dark gray (10YR 4/1). The IIB1g horizon is gray or grayish brown. The texture of the IIB1g is silt loam to sandy loam.

The IIB2g horizon is dominantly gray or grayish brown. In texture it ranges from loam to sandy loam.

The depth to the IIICg horizon ranges from 20 to 36 inches. This horizon is usually grayish to brownish stratified sand and gravel. The reaction at a depth of 36 inches is usually pH 6.0 to 7.0. The gravel content is 2 to 20 percent in the A horizon, 5 to 25 percent in the B horizon, and 5 to 30 percent in the C horizon.

Halsey soils have a thinner black surface layer than Luray soils; they have less clay and more sand in the subsoil than Papakating soils; and they are grayer in the upper part of the subsoil than Red Hook soils.

Halsey silt loam (Ha).—Included in the mapped areas of this soil are small areas of Frenchtown soils, Luray soils, gently sloping Red Hook soils, and Wayland soils, coarse variant.

The water table in this Halsey soil is high. Movement of water is moderately slow to moderate through the lower part of the subsoil and rapid through the substratum.

About half of this soil has been cultivated. Tilth and workability are improved by drainage, but about a third of the acreage is in concave areas that are difficult to drain because of a scarcity of natural outlets. The high water table limits many nonfarm uses. (Capability unit IIIw-5)

Lordstown Series

The Lordstown series consists of well-drained soils that developed in thin deposits of silty glacial till over thick beds of sandstone and shale. These soils occur throughout the county but are most common in the eastern part. Stones and boulders are strewn abundantly over the surface in many areas.

A typical profile has a surface layer of very dark brown to brownish-yellow silt loam about 5 inches thick. The subsoil is yellowish-brown, friable silt loam. The dark-brown loam substratum occurs at a depth of about 22 inches, and bedrock is at a depth of about 40 inches.

A few fields of Lordstown soils have been farmed. A thin root zone, stones, and an erosion hazard are limitations that affect many uses.

Representative profile of Lordstown silt loam, in a sloping, very stony, wooded area a mile northeast of Fredonia.

O2—1 inch to 0, black mat of leaves and stems in all stages of decay.

A1—0 to 2 inches, very dark brown (10YR 2/2) silt loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; 5 percent gravel up to 2 inches in diameter; strongly acid (pH 5.2); abrupt, smooth boundary. 1 to 3 inches thick.

A2—2 to 5 inches, brownish-yellow (10YR 6/6) silt loam; weak, medium, platy structure and weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 5 percent gravel up to 2 inches in diameter; very strongly acid (pH 5.0); clear, wavy boundary. 3 to 6 inches thick.

B21—5 to 15 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 10 percent channery fragments 2 inches or less in diameter; very strongly acid (pH 5.0); clear, wavy boundary. 6 to 14 inches thick.

B22—15 to 22 inches, dark yellowish-brown (10YR 4/4) channery silt loam; moderate, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 20 percent channery fragments; very strongly acid (pH 5.0); clear, wavy boundary. 5 to 12 inches thick.

IIC—22 to 40 inches, dark-brown (10YR 4/3) loam; moderate, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 60 percent angular fragments of sandstone, 1 to 2 inches thick and about 6 inches across; very strongly acid (pH 5.0); gradual, wavy boundary. 4 to 20 inches thick.

IIR—40 to 45 inches +, mostly fractured, platy fragments of sandstone; soil in cracks and crevices is dark-brown (10YR 4/3), structureless loam; very strongly acid (pH 5.0).

The A1 horizon is black or very dark brown, and the A2 horizon is brown or brownish yellow and in places has a granular structure. In cultivated areas there is an Ap horizon 5 to 10 inches thick and dark grayish brown to brown in color.

The color of the B horizon is brown to brownish yellow (hue 10YR, value 4 to 6, and chroma 3 to 6). The texture of this layer is loam to silt loam. The structure is weak to moderate, fine to medium, subangular blocky.

The depth to the IIC horizon is 20 to 30 inches, and the depth to the IIR horizon is 25 to more than 45 inches.

The A and B horizons are 5 to 35 percent coarse fragments. The IIC horizon is 30 to 95 percent sandstone fragments.

Lordstown silt loam, 5 to 15 percent slopes (LoC).—This soil is similar to the one described as having the profile that is typical for the series, but it does not have stones on the surface. Included in mapping were small areas of gently sloping and sloping Canfield and Ravenna soils.

The root zone is thin, and the available moisture capacity is low to moderate. The hazard of erosion is severe. The few areas that are cultivated are eroded to varying degrees; the woodland areas are comparatively uneroded. The restricted depth to bedrock (fig. 8) is a limitation that affects many uses of this soil. (Capability unit IIIe-3)

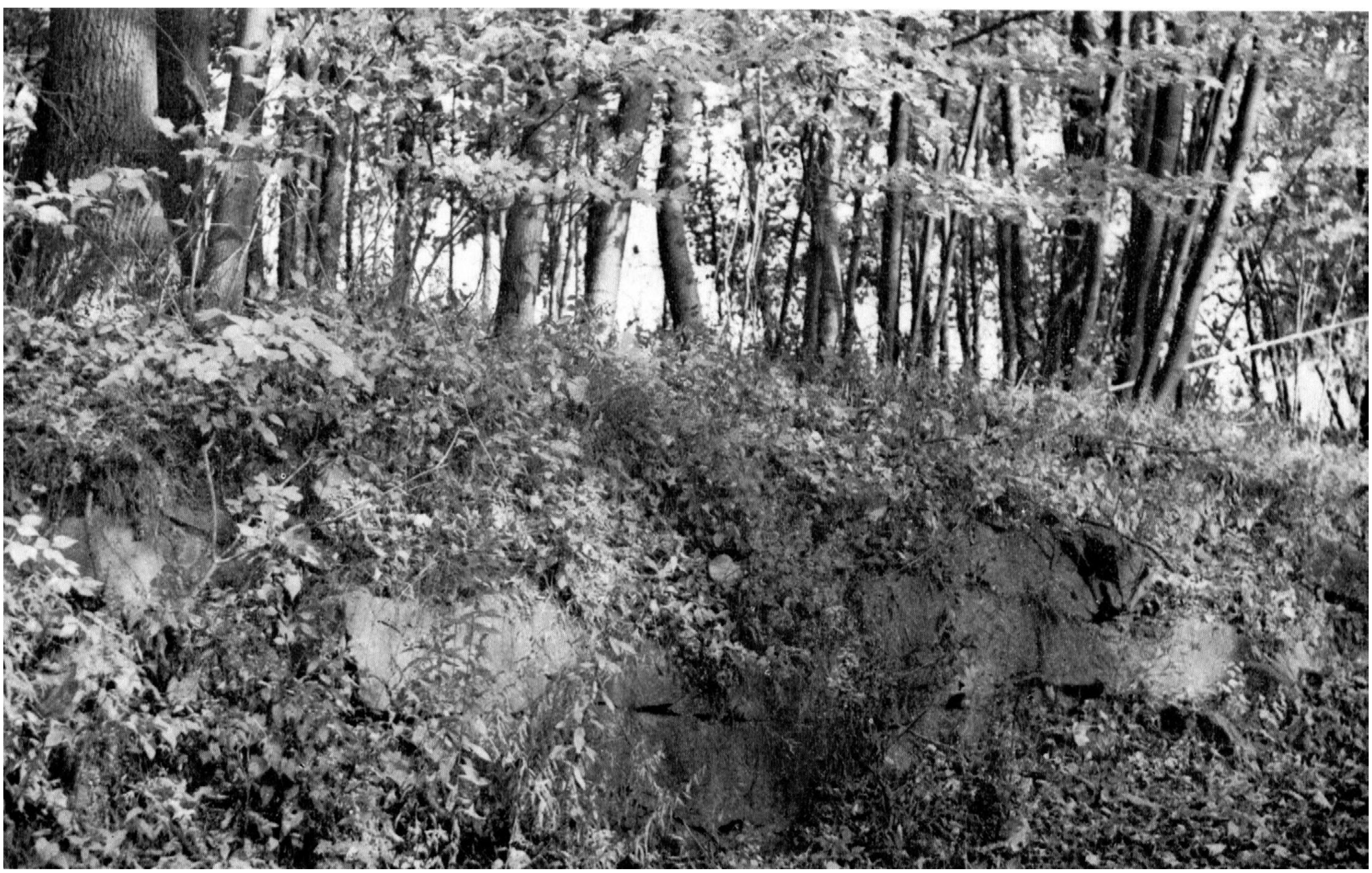

Figure 8.—**Lordstown silt loam, 5 to 15 percent slopes. Roadcut reveals sandstone bedrock just below the surface.**

Lordstown silt loam, 15 to 25 percent slopes (LoD).—This soil is similar to the one described as having the typical profile, but the subsoil is a few inches thinner and the surface stones are lacking. Included in mapping were areas of stony Lordstown soils, of sloping Lordstown soils, and of moderately steep Canfield soils.

The root zone is thin, and the available moisture capacity is low to moderate. The hazard of erosion is severe.

Crops should be grown only in long rotations. The slope and the restricted depth to bedrock are limitations that affect many uses. (Capability unit IVe-3)

Lordstown very stony silt loam, 8 to 25 percent slopes (LrD).—This soil has the profile described as typical for the series. Included in mapping were areas of very stony Ravenna soils and nonstony Lordstown soils, of rock outcrops, and of soils more shallow to bedrock.

Subrounded stones 10 to 36 inches in diameter cover about 0.5 to 5 percent of the surface. Boulders more than 36 inches in diameter are common. The available moisture capacity is low to moderate.

None of this soil is cultivated. The thin root zone and the stones limit its use to woodland or wildlife habitat. Removal of the stones is possible but generally not practical. (Capability unit VIIs-1)

Lordstown very stony silt loam, 25 to 45 percent slopes (LrE).—This soil is much like the soil described as having the typical profile, but is shallower and has a thinner subsoil. Included in mapping were a few areas of moderately steep Canfield soils, bedrock outcrops, and soils shallow to bedrock.

Stones and boulders, 10 inches to 12 feet in diameter, occupy 1 to 10 percent of the surface. The hazard of erosion is very severe.

None of this soil is cultivated. The erosion hazard, the stones, and the thin root zone limit its use severely. (Capability unit VIIs-1)

Luray Series

The Luray series consists of very poorly drained soils that developed on thick deposits of silty glacial deposits and erosional sediments. These soils have a moderately fine textured subsoil that is moderately slowly permeable to air and water. The water table is at the surface for a large part of each year.

A typical profile has a surface layer of black silt loam about 10 inches thick. The uppermost 3 inches of the subsoil is friable, dark-gray silt loam. The lower part, about 35 inches thick, is friable to firm, sticky, gray and grayish-brown silty clay loam, mottled with red, yellowish red, brownish yellow and brown.

Very little of the acreage of Luray soils in this county has been cultivated, but pasture is a common use. Drainage is difficult because outlets are scarce. The moderately slow permeability and the high water table are limitations that affect many uses of these soils.

In Mercer County, Luray soils are mapped only as part of an undifferentiated unit with Frenchtown soils.

Representative profile of Luray silt loam in a nearly level, brushy pasture, 3 miles west of Grove City.

O2—½ inch to 0, black, fibrous, greasy, partly decomposed leaf litter.

A1—0 to 10 inches, black (10YR 2/1) silt loam; moderate to strong, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; medium acid (pH 5.8); clear, smooth boundary. 9 to 14 inches thick.

B1g—10 to 13 inches, dark-gray (10YR 4/1) silt loam; many, medium, distinct, yellowish-red (5YR 4/6) mottles; moderate, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; slightly acid (pH 6.2); clear, smooth boundary. 0 to 5 inches thick.

B21tg—13 to 20 inches, gray (10YR 5/1) silty clay loam; many, medium, distinct, yellowish-red (5YR 4/6) and red (2.5YR 4/6) mottles; weak, medium, prismatic structure that breaks to moderate, fine, subangular blocky structure; friable when moist, slightly sticky and plastic when wet; clay films in pores and thin patchy clay films on ped faces; slightly acid (pH 6.4); gradual, wavy boundary. 5 to 10 inches thick.

B22tg—20 to 30 inches, gray (10YR 5/1) silty clay loam; many, medium, distinct, brownish-yellow (10YR 6/6) and few, medium, faint, gray (N 5/0) mottles; weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky and blocky structure; firm when moist, sticky and plastic when wet; many, thin, almost continuous clay films in pores and on ped faces; slightly acid (pH 6.4); gradual, wavy boundary. 7 to 15 inches thick.

B3tg—30 to 48 inches +, grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; common, patchy clay films; neutral (pH 6.8).

The A horizon is black to very dark grayish brown (hue (10YR or 2.5Y, value 2 to 3, and chroma 0 to 2).

The B1g horizon is very dark gray to dark gray (hue 10YR or 2.5Y, value 3 to 4, and chroma 0 to 1). In texture, this horizon is silt loam to silty clay loam.

The depth to the B2tg horizon is 10 to 15 inches. This horizon is gray to light gray, (hue 10YR or 2.5Y, value 5 to 6, and chroma 0 to 1). The texture is silt loam to silty clay loam; the clay component is less than 35 percent. Mottles are mostly red or yellowish red, but a few are gray (N 5/0). These horizons have compound, weak, prismatic structure and moderate, medium or fine, subangular blocky and blocky structure.

The B3tg is much like the B2tg horizon, but it is light brownish gray (10YR 6/2) or grayish brown (10YR 5/2) mottled with strong brown and brown. The texture is the same as in the B2tg horizon. The structure gradually weakens and becomes massive with depth.

Luray soils have a thicker black surface layer than Halsey or Frenchtown soils, and differ from Papakating soils in having a horizon of clay accumulation.

Mine dumps (Md).—This land type consists of fire clay, shale, sandstone, and impure coal accumulated as a result of deep-pit coal mining. Most areas are conical, 50 to 100 feet in diameter, and 15 to 20 feet high. Some are larger, oblong, up to 300 feet long, and 50 feet high. Most slopes are very steep. Included in mapping are tipples (where coal is separated by size), parking areas, access roads, and ramps.

The waste material is very acid, and the dumps usually are devoid of vegetation. Vegetation is scanty on abandoned tipples, and vegetation in the low areas is likely to be destroyed by acid water from the mines.

The slope and the extremely acid reaction severely limit the use of this land type for agriculture. The material can be used to some extent for roads and fills. (Not in a capability unit)

Muck and peat (Mp).—This mapping unit occupies depressions and potholes. The two largest areas, each nearly 200 acres in size, are Rattlesnake Swamp, near Mercer, and Cranberry Swamp, in the northern part of the county. Smaller areas, 5 to 40 acres in size, are common on moraines in the southeastern part of the county.

This soil consists of thick beds of organic matter over sand or gravel. The total thickness of the organic deposits ranges from 3 feet to tens of feet. The uppermost 20 to 30 inches is black muck, in which most of the organic fibers have decomposed. There is a gradual transition to dark grayish-brown peat, which is less thoroughly decomposed.

The water table is near the surface all the time, but it fluctuates enough to permit decomposition of the upper part of the organic deposits. The lower part is saturated all the time, so decomposition is very slow.

This unit can be cultivated if drained, but drainage is very expensive. None is cultivated now. In their natural state, these areas provide a suitable habitat for muskrat, beaver, and waterfowl. The vegetation consists of reeds, sedges, alders, and a few scrubby trees. Some areas are flooded by overflow from streams. (Not in a capability unit)

Papakating Series

The Papakating series consists of very poorly drained, dark-colored soils that developed on thick beds of silty, sandy, and gravelly alluvium on flood plains of streams throughout the county. These soils are flooded every 1 to 3 years. The water table is near the surface for much of the year.

A typical profile has a surface layer of very dark gray silt loam about 6 inches thick. The subsoil consists of about 12 inches of sticky, very dark gray and dark gray clay loam mottled with yellowish red and dark reddish brown. The substratum is gray loam over gray sandy loam, both mottled with yellowish brown.

Only a few fields of Papakating soils have been farmed. Some areas are pastured, and others are wooded. The high water table and frequent flooding are limitations for many uses of these soils.

Representative profile of Papakating silt loam in a nearly level pasture, 4 miles northeast of Greenville.

A1—0 to 6 inches, very dark gray (10YR 3/1) silt loam; many, fine, distinct, brownish-yellow (10YR 6/6) mottles, some along fine root channels; moderate, medium to coarse, granular structure; friable when moist, slightly sticky and plastic when wet; medium acid (pH 6.0); clear, smooth boundary. 4 to 10 inches thick.

IIB21g—6 to 12 inches, very dark gray (10YR (3/1) clay loam; many, fine, distinct, dark reddish-brown (2.5YR 3/4) mottles; weak, coarse, prismatic structure that breaks to moderate, coarse, blocky structure; firm when moist, sticky and plastic when wet; roots common along ped faces; medium acid (pH 6.0); gradual, wavy boundary. 4 to 15 inches thick.

IIB22g—12 to 18 inches, dark-gray (N 4/0) clay loam; many, medium, prominent, yellowish-red (10YR 5/8) mottles; weak, coarse, prismatic structure that breaks to moderate, coarse, blocky structure; firm when moist, sticky and plastic when wet; some roots along prism faces; slightly acid (pH 6.2); clear, wavy boundary. 3 to 10 inches thick.

IIIC1g—18 to 30 inches, gray (N 6/0) loam; many, coarse, distinct, yellowish-brown (10YR 5/8) mottles; weak, thick, platy structure and weak, medium, blocky structure; friable when moist, nonsticky and nonplastic when wet; slightly acid (pH 6.2); clear, smooth boundary. 0 to 20 inches thick.

IVC2g—30 to 50 inches +, gray (N 6/0) sandy loam; many, coarse, distinct, yellowish-brown (10YR 5/8) mottles; structureless; very friable when moist, nonsticky and nonplastic when wet; slightly acid (pH 6.4).

The A1 horizon is black to very dark gray (hue 10YR or neutral, value 2 to 4 and chroma 0 to 1). The structure is usually granular but tends toward prismatic in the lower part of this horizon.

The IIB2 horizon is very dark gray to light gray. The upper part is usually darker colored than the lower part. The texture ranges from silt loam to silty clay.

In places the C horizon consists of stratified sandy loam, loam, and loamy sand, and in places it contains lenses of gravel. The thickness and the structure of this horizon are highly variable.

The content of coarse fragments is generally low, but in some layers it is as much as 30 percent. The reaction generally is medium acid to neutral.

Papakating soils lack the horizon of clay accumulation that is characteristic of Luray soils. They have a thicker dark-colored surface layer than Wayland soils, coarse variant.

Papakating silt loam (Pa).—This soil has a high water table and is flooded frequently late in winter and early in spring. Some of the areas are in depressions, and these areas remain under water for a time after floodwater has receded from the adjacent flood plains. Included in mapping were areas of Halsey soils, of Wayland soils, coarse variant, and of Muck and peat.

If drained, this soil can be cultivated. Drainage is difficult because of the scarcity of outlets. The high water table and the frequent floods are limitations that affect many uses. (Capability unit IVw-1)

Ravenna Series

The Ravenna series consists of somewhat poorly drained soils that developed on thick deposits of firm glacial till. These soils have a slowly permeable fragipan in the lower part of the subsoil. The water table is within 6 to 18 inches of the surface in spring.

A typical profile has a surface layer of dark-brown silt loam about 8 inches thick. The uppermost 6 inches of the subsoil is firm, yellowish-brown, mottled silt loam. Below this is 4 inches of firm, light brownish-gray, mottled silt loam. The lower part of the subsoil is a fragipan that is about 3 feet thick and consists of gray, mottled gravelly silt loam. The substratum is firm, grayish-brown, mottled gravelly silt loam.

A large acreage of Ravenna soils has been farmed, but some is now idle or planted to trees. The seasonal high water table and the slow movement of water through the fragipan are limitations that affect many uses.

Representative profile of Ravenna silt loam in a gently sloping hayfield 3 miles south of Grove City. This is the profile sampled for soil characterization by the Pennsylvania State University (S63 Pa 43-6). It is also the site from which the Pennsylvania Department of Highways soil test samples S63 Pa 43-6-4 and 7 were taken.

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable when moist, nonsticky and slightly plastic when wet; less than 5 percent gravel up to 4 inches in diameter; very strongly acid (pH 4.8); abrupt, smooth boundary. 6 to 12 inches thick.

B21t—8 to 14 inches, yellowish-brown (10YR 5/4) silt loam; few, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, fine and medium, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; thin patchy clay films on ped faces and on lining of pores; 5 percent gravel up to 3 inches in diameter; very strongly acid (pH 4.8); clear, wavy boundary. 2 to 7 inches thick.

B22tg—14 to 18 inches, silt loam; light brownish-gray prism faces (10YR 6/2); prism interiors and faces of small peds are yellowish brown (10YR 5/4) with many, medium, distinct, light brownish-gray (10YR 6/2) and brown (7.5YR 5/4) mottles; moderate, coarse, prismatic structure that breaks to moderate, thick, platy and weak, fine, subangular blocky structure; firm when moist, sticky and plastic when wet; thick patchy clay films on ped faces and on pore linings; 10 percent coarse fragments up to 4 inches in diameter; very strongly acid (pH 4.8); clear, wavy boundary. 4 to 9 inches thick.

Bx1g—18 to 33 inches, silt loam; gray (N 5/0) prism faces; dark grayish-brown (10YR 4/2) prism interiors with many, medium and coarse, distinct, gray (10YR 6/1) and yellowish-brown (10YR 5/6) mottles; common, black coatings on faces of platy peds; moderate, very coarse, prismatic structure that breaks to moderate, medium and thick, platy and blocky structure; very firm in place, friable if displaced when moist, slightly sticky and slightly plastic when wet; very thick silt and clay deposits on prism faces, and thick clay films on interior peds; 15 percent coarse fragments up to 4 inches in diameter; very strongly acid (pH 5.0); gradual, wavy boundary. 12 to 20 inches thick.

Bx2g—33 to 42 inches, silt loam; gray (N 6/0) prism faces; dark grayish-brown (10YR 4/2) ped interiors with common, medium, distinct, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6) mottles; many black coatings on ped faces; fine black concretions; moderate, very coarse, prismatic structure that breaks to moderate, thick, platy and weak, fine, blocky structure; very firm in place, friable if displaced when moist, slightly sticky and slightly plastic when wet; very thick silt and clay deposits on prism faces and thick continuous films on interior peds; 15 percent coarse fragments up to 5 inches in diameter; strongly acid (pH 5.1); gradual, wavy boundary. 6 to 12 inches thick.

Bx3g—42 to 55 inches, silt loam; grayish-brown (10YR 5/2) prism faces; dark yellowish-brown (10YR 4/4) ped interiors with common, medium and coarse, distinct, gray (N 6/0) and brown (7.5YR 5/4) mottles; many coatings on faces; few, fine, black concretions; weak, very coarse, prismatic structure that breaks to weak, medium, platy and blocky structure; firm in place, friable if displaced when moist, slightly sticky and slightly plastic when wet; thick silt and clay deposits on prism faces and few patches on interior peds; 10 percent coarse fragments up to 5 inches in diameter; strongly acid (pH 5.4); gradual wavy boundary. 10 to 20 inches thick.

Cg—55 to 70 inches +, silt loam; grayish-brown (10YR 5/2) prism faces; dark yellowish-brown (10YR 4/4) ped interiors that have common, medium, distinct, yellowish-brown (10YR 5/6) and brown (7.5YR 5/4) mottles; common black coatings on ped faces; few, very fine, black concretions; weak, very coarse, prismatic structure that breaks to weak, thick, platy structure; friable when moist, slightly sticky and slightly plastic when wet; thick clay and silt deposits on prism faces; 15 percent coarse fragments up to 5 inches in diameter; medium acid (pH 6.0).

The Ap horizon has a hue of 10YR, a value of 3 to 4, and a chroma of 2 to 3. In unplowed areas a 2- to 5-inch A1 horizon of silt loam is at the surface. This A1 horizon has a hue of 10YR or 2.5Y, a value of 2 to 4, and a chroma of 2 to 3. A 2- to 4-inch A2 horizon of silt loam occurs immediately below the A1 horizon. The A2 horizon has a hue of 10YR, a value of 5 to 7, and a chroma of 4 to 6.

The B21t horizon is usually yellowish brown (10YR 5/4) but ranges to light yellowish brown (10YR 6/4). This horizon is usually mottled in some degree with light brownish gray (10YR 6/2). The dominant structure of the B21t horizon is moderate, medium to fine, subangular blocky.

The ped interiors in the B22tg horizon have a hue of 10YR, a value of 4 to 5, and a chroma of 3 to 4. The ped faces range in value from 5 to 7. This horizon is flecked with common to many mottles with a hue of 7.5YR or 2.5Y, a value of 4 to 7, and a chroma of 2 to 8. The structure of the B22tg horizon is moderate, coarse, prismatic that breaks to weak, medium, platy and weak, fine, subangular blocky.

The depth to the Bx horizon ranges from 16 to 28 inches. The ped faces in this horizon have coatings of light brownish-gray (10YR 6/2 and 2.5Y 6/2), gray (N 5/0), or light gray (10YR 7/2). The color of the interiors generally ranges from 10YR 4/2 to 7.5YR 4/4. This horizon has many mottles (hue 2.5Y or 7.5YR, value 4 to 7, and chroma 2 to 8). The texture of this horizon ranges from silt loam to loam.

The depth to the C horizon ranges from 40 to 60 inches. The boundary between the fragipan and the C horizon is gradual in many places. The C horizon is dense. In color it is much like the Bx horizon. The texture is sandy loam to silt loam.

The reaction is generally very strongly to strongly acid in the upper part of the solum. The fragipan and the C horizon are very strongly acid to neutral. The content of coarse fragments is usually less than 15 percent above the fragipan but 10 to 50 percent in the pan and below it.

Ravenna soils differ from Frenchtown soils in having colors of high chroma just below the surface layer. They differ from Red Hook soils in having a horizon of clay accumulation (Bt horizon). They differ from Caneadea soils in having a fragipan and in being less clayey. They are grayer in the upper part of the Bt horizon than Canfield soils.

Ravenna silt loam, 0 to 3 percent slopes (RaA).—This soil occurs throughout the county, usually in association with gently sloping Ravenna soils. The surface layer and the upper part of the subsoil are slightly thicker than those in the soil described as having the typical profile, and the depth to the fragipan is greater. Included in mapping were areas of nearly level Frenchtown and Canfield soils and of gently sloping Ravenna soils.

The water table is high for a long time each year, and water moves slowly through the fragipan. Drainage improves workability.

Most of this soil has been farmed (fig. 9). The seasonal high water table and the restricted permeability of the fragipan limit nonfarm uses. (Capability unit IIw-3)

Ravenna silt loam, 3 to 8 percent slopes, moderately eroded (RaB2).—This is the most extensive soil in the county. It has the profile described as typical for the series. Because several inches of the surface layer have been lost through erosion, the plow layer now consists partly of the brighter colored subsoil. Included in mapping were areas of nearly level and sloping Ravenna soils, of severely eroded, gently sloping Frenchtown and Canfield soils, and, north of Greenville, soils that are like the Ravenna but are moderately deep to bedrock.

The water table is seasonally high, and water moves slowly through the fragipan.

Much of this soil has been farmed, but some parts are now idle or planted to trees. The seasonal high water

Figure 9.—**Pasture on Ravenna silt loam, 0 to 3 percent slopes.**

table and the restricted permeability of the fragipan limit nonfarm uses. (Capability unit IIIe–4)

Ravenna silt loam, 8 to 15 percent slopes, moderately eroded (RaC2).—This soil has a thinner surface layer and subsoil and is shallower to the fragipan than the soil described as having the typical profile. Wooded areas are relatively uneroded. Included in mapping were areas of gently sloping and moderately steep Ravenna soils, of severely eroded, sloping Ravenna soils, of sloping Canfield soils, and, north and east of Greenville, soils that are like the Ravenna but are shallow over bedrock.

The water table is seasonally high, and water moves slowly through the fragipan.

Approximately 60 percent of this soil has been cultivated, but some areas are now idle or planted to trees. The slope, the seasonal high water table, and the restricted permeability of the fragipan limit nonfarm uses. (Capability unit IVe–4)

Ravenna silt loam, 8 to 15 percent slopes, severely eroded (RaC3).—This soil has a thinner surface layer and subsoil and is shallower to the fragipan than the soil described as having the typical profile. Included in mapping were areas of sloping, moderately eroded Ravenna soils.

The water table is seasonally high, and water moves slowly through the fragipan.

All of this soil has been cultivated in the past, although it is better suited to pasture, woodland, or wildlife habitat. The slope, past erosion, the seasonal high water table, and the restricted permeability of the subsoil limit nonfarm uses. (Capability unit VIe–2)

Ravenna silt loam, 15 to 25 percent slopes, moderately eroded (RaD2).—This soil is most common in the eastern part of the county. The layer of subsoil above the fragipan is thinner than that in the soil that has the typical profile, and the depth to the fragipan is less. Wooded areas are only slightly eroded. Included in mapping were areas of severely eroded, moderately steep Ravenna soils; of sloping Ravenna soils; of Lordstown soils; of moderately steep Canfield soils; and of nearly level Wayland soils, coarse variant.

The water table is seasonally high, and water moves slowly through the fragipan. The hazard of erosion is very severe.

Pasture, woodland, and wildlife habitat are better uses for this soil than cultivated crops, but about half of the acreage has been cultivated in the past. The slope, the hazard of erosion, the seasonal high water table, and the slow permeability limit nonfarm uses. (Capability unit VIe–2)

Ravenna very stony silt loam, 0 to 15 percent slopes (ReC).—This soil is most common in the eastern part of the county, on seepy slopes below areas of very stony Lordstown soils. Rounded stones 10 to 36 inches in diameter cover 0.5 to 5 percent of the surface. A few boulders 3 to 7 feet in diameter are among the stones in some areas. Included in mapping were areas of nearly level, very stony Frenchtown soils and nearly level to sloping, nonstony Ravenna soils.

The water table is seasonally high, and water moves slowly through the fragipan.

None of this soil is cultivated, but it is suited to pasture, woodland, or wildlife habitat. The stones generally prevent the use of farm machinery, and removing the stones is expensive. The stones, the seasonal high water table, and the restricted permeability of the lower subsoil limit nonfarm uses. (Capability unit VIs-1)

Red Hook Series

The Red Hook series consists of somewhat poorly to moderately well drained soils that developed on thick deposits of silt, sand, and gravel. These soils occur along major drainageways in Mercer County and on moraines in the eastern and southeastern parts of the county. The water table is within 8 to 20 inches of the surface in spring. The subsoil is moderately slowly permeable, and the substratum is rapidly permeable.

In a typical profile, the plow layer is dark grayish-brown silt loam about 8 inches thick. The uppermost part of the subsoil is friable, dark yellowish-brown silt loam. The middle part is friable, brown loam that has light brownish-gray mottles. The lower part is firm, dark grayish-brown gravelly sandy loam that has light brownish-gray mottles. The substratum, which is at a depth of about 31 inches, is dark-brown, loose gravelly sandy loam that is several feet thick.

Red Hook soils are suited to general crops. Most of the acreage has been cultivated. The seasonal high water table, the moderately slow movement of water through the lower part of the subsoil, and flooding of some areas limit nonfarm uses.

Representative profile of gently sloping Red Hook silt loam in a hayfield 2 miles southeast of Jamestown.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium and coarse, granular structure; friable when moist, slightly sticky and slightly plastic when wet; slightly acid (pH 6.5); clear, wavy boundary. 6 to 10 inches thick.

B1—8 to 15 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium, prismatic structure that breaks to weak, medium, subangular blocky; friable when moist, slightly sticky and slightly plastic when wet; slightly acid (pH 6.4); clear, wavy boundary. 2 to 12 inches thick.

B21—15 to 24 inches, brown (10YR 4/3) loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium, prismatic structure that breaks to moderate, medium to fine, subangular blocky; friable when moist, slightly sticky and nonplastic when wet; 10 percent gravel; few, thin, patchy clay films; slightly acid (pH 6.2); gradual, wavy boundary. 6 to 12 inches thick.

B22g—24 to 31 inches, gravelly sandy loam; dark grayish-brown (10YR 4/2) ped faces; strong-brown interiors (7.5YR 5/6) that have many, medium, distinct, light brownish-gray (10YR 6/2) mottles; compound structure—moderate, coarse, prismatic structure that breaks to weak, thick, platy and weak, coarse, subangular blocky; firm in place but friable if removed when moist, tendency to brittleness; nonsticky and nonplastic when wet; 15 percent gravel; few, thin, patchy clay films; medium acid (pH 5.8); gradual, wavy boundary. 4 to 10 inches thick.

IIC—31 to 50 inches +, dark-brown (10YR 4/3) gravelly sandy loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; single grain; very friable when moist, nonsticky and nonplastic when wet; 40 percent coarse fragments; slightly acid (pH 6.2).

The Ap horizon is dark brown to dark grayish brown (hue 10YR, chroma 2, and value 2 to 4). In unplowed areas there is a black to very dark gray A1 horizon 1 to 2 inches thick and a brown, granular A2 horizon 2 to 6 inches thick.

The B1 horizon is brown to yellowish brown (hue 10YR, value 4 to 5, and chroma 3 to 4). The depth to the mottled B21 horizon is 8 to 20 inches. This horizon is dark brown to yellowish brown (hue 10YR or 7.5YR, value 4 to 5, and chroma 3 to 4).

The depth to the B22g horizon is 14 to 30 inches. This horizon has low-chroma colors on the ped faces. The texture ranges from silt loam to sandy loam.

The substratum is sandy loam to loamy sand.

The coarse-fragment content is 5 to 15 percent in the uppermost 2 feet of the profile and as much as 40 percent in the lower part. The reaction is usually medium acid to neutral.

Red Hook soils have brighter colors below the A horizon than Halsey soils. They have a less firm subsoil than Frenchtown and Ravenna soils, and they lack the horizon of clay accumulation that is typical of those soils. They have brighter colors in the upper part of the subsoil than Wayland soils. They have much more sand and gravel in the subsoil and substratum than Caneadea soils.

Red Hook silt loam, flooded (Rf).—This nearly level soil is free of mottles to a greater depth than the soil that has the typical profile. All areas except those protected by large structures are flooded by stream overflow every 1 to 3 years. Included in mapping were areas of Red Hook soils of more sandy texture, areas of Wayland soils, coarse variant, and areas of Chenango fine sandy loam.

The water table is seasonally high, and the substratum is moderately permeable.

Most of this soil has been cultivated. Drainage makes farming easier. Most floods occur late in winter or early in spring, and so do not damage crops. The seasonal high water table and the flood hazard limit nonfarm uses. (Capability unit IIw-2)

Red Hook silt loam, low terrace (Rh).—This nearly level soil is free of mottles to a greater depth than the soil that has the typical profile. It is slightly higher than the flood plains of major streams and is flooded only occasionally. Included in mapping were areas of Red Hook soils of more sandy texture, areas of Chenango soils, low terrace, and areas of Chenango silt loam.

The water table is seasonally high, and the substratum is moderately permeable. This soil is suited to general farm crops. Most of it has been farmed. Drainage makes farming easier. Most floods occur late in winter or early in spring, and so do not damage crops. The seasonal high water table and the flood hazard limit nonfarm uses. (Capability unit IIw-2)

Red Hook silt loam, 3 to 8 percent slopes, moderately eroded (RoB2).—This soil has the profile described as typical for the series. Several inches of the original surface layer has been lost through erosion, and the plow layer now consists partly of the brighter colored subsoil. Wooded areas are only slightly eroded. Included in mapping were areas of gently sloping Frenchtown soils, of nearly level Halsey soils in depressions, and of gently sloping Braceville soils.

The water table is seasonally high, and water moves moderately slowly through the lower part of the subsoil. Runoff from higher soils accumulates. The hazard of erosion is moderate.

Most of this soil has been farmed. The seasonal high water table limits nonfarm uses. (Capability unit IIIw–5)

Strip Mine Spoil

This land type consists of the spoil that remains after coal is strip mined. Most of it is in the southeastern part of the county. Fragments of sandstone, shale, impure coal, and limestone are abundant on the surface and throughout the raw earth turned up in the mining operations. The reaction ranges from very strongly acid to neutral.

Strip mine spoil, gently sloping (StB).—Some areas of this unit have been leveled after stripping, but even these areas remain rough. Included in mapping were areas of Strip mine spoil, moderately steep, and Strip mine spoil, steep.

Some of the areas are devoid of vegetation; others have been planted to locust and pine trees; and a few have been fertilized and planted to grass and clover.

Although erosion is a hazard, this unit could be reclaimed and farmed. Nonfarm uses are limited by the large quantities of stone fragments. (Not in a capability unit)

Strip mine spoil, moderately steep (StC).—Some areas have been leveled after stripping, but even these areas are rough. Areas of this unit are 10 to 100 acres in size. Included in mapping were small areas of Strip mine spoil, gently sloping; of Strip mine spoil, moderately steep; and of Mine dumps.

Some of the areas are devoid of vegetation; some have been planted to locust and pine trees; and a few have been fertilized and planted to grass and clover.

This unit is unsuitable for farming, and the stones, the hazard of erosion, and the slope limit nonfarm uses. (Not in a capability unit)

Strip mine spoil, steep (StE).—This unit is characterized by many short, steep slopes and some high walls with water at the base (fig. 10). Many shallow gullies have developed on the slopes. The areas are 10 to 200 acres in size. Included in mapping were a few areas of Strip mine spoil, moderately steep, of Strip mine spoil, gently sloping, and of Mine dumps.

Some of the areas are devoid of cover; others have been planted to locust and pine trees.

The steep slopes, the erosion hazard, and the stones severely limit both farm and nonfarm uses of this unit.

Figure 10.—Vegetated areas of Strip mine spoil, steep.

Some of the water areas can be stocked with fish. (Not in a capability unit)

Unadilla Series

The Unadilla series consists of well-drained soils that developed in deposits of silt, sand, and gravel. They occur mainly on terraces along French Creek in the extreme northeastern part of the county.

A typical profile has a 4-inch surface layer of silt loam; the upper half is very dark grayish brown, and the lower half is dark yellowish brown. The subsoil is dark-brown, friable silt loam about 24 inches thick. The substratum, which is at a depth of about 28 inches, is dark-brown, very friable sandy loam.

Unadilla soils have a high available moisture capacity and are productive. Nearly all the acreage has been farmed. The moderately rapidly permeable substratum limits the capacity for filtering wastes.

Representative profile of Unadilla silt loam in a nearly level field on the Boy Scout Camp, 1½ miles southeast of Carlton:

O1—1½ inches to 1 inch, layers of new and partly decayed leaves.

O2—1 inch to 0, mostly decomposed leaves and stems.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium to fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 4.8); abrupt, smooth boundary. 0 to 4 inches thick.

A2—2 to 4 inches, dark yellowish-brown (10YR 3/4) silt loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 5.0); abrupt, smooth boundary. 2 to 5 inches thick.

B21—4 to 13 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, prismatic structure that breaks to moderate, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 5.0); gradual, wavy boundary. 5 to 13 inches thick.

B22—13 to 28 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, prismatic structure that breaks to moderate, fine, subangular blocky and blocky structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 5.0); clear, wavy boundary. 10 to 20 inches thick.

IIC—28 to 40 inches +, dark-brown (10YR 4/3) sandy loam; structureless; very friable when moist, nonsticky and nonplastic when wet; strongly acid (pH 5.2).

The A1 horizon is very dark brown and very dark grayish brown to dark brown (hue 10YR or 7.5YR, value 2 to 3, and chroma 2 to 4). In plowed areas there is a 6- to 8-inch, dark-brown or brown Ap horizon. The coarse-fragment content of the A horizon is less than 15 percent.

The B horizon is dark brown to brown to yellowish brown (hue 7.5YR or 10YR, value 4 to 5, and chroma 3 to 4). The texture is silt loam to a depth of 20 inches and in many places to a depth of 30 or 40 inches, but in the lower part of the B horizon the texture ranges to loam or sandy loam. The content of coarse fragments is less than 15 percent. The depth to the C horizon is 25 to 40 inches. This horizon overlies several feet of acid sandy loam. Lenses of silt loam, loam, or gravel are not uncommon. The content of coarse fragments is 10 to 30 percent.

Unadilla soils have more silt and less sand than Chenango soils; they are much deeper to bedrock than Lordstown soils; they have a more friable, less dense subsoil and colors of higher chroma in the subsoil than Canfield or Braceville soils.

Unadilla silt loam (Un).—This soil has a slope range of 0 to 5 percent. It has a friable, moderately permeable subsoil and a loose, sandy, moderately rapidly permeable substratum. Included in mapping were areas of nearly level Chenango silt loam.

This soil is well suited to all crops grown in the area. The erosion hazard is slight. Tilth can be maintained by including cover crops or hay crops in the rotation. Because of the loose, moderately rapidly permeable substratum, contamination of ground water is possible if this soil is used for filtering wastes. (Capability unit I–1)

Urban land (Ur).—This unit consists of soils that have been cut, moved, leveled, filled, or otherwise disturbed by man. The original soil horizons have been destroyed or buried.

Some of these areas are in towns, where earth shaping was necessary to permit the construction of schools, factories, offices, shops, and stores. Also mapped with this unit were borrow pits and areas of cut and fill near the interstate highways.

Most areas of Urban land are unsuitable for farming. Their suitability for nonfarm uses varies with each site. (Not in a capability unit)

Wayland Series, Coarse Variant

The Wayland series, coarse variant, consists of poorly drained to somewhat poorly drained soils that developed in thick deposits of sand, silt, and gravel. These soils occur on the flood plains of most of the streams of the county. They are flooded almost every year, usually late in winter or early in spring. The water table is within 6 inches of the surface for several months each year.

A typical profile has a surface layer of very dark gray silt loam about 4 inches thick. The subsoil is about 14 inches thick and consists of friable, dark-gray silt loam mottled with dark reddish brown. The substratum is friable, very dark gray sandy loam over loose, dark-gray gravelly sandy loam.

These soils are commonly used for pasture. Some areas have been cultivated, but farming is hampered by the irregular shape of the areas and the meandering streams. Artificial drainage is necessary to make farming possible. The high water table and the flood hazard limit nonfarm uses.

Representative profile of Wayland silt loam, in a nearly level pasture, 4½ miles northeast of Grove City. This is the profile from which Pennsylvania Department of Highways test samples S63 Pa 43–12–1 and 2 were taken.

A1g—0 to 4 inches, very dark gray (10YR 3/1) silt loam; common, fine, distinct, reddish-brown (5YR 4/4) mottles along root channels; moderate, medium, granular structure; friable when moist, nonsticky and slightly plastic when wet; many roots; medium acid (pH 5.7); clear, smooth boundary. 3 to 7 inches thick.

B2g—4 to 18 inches, dark-gray (10YR 4/1) silt loam; many, medium, prominent, dark reddish-brown (5YR 3/4) mottles; weak, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; common roots; few, thin patchy clay films; 3 percent gravel; slightly acid (pH 6.4); gradual, irregular boundary. 7 to 20 inches thick.

IIC1g—18 to 25 inches, very dark gray (10YR 3/1) sandy loam; stratified with 2- to 3-inch bands of gray (10YR 5/1) loamy sand; single grain; loose to very friable when moist, nonsticky and nonplastic when wet; 10 percent gravel ¼ to 1 inch in diameter;

slightly acid (pH 6.4); gradual, irregular boundary. 5 to 10 inches thick.

IIIC2g—25 to 36 inches +, dark-gray (N 4/0) gravelly sandy loam; single grain; loose when moist, nonsticky and nonplastic when wet; 50 percent gravel 1/3 inch in diameter; slightly acid (pH 6.4).

The A1 horizon is very dark gray or dark gray to very dark grayish brown (hue 10YR, value 3 to 4, and chroma 1 to 2). The structure of the A1 horizon is moderate, medium to coarse, granular.

The B2g horizon is dark gray or gray to very dark gray (hue 10YR or 5Y, value 3 to 5, and chroma 1). This horizon normally has many dark reddish-brown (5YR 3/4), reddish-brown (5YR 4/4), yellowish-red (5YR 4/6), or strong-brown (7.5YR 5/6) mottles. The texture is normally silt loam, but it ranges to loam and sandy loam. The structure is weak, fine and medium, subangular blocky to moderate, medium, granular.

The depth to the C or IIC horizon is 10 to 25 inches. This horizon consists of stratified, gray (N 4/0), dark gray (10YR 4/1), or very dark gray (10YR 3/1), sandy and gravelly material and is several feet thick.

The reaction is medium acid to neutral in the solum and slightly acid to neutral in the substratum. The content of coarse fragments is generally less than 15 percent in the solum and is as much as 75 percent in the substratum.

Wayland soils, coarse variant, have a thinner, less dark-colored surface layer than Luray or Papakating soils; a grayer upper subsoil than Red Hook soils, and a less dense subsoil than Frenchtown soils.

Wayland silt loam, coarse variant (Wa).—This soil has a slope range of 0 to 5 percent. It is on the flood plains of streams throughout the county and is flooded almost every year. Included in mapping were areas of Papakating soil.

The water table is near the surface for several months.

If drained, the larger fields of this soil can be planted to general farm crops. Floods occur late in winter or early in spring, and so do not damage crops. The flood hazard and the high water table severely limit nonfarm use. (Capability unit IIIw-4)

Formation and Classification of the Soils

The first part of this section discusses the factors that affect soil formation, and the second part defines the categories in the system of soil classification and shows where the soils of Mercer County are placed in that system. The third part contains two tables that give data on physical and chemical properties of selected soils.

Formation of the Soils

The characteristics of a soil at any given site depend on the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and remained, the plant and animal life on and in the soil, the relief or lay of the land, and the length of time the forces of soil development have acted on the soil material.

Climate and plant and animal life are the active forces that change the parent material into a soil that has genetically related horizons. The effects of climate and plant and animal life are influenced by relief and by the nature of the parent material. In some cases the parent material dominates the other factors in profile formation. Finally, time is needed to change the parent material into a soil profile. A long time usually is needed for the development of distinct horizons.

These factors of soil formation interrelate so closely in their effects on the soil that few generalizations can be made about the effect of one. Furthermore, many processes of soil development are unknown.

Parent material

The material from which soils form is composed of varying amounts of sand, silt, and clay. The material also has various kinds and amounts of chemicals and is exposed to various climates. All the other soil-forming factors affect parent material, but the nature of the parent material often determines the character of the soil.

The parent material of the soils of Mercer County was deposited by glacial ice and water. The upper part of many soils developed from wind-deposited silty material. This silty material overlies firm, gravelly, loamy material. The gravelly loamy nature of the parent material has resulted in the development of a very firm, dense, brittle hardpan in many soils. The Canfield, Ravenna, and Frenchtown soils developed from such materials.

The gravelly sandy Chenango, Braceville, and Red Hook soils formed where water from the melting glacier deposited stratified material. The Wayland, coarse variant, soils, the Chenango, flooded, soils, and the Red Hook soils developed from stratified material deposited in stream valleys by water carrying sediments from silty, sandy, or gravelly sources.

Climate

Precipitation, temperature, humidity, and wind have been important in the development of Mercer County soils. Ample precipitation combined with gentle topography and a dense substratum has created a high water table in many soils. This high water table accounts for grayish colors in the wetter soils. The relatively cool temperature has influenced the reaction and produced the yellow colors that are common in Mercer County soils. The climate has also affected the soils through its influence on the vegetation.

Plant and animal life

Vegetation, micro-organisms, earthworms, and other forms of life contribute to soil formation. The kind and quantity of vegetation are important, and these depend on the parent material and the climate.

The climate of Mercer County favors the growth of both hardwood and softwood trees, and many of the soils formed under forests. Leaves, twigs, roots, and entire plants accumulate on the surface of forest soils. Organic matter is added to the soil as plant remains decompose under the action of micro-organisms, earthworms, and other forms of life. The uprooting of trees also influences soil formation by mixing the soil and loosening the underlying material.

Man also has influenced the direction and rate of soil formation. He has altered the soils by drainage, by changing the vegetation, by tilling and compacting the soils, and by changing the amount of organic matter. By earth-moving practices he has created artificial horizons, destroyed natural horizons, and mixed and completely obscured natural profiles.

Relief

Relief influences soil formation through its effect on surface drainage and the rate of erosion. The extensive areas of nearly level and gently sloping relief in Mercer County have contributed to the development of a seasonal high water table of long duration in Ravenna, Frenchtown, Red Hook, Halsey, Luray, Wayland, coarse variant, and Papakating soils. Muck and peat developed from beds of plant residues in ponded depressions. Soils on the stronger slopes, where the water drains away, have seasonal high water tables of short duration. The Lordstown soils are examples.

Time

Climate, relief, and living organisms need time to change parent material into a soil. The degree of profile development generally indicates the age of a soil.

The Papakating and Wayland soils are on flood plains and are younger than other soils of the county. Organic matter has accumulated on the surface, but the horizons are less distinct than those in soils of the uplands and terraces. The soils of the uplands, of which the Canfield and Ravenna soils are examples, are older than those on the flood plains but younger than those in nonglaciated areas a few miles southeast of the county.

Classification of the Soils

Soils are classified so that we may more easily remember their significant characteristics, assemble knowledge about them, see their relationships to one another and to the whole environment, and develop principles that help us understand their behavior and response to manipulation. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The system of soil classification used in this survey is that adopted as standard for all soil surveys in the United States, effective January 1, 1965 (*24*). It replaces the system used since 1938 (*4*), as later revised (*19*). Persons interested in the background of the current system can refer to the available literature (*16*, *17*). Table 12 shows the classification of the soils of Mercer County according to the current system and their placement in one broad category of the 1938 system.

The current system of classification defines categories of soils in terms of observable or measurable properties. The properties chosen are primarily those that permit grouping soils that are similar in genesis. The classification, designed to accommodate all soils, has six categories. Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. Following are brief descriptions of the categories.

ORDER.—Ten soil orders are recognized: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The exceptions to this are the Entisols and Histosols, which occur in many different climates.

As shown in table 12, four soil orders are represented in Mercer County: Inceptisols, Mollisols, Alfisols, and Histosols.

Typical Inceptisols have a surface layer that has been darkened to a depth of several inches by organic matter. The B horizon has uniform color, weak to moderate structure, and little if any accumulation of silicate clay. Some Inceptisols have a fragipan. The soils of this order range from very poorly drained to well drained. In Mercer County the Inceptisols are represented by the following

TABLE 12.—*Classification of soil series according to the higher categories*

Series	Current system			Great soil group according to the 1938 system
	Family	Subgroup	Order	
Braceville	Coarse-loamy, mixed, mesic	Typic Fragiochrepts	Inceptisols	Sols Bruns Acides.
Caneadea	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Canfield	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils.
Chenango	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Frenchtown	Fine-loamy, mixed, mesic	Typic Fragiaqualfs	Alfisols	Low-Humic Gley soils.
Halsey	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Lordstown	Coarse-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Luray	Fine-silty, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols	Humic Gley soils.
Muck and peat	(1)	(1)	Histosols	Bog soils.
Papakating	Fine-silty, mixed, nonacid, mesic	Fluventic Haplaquepts	Inceptisols	Humic Gley soils.
Ravenna	Fine-loamy, mixed, mesic	Aeric Fragiaqualfs	Alfisols	Gray-Brown Podzolic soils.
Red Hook	Coarse-loamy, mixed, acid, mesic	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Unadilla	Coarse-silty, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Wayland, coarse variant.	Fine-loamy, mixed, nonacid, mesic	Fluventic Haplaquepts	Inceptisols	Low-Humic Gley soils.

[1] The classification of Histosols at the subgroup and family levels was provisional at the time this survey went to the printer.

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series: Braceville, Chenango, Halsey, Lordstown, Papakating, Red Hook, Unadilla, and Wayland, coarse variant.

Typical Mollisols have a thick, friable, dark-colored surface layer. The B horizon has measurably more clay particles than the A horizon, and it has uniform color and weak to moderate structure. Luray soils, the only Mollisols in Mercer County, are very poorly drained. Their base saturation is greater than 60 percent.

Typical Alfisols have a surface layer that has been darkened to a depth of several inches by organic matter. The B horizon has measurably more clay than the A horizon, uniform color, and moderate to strong structure. Some Alfisols have a fragipan. Base saturation is usually 40 to 70 percent. The soils in this order range from poorly drained to moderately well drained. In Mercer County the Alfisols are represented by the following series: Caneadea, Canfield, Frenchtown, and Ravenna.

Histosols are organic soils. The order is represented in Mercer County by Muck and peat, which has a thick surface layer of black, acid muck over many feet of grayish-brown, acid, fibrous peat. Areas of Muck and peat are saturated most of the year. The classification of Histosols in the lower categories of the current system was provisional at the time this survey went to the printer.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the order. The criteria for suborders reflect either the presence or absence of waterlogging or differences in climate or vegetation.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of uniformity in kind and sequence of genetic horizons. The great group is not shown in table 12, because the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) concept of the group and others, called intergrades, made up of soils that have mostly the properties of one great group but also one or more properties of another great group.

FAMILIES.—Families are established within subgroups, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

TABLE 13.—*Physical*

[Dashes indicate no

Soil and sample number	Horizon	Depth from surface	Particle-size distribution				
			Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Canfield silt loam (S63 Pa-43-3)	Ap	0-10	3.4	3.8	6.9	7.5	9.8
	B21t	10-18	3.3	3.2	5.2	7.1	10.0
	B22t	18-25	3.6	3.2	5.1	6.0	8.1
	Bx1tg	25-40	2.7	4.2	7.5	9.5	12.3
	Bx2g	40-62	2.7	3.6	6.7	9.6	13.0
	Bx3	62-71	5.5	5.5	8.0	10.0	12.0
	C	71-89	8.3	8.9	14.4	11.1	10.3
Chenango gravelly loam (S63 Pa-43-1).	A1	0-6	4.6	4.4	5.8	5.6	7.1
	A2	6-14	5.7	6.7	10.0	9.8	9.1
	B2	14-22	7.8	8.4	13.3	11.6	12.7
	B3	22-29	7.6	9.4	15.2	15.2	13.0
	C	29-53	25.4	23.6	20.7	7.8	4.4
Frenchtown silt loam (S63 Pa-43-5)	Ap	0-10	1.3	1.8	3.1	3.2	8.8
	B2tg	10-16	1.2	1.7	3.0	3.9	9.1
	Bx1tg	16-30	1.5	1.5	2.3	2.9	5.0
	Bx2tg	30-41	2.8	2.3	3.8	4.4	7.6
	Bx3tg	41-49	1.8	2.6	3.5	4.3	4.9
	Cg	49-70	3.6	3.8	6.5	6.8	5.1
Ravenna silt loam (S63 Pa-43-6)	Ap	0-8	.8	1.9	4.4	5.3	5.9
	B21t	8-14	.9	1.9	4.6	5.4	6.4
	B22tg	14-18	2.7	11.7	16.8	4.9	2.6
	Bx1tg	18-33	2.5	4.2	11.2	9.5	16.2
	Bx2tg	33-42	2.4	3.5	9.7	13.0	13.0
	Bx3g	42-55	2.2	3.7	8.7	11.9	17.1
	Cg	55-70	2.6	3.8	8.0	11.0	11.6

[1] Not corrected for coarse fragments or fragipan.

SERIES.—Soil series are groups of soils that are in the same family and have horizons similar in differentiating characteristics and in arrangement in the profile. The series is the lowest category in the classification system.

Characterization Data [4]

Physical and chemical properties of Frenchtown, Ravenna, Canfield, and Chenango soils are given in tables 13 and 14. The profiles of these soils are described in the section "Descriptions of the Soils."

These soils are among the most extensive in the county. Each profile sampled is located in an area representative of the series in slope, erosion, stoniness, and present use. For each soil, a pit was dug through the solum into the parent material, and samples were collected from each recognizable horizon for laboratory characterization. Also, samples were taken from selected horizons for engineering tests made by the Soil Testing Laboratory of the Pennsylvania Department of Highways. Results of the engineering tests are reported in table 4 in the section "Engineering Uses of the Soils".

[4] Laboratory analysis and interpretations made at the Soil Characterization Laboratory of the Pennsylvania State University by R. P. MATELSKI, R. L. CUNNINGHAM, C. F. ENGLE, G. W. PETERSEN, and others.

Methods of analysis

Each sample was air dried, crushed carefully with a rolling pin to avoid crushing any nonsoil material, and then passed through a series of sieves in order to determine the percentage, by weight, of the various sizes of coarse fragments. The material that passed through the 2-millimeter sieve was then used for all laboratory determinations, except those for bulk density and moisture retention at ⅓-bar tension.

Particle-size analysis was made by the pipette method of Kilmer and Alexander (*6*) with the modifications suggested by Kilmer and Mullins (*7*), using sodium hexametaphosphate as the dispersing agent.

Bulk density was determined on 1- by 2-inch cylindrical core samples taken with a modified Uhland (*20*) core sampler. The results are expressed in grams per cubic centimeter.

properties of selected soils

determination was made]

Particle-size distribution—Con.		Coarse fragments (larger than 2.0 mm.)	Textural class	Bulk density (core)	Moisture held at		Available moisture [1]
Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)				⅓ bar tension (core)	15 bar tension (fragmented)	
Pct.	*Pct.*	*Pct. by weight*		*G./cc.*	*Pct.*	*Pct.*	*In./in. of soil*
56.3	12.3	86	Silt loam	----------	27.1	7.8	----------
54.7	16.5	26	Silt loam	----------	23.7	8.0	----------
56.4	17.6	14	Silt loam	----------	25.3	9.1	----------
45.5	18.3	29	Loam	----------	21.7	9.2	----------
47.0	17.4	29	Loam	----------	19.1	8.4	----------
43.2	15.8	35	Loam	----------	18.1	7.7	----------
34.3	12.7	38	Sandy loam	----------	16.1	6.7	----------
64.2	8.3	58	Silt loam	1.09	26.46	8.7	0.19
54.2	4.5	59	Silt loam	1.43	17.65	5.0	.18
39.6	6.6	65	Sandy loam	1.66	11.89	5.3	.11
33.6	6.0	60	Sandy loam	1.61	11.51	4.8	.11
14.8	3.3	66	Loamy coarse sand	----------	9.4	4.3	----------
65.9	15.9	6	Silt loam	1.26	29.55	11.2	.23
57.9	23.2	12	Silt loam	1.49	22.59	9.7	.19
74.0	12.8	10	Silt loam	1.60	20.45	11.2	.15
61.0	18.1	16	Silt loam	1.77	16.44	10.7	.10
59.6	23.3	12	Silt loam	1.91	14.46	11.8	.05
61.0	13.2	20	Silt loam	1.77	14.13	8.6	.10
71.8	9.9	3	Silt loam	1.28	27.73	8.6	.24
66.2	14.6	4	Silt loam	1.53	22.30	9.1	.20
41.3	20.0	28	Loam	1.67	21.07	10.0	.18
35.9	20.5	21	Loam	1.70	15.20	8.2	.12
40.0	18.4	26	Loam	1.80	13.79	8.3	.07
42.2	14.2	29	Loam	1.82	13.20	7.1	.11
39.6	23.4	32	Loam	1.79	14.06	9.4	.08

TABLE 14.—*Chemical properties*

[Dashes indicate material not

Soil and sample number	Horizon	Depth from surface	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Calcium-magnesium ratio	Extractable cations (milliequivalents per 100 grams of soil)				
							Calcium	Magnesium	Sodium	Potassium	Hydrogen
		In.	*Pct.*	*Pct.*							
Canfield silt loam (S63 Pa-43-3).	Ap	0-10	1. 63	0. 137	12	9. 9	10. 9	1. 1	0. 1	0. 1	1. 4
	B21t	10-18	. 39	. 041	10	--------	2. 5	. 9	. 1	. 1	5. 6
	B22t	18-25	. 10	--------	--------	1. 5	2. 4	1. 6	. 1	. 1	6. 5
	Bx1g	25-40	. 10	--------	--------	1. 3	3. 5	2. 6	. 1	. 2	5. 6
	Bx2g	40-62	. 17	--------	--------	2. 0	5. 5	2. 8	. 2	. 1	2. 1
	Bx3	62-71	. 16	--------	--------	2. 6	5. 1	2. 0	. 1	. 1	2. 0
	C	71-89	. 14	--------	--------	2. 9	5. 3	1. 8	. 1	. 1	. 8
Chenango gravelly loam (S63 Pa-43-1).	A1	0-6	2. 00	. 171	12	--------	. 4	. 9	. 2	. 1	18. 7
	A2	6-14	. 36	. 045	8	--------	1. 5	. 9	. 1	. 1	6. 9
	B2	14-22	. 18	--------	--------	1. 9	1. 9	1. 0	. 2	. 1	5. 8
	B3	22-29	. 10	--------	--------	. 9	1. 0	1. 1	. 1	. 1	6. 4
	C	29-53	. 11	--------	--------	. 7	1. 1	1. 6	. 1	. 1	3. 8
Frenchtown silt loam (S63 —Pa-43-5).	Ap	0-10	2. 27	. 195	12	1. 8	7. 9	4. 4	. 1	. 3	7. 6
	B2tg	10-16	. 34	. 052	6	2. 1	5. 3	2. 5	. 2	. 2	4. 7
	Bx1tg	16-30	. 16	--------	--------	1. 8	8. 3	4. 6	. 2	. 2	2. 1
	Bx2tg	30-41	. 16	--------	--------	1. 8	7. 2	3. 9	. 2	. 1	. 0
	Bx3tg	41-49	. 15	--------	--------	7. 8	32. 0	4. 1	. 2	. 2	. 1
	Cg	49-70	. 17	--------	--------	5. 0	15. 5	3. 1	. 2	. 1	. 4
Ravenna silt loam (S63 Pa-43-6).	Ap	0-8	1. 91	. 145	13	--------	5. 6	. 8	. 1	. 4	9. 9
	B21t	8-14	. 33	. 049	7	2. 3	2. 3	1. 0	. 1	. 2	9. 4
	B22tg	14-18	. 19	--------	--------	2. 1	2. 5	1. 2	. 1	. 2	9. 7
	Bx1tg	18-33	. 16	--------	--------	1. 1	1. 7	1. 5	. 1	. 1	7. 5
	Bx2tg	33-42	. 19	--------	--------	1. 3	2. 8	2. 2	. 1	. 1	5. 7
	Bx3g	42-55	. 17	--------	--------	1. 5	3. 8	2. 6	. 1	. 1	4. 4
	Cg	55-70	. 45	. 042	11	2. 5	7. 5	3. 0	. 1	. 1	2. 1

Moisture retained at 1/3-bar tension was determined on core samples, using the pressure plate apparatus (*13*), and moisture retained at 15-bar tension was determined on fragmented samples, using the pressure plate and pressure membrane apparatus (*12*, *23*).

The reaction was determined on a 1:1 soil-water ratio, using a glass electrode. Organic carbon content was determined by wet combustion, using a modification of the Walkley-Black method (*10*). Total nitrogen content was determined by the Kjeldahl method (*3*), modified by trapping ammonia in a boric acid solution and titrating with sulfuric acid.

Sodium, potassium, calcium, and magnesium were extracted with neutral normal ammonium acetate (*10*). Extractable sodium and potassium were determined with a Beckman flame spectrophotometer and extractable calcium and magnesium were determined by titration (*10*). Titration of a buffered barium chloride solution with triethanolamine was used to determine exchangeable acidity (*8*). Cation-exchange capacity was determined by summation of the extractable cations and exchangeable acidity.

Clay minerals in selected horizons were identified on a Norelco X-ray spectrometer equipped with a Geiger counter and chart recorder using a copper target. Before the X-ray analysis, the air-dry sieved samples were treated with 10-percent hydrogen peroxide to remove the organic matter. Iron oxides were removed by the method developed by Jeffries (*5*). Clay samples (less than 2 microns) were separated by centrifugation and flat-oriented as a thin film on a glass slide. The clays were analyzed as magnesium saturated-ethylene glycol solvated, and as potassium saturated-water solvated specimens.

Significance of data

The data on physical properties (table 13) can be used to check field determinations of coarse-fragment content and particle-size distribution. These data also show the ability of the soils to store moisture and supply it to plants and the density of the soils, which is important because it affects the movement of water and the development of root systems.

The data on chemical properties (table 14) can be used to estimate the fertility or the potential fertility of a soil and so are helpful in determining the amounts of fertilizer and lime needed.

Both physical and chemical data are used in placing soils in the various categories of the comprehensive classification system.

The results of the laboratory analysis of each of the four samples are discussed in the following pages.

of selected soils

present or no determination made]

Cation exchange capacity (sum)	Base saturation (sum)	Reaction, field (electrometric)	Mineral composition of clay fraction					
			Kaolinite	Illite	Vermiculite	Chlorite	Montmorillonite	Interstratified
Meq./100 gms.	*Pct.*	*pH*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
13. 6	90	6. 8	30	35	5	10	----	20
9. 2	39	5. 1	30	40	15	5	----	10
10. 7	39	4. 8	30	50	----	10	----	10
12. 0	53	4. 9	20	65	5	----	5	5
10. 7	80	5. 9	20	70	----	5	----	5
9. 3	78	6. 0	15	75	----	----	----	10
8. 1	90	5. 9	20	70	----	----	----	10
20. 3	8	4. 4	30	30	10	10	----	20
9. 5	27	5. 3	----	----	----	----	----	----
9. 0	36	4. 8	25	45	15	5	5	5
8. 7	26	4. 8	----	----	----	----	----	----
6. 7	43	5. 4	25	55	10	----	5	5
20. 3	63	6. 0	25	35	15	5	10	10
12. 9	64	6. 1	20	45	----	----	20	15
15. 4	86	7. 2	15	65	----	5	10	5
11. 4	100	7. 6	15	70	----	5	5	5
36. 6	100	7. 7	15	75	5	----	----	5
19. 3	98	7. 8	15	75	5	----	----	5
16. 8	41	4. 8	25	25	20	----	10	10
13. 0	28	4. 8	20	40	10	5	20	5
13. 7	29	4. 8	20	40	10	5	20	5
10. 9	31	5. 0	25	50	10	----	10	5
10. 9	48	5. 1	30	55	----	----	10	5
11. 0	61	5. 4	30	60	----	----	10	----
12. 8	84	6. 0	35	55	----	----	5	5

Canfield silt loam (S63–Pa–43–3)

Canfield silt loam is deep and moderately well drained. It is a member of a fine-loamy, mixed, mesic family of Aquic Fragiudalfs. Moderate cation-exchange capacity, base saturation of more than 35 percent, and a weakly expressed argillic horizon are its distinctive features.

Chemical properties.—Base saturation is more than 35 percent in all horizons and is 90 percent in both the Ap and the C horizons. The content of extractable hydrogen decreases with increasing depth below the B22t horizon.

Physical properties.—The amount of coarse fragments is moderate and tends to increase with increasing depth. The slight increase in clay content in the B horizon, along with the presence of clay films, indicates an argillic horizon. The silt content decreases, and sand increases in relative amount and becomes coarser with increasing depth.

Chenango gravelly loam (S63–Pa–43–1)

Chenango gravelly loam is deep and well drained. It is a member of a loamy-skeletal, mixed, mesic family of Typic Dystrochrepts. Coarse texture and a large amount of coarse fragments are the dominating features.

Chemical properties.—The base saturation is less than 35 percent in most horizons. The content of extractable calcium is low, and the reaction is strongly acid or very strongly acid in most horizons.

Physical properties.—The available moisture capacity is moderate and decreases with increasing depth. The content of coarse fragments is more than 35 percent; consequently, this soil is in a skeletal family. Bulk densities of 1.66 in the B2 horizon and of 1.61 in the B3 horizon indicate the possible presence of a fragipan. The data show that there is no argillic horizon; the proportion of coarser particles increases with depth, with coarse sand and very coarse sand predominating.

Frenchtown silt loam (S63–Pa–43–5)

Frenchtown silt loam is deep and poorly drained. It is a member of a fine-loamy, mixed, mesic family of Typic Fragiaqualfs.

Chemical properties.—Alkalinity at a depth of 36 inches is the dominant chemical property. The high calcium content results in a base saturation of more than 80 percent in the lower horizons. The calcium-magnesium ratio is lower than is favorable for some crops. The content of exchangeable hydrogen decreases from 7.6 milliequivalents per 100 grams at the surface to 0.4 below a depth of 47 inches.

Physical properties.—Moisture retention at 1/3-bar tension decreases from almost 30 percent in the surface layer to less than 15 percent below a depth of 49 inches, and moisture retention at 15-bar tension is fairly constant throughout the profile; consequently, the available moisture capacity decreases with increasing depth. The increase in bulk density from 1.49 to 1.6 grams per cubic centimeter at a depth of 16 inches supports the field description in indicating the presence of a fragipan at that depth. The percentage of coarse fragments generally increases with depth. The textural class is silt loam throughout the profile, although there are variations in the amounts of silt and clay. Sand content is fairly uniform throughout. An increase in clay content in the B horizon and the presence of clay films are evidence of an argillic horizon.

Ravenna silt loam (S63–Pa–43–6)

Ravenna silt loam is deep and somewhat poorly drained. It is a member of a fine-loamy, mixed, mesic family of Aeric Fragiaqualfs. A dense fragipan, an argillic horizon, and moderate base status are its distinctive features.

Chemical properties.—The content of extractable calcium and of magnesium is rather low. The surface layer appears to have been affected by liming. Base saturation increases with depth and is 84 percent at a depth of 55 to 70 inches; this is a characteristic of Alfisols. The content of extractable magnesium increases with depth, and that of hydrogen decreases. The medium cation-exchange capacity suggests that several applications of small amounts of fertilizer may be better than a single application of a large amount. The reaction increases with depth from very strongly acid to medium acid.

Physical properties.—Moisture retention at 1/3-bar tension decreases with depth, and, consequently, the available moisture capacity decreases. The bulk density of 1.7 grams per cubic centimeter at a depth of about 18 inches indicates a dense fragipan. The amount of coarse fragments increases with increasing depth. Particle-size analysis shows a high silt content in the uppermost 14 inches and an increase in the proportions of coarser particles with increasing depth. This profile has an argillic horizon, evidenced by an increase in clay content and the presence of clay films, but another Ravenna profile sampled lacked a well-expressed argillic horizon.

Summary of data

The Frenchtown, Ravenna, and Canfield soils in Mercer County are related to one another through parent material. In the order listed, they are successively better drained and, consequently, successively less alkaline because of increasingly intense leaching. All are on uplands, and all developed in glacial till containing some limestone. All have argillic horizons and are slightly calcareous in the lower horizons. Drainage, as related to topographic position, is the soil-forming factor that accounts for differences in the development of these soils.

Common to the three soils sampled are the fragipans, designated by the x in the horizon nomenclature and characterized by firm consistence when moist, firmness in place, and brittleness. The bulk density of a fragipan is generally higher than that of the horizons above it. An increase of at least 0.1 to 0.2 grams per cubic centimeter from one horizon to another and a range of 1.6 to 1.9 grams per cubic centimeter usually accompanies field determination of a fragipan. The laboratory data generally supported the field determinations.

The soils have more silt particles in the uppermost 15 to 20 inches than elsewhere in the profile, while the proportion of sand generally increases with increasing depth. There is the possibility that the addition of some windblown material has increased the silt percentage of the surface layer. Also, weathering is more intense at the surface, and this accounts for some physical disintegration of coarser particles into silt-size particles.

Percolation is slow for all three soils because of poor drainage and the restricted permeability of the fragipan.

The Chenango soils occur on terraces or beach ridges. They developed in deposits of water-worked coarse sand and gravel. These deposits are usually deep to bedrock and are readily permeable. Because of the lack of fine material and the ease of water movement, little horizon differentiation has taken place. Percolation is rapid to excessive.

Clay minerals in the sampled profiles

All the soils sampled formed from material of glacial origin, the Chenango soils from glacial outwash and the others from glacial till. The clay fractions of all are similar in mineral composition. Illite is the principal clay mineral. It is followed, in order of abundance, by kaolinite, vermiculite, interstratified minerals, montmorillonite, and chlorite. Each of the soils has a well-developed profile of weathering, which is indicated by an increase in illite and a decrease in vermiculite, montmorillonite, and interstratified minerals with increasing depth. One difference that results from differences in drainage is evident: there is almost no montmorillonite in the moderately well drained Canfield soil and the well drained Chenango soil, but this mineral is fairly abundant in some horizons of the less well drained Frenchtown and Ravenna soils.

Interpretation of clay minerals [5]

The clay fraction of soil may have been inherited from parent rock, or it may have formed through weathering in place of preexisting minerals. In both instances the soil-forming processes leading to the development of a soil profile can produce differences in the relative distribution of clay mineral types as a function of depth. As a result, data on the mineral composition of the clays within a soil profile can be interpreted in terms of soil genesis.

The kinds of minerals occurring within the clay fraction in the soils of Pennsylvania are few. In addition to the clay minerals, several other kinds of minerals may be present in small amounts. Quartz and feldspar are at the coarsest end of the particle-size range for clay. Quartz is most prominent in the surface horizon. The iron oxide minerals, goethite and lepidocrocite, and hydrated amorphous types occur mainly as surface coatings. Generally, the surface coatings are removed before the soil is analyzed so as to facilitate soil dispersion and identification of the minerals by X-ray methods. Although gibbsite, $Al(OH)_3$, has been identified in some of the soils in Pennsylvania, its occurrence is very limited. Amorphous silica and silicate materials may occur in small or moderate

[5] Prepared by L. J. JOHNSON, Department of Agronomy, Pennsylvania State University.

amounts, but they are not detected by the techniques now in use.

Primary attention was focused on the mineralogical analysis of the clay minerals that are the major components of the clay fraction. In terms of crystal structure, the clay minerals are part of a group called layer lattice silicate and make up a number of specific types. These minerals are most commonly identified by measuring the distance between the unit layers by X-ray diffraction techniques, and they are designated as 7, 10, and 14 A (angstrom) types. Dioctahedral and trioctahedral refer to the number of cations, two and three respectively, that occupy the three sites available for the cations within a unit layer of the crystal lattice. The term "interstratification" refers to interlayering or mixed layering and denotes that the unit layers of one clay mineral are stacked together with the unit layers of another clay mineral. Although combinations of two clay minerals are most common, three or four different clay minerals can be interlayered.

Soil genesis interpretations

To facilitate the interpretation of the clay mineral information in terms of soil genesis, it has been found helpful to define a "standard" soil profile with respect to the distribution of clay mineral types as a function of depth. This standard soil profile is assumed to be representative of many soils in Pennsylvania. The standard profile has the typical distribution of clay minerals we would expect to find in a mature, well-drained soil derived from sedimentary rocks in Pennsylvania. It has a medium-textured surface soil and a finer textured subsoil. Soil genesis interpretations can be made by comparing this standard profile with the one being examined.

Sedimentary rocks, having formed from material subjected to one or more cycles of weathering, already contain a suite of clay minerals, and this is inherited by the soil that forms in material derived from these rocks. Typical mineral suites are composed of some combination of illite, kaolinite, and trioctahedral chlorite. In some cases the parent rock contains a high predominance of illite but only small amounts of other clay minerals.

In the standard profile, illite is the dominant clay type. Within the profile, the illite is most abundant in the C horizon and progressively decreases in amount with approach to the surface. Kaolinite is present in a lesser amount than illite and is distributed fairly uniformly throughout the profile. Dioctahedral chlorite generally occurs interstratified with vermiculite and is most prominent in the surface horizons. Trioctahedral chlorite, when present, usually is most abundant in the B and C horizons.

In our standard soil, which is well drained and in a humid temperate climate, dominant movement of water is down through the profile. This downward movement leads to weathering, leaching, and translocation of material within the profile. Consequently, at maturity, this profile has a characteristic distribution of clay minerals that is a function of depth. The weathering process can be conveniently summarized by listing minerals in the order in which they are formed, the adjacent pairs of minerals being regarded as parent mineral and weathering product respectively. The sequence best typifying the process in Pennsylvania is this: Illite-dioctahedral vermiculite (and/or montmorillonite)-dioctahedral chlorite.

Interstratification of clay types may be viewed as a consequence of weathering, the transformation of clay within a single particle being more rapid in some layers than in others. Where the transformation is not completed, the products are intermediate between the steps in the previously mentioned illite-vermiculite-chlorite process. It is therefore common to find illite/vermiculite and vermiculite/chlorite as interstratified pairs.

The processes just described result in a distribution of clay types that is typical, or standard, for Pennsylvania. This standard profile is then used as a sort of "yardstick" to evaluate divergence in terms of the factors of soil formation or in related parameters.

Additional Facts About the County

Prior to 1780, Indians of the Six Nation Confederacy lived in the area that is now Mercer County. The earliest permanent white settlers were people who accepted land from the government as gratuity for service in the Revolutionary War. Mercer County was formed from part of Allegheny County in 1800. It was named for General Hugh Mercer, who was killed in the Revolutionary War.

The county was entirely agricultural until 1844, when canals linking Lake Erie with the Beaver River made coal mining, iron production, and small industries feasible. Railroads were built across the county in the 1860's, and the canals were abandoned in 1871.

General farming was usual for 100 years, but the past 50 years has seen the development of more specialized farming. Dairying is the main agricultural specialty at this time.

In 1960 the population of the county was 127,519. Shenango Valley, an industrial and residential complex in the west-central part of the county, had a population of 65,612. The population of Greenville was 8,765, and that of Grove City was 8,368.

All parts of Mercer County are easily accessible by improved roads. The main highways are U.S. Routes 62 and 19 and Pennsylvania Route 18. Interstate 79, a north-south route, and Interstate 80, an east-west route, which are under construction, will intersect in the central part of the county. Four railroads provide freight service, and one has passenger service. Passenger bus service and truck freight service to most nearby cities are available.

The nearest commercial airports are located in Franklin, Pa., and Vienna, Ohio.

Climate [6]

A humid, continental climate provides Mercer County with warm summers, long cold winters, and a plentiful supply of precipitation. Precipitation is normally well distributed throughout the year, a sizable proportion falling as snow during the winter months. Prevailing westerly winds bring weather changes every few days. Lengthy periods of abnormally cold, hot, wet, or dry weather are rare. Temperature and precipitation data for the county

[6] Prepared by NELSON M. KAUFFMAN, State climatologist, ESSA.

are given in table 15, and the probability of specified temperatures of 32° F. and lower in table 16.

Temperature.—The warmest part of Mercer County is the Shenango River Valley, where the temperature averages 52° F. annually. The eastern and northern parts are consistently 3° to 4° colder. In the Greenville area the average monthly temperature ranges from 29° in January to 72° in July. The temperature dips to 0 or lower on an average of 5 days each winter and climbs to 90° or higher on 21 days each summer. Extreme values over the period of record range from −27°, in January 1912, to 104°, in July 1936.

In the western part of the county, the growing season, which is defined as the interval between the last 32° F. temperature in spring and the first in fall, normally extends from mid-May through September, a period of approximately 134 days. In the higher eastern part of the county and in the deeper valleys of the western part, the growing season is somewhat shorter and varies appreciably in length from year to year; it has ranged from 110 to 157 days over the period of record. The data in table 16, based on records at Greenville, can be applied to other parts of the county where elevation and air drainage are similar.

Precipitation.—Normal annual precipitation ranges from 37 inches in the southwestern part of the county to 41 inches in the central, northern, and eastern parts. Year-to-year variations, however, are frequently considerable; the total has ranged from 25 to 51 inches. Monthly totals vary also, having ranged from 0.2 inch to 10.7 inches, but normally precipitation is well distributed throughout the year (see table 15). Short dry spells occur, but extended severe droughts are rare.

TABLE 15.—*Temperature and precipitation data*

[Elevation 1,026 feet. Period of record 1931–60]

Month	Temperature				Precipitation			Snow		
	Average daily maximum	Average daily minimum	Average extreme maximum	Average extreme minimum	Average total	One year in 10 will have—		Average snowfall	Average number of days with snow depth of—	
						Less than—	More than—		1 in.	6 in.
	° F.	*° F.*	*° F.*	*° F.*	*In.*	*In.*	*In.*	*In.*		
January	37	20	56	−2	3.1	1.3	6.5	11.0	14	2
February	38	20	58	−3	2.5	1.2	4.1	10.2	11	2
March	48	26	70	7	3.4	1.9	5.1	9.4	6	1
April	61	35	81	20	3.9	1.6	5.9	2.0	(1)	0
May	73	45	88	28	4.0	2.1	6.7	(2)	0	0
June	82	54	93	38	4.1	1.9	6.4	0	0	0
July	86	58	95	44	4.1	1.5	6.1	0	0	0
August	84	56	94	41	3.8	1.8	7.3	0	0	0
September	78	50	92	32	2.8	1.9	4.6	0	0	0
October	66	40	82	24	3.2	1.0	5.3	.3	(1)	0
November	48	32	72	15	3.0	1.6	5.3	6.9	3	1
December	37	23	58	0	2.6	1.1	4.6	11.5	14	2
Year	62	38	[3] 97	[4] −8	40.5	32.0	48.7	51.3	48	8

[1] Less than half a day.
[2] Trace.
[3] Highest maximum during 1931–1960 period.
[4] Lowest minimum during 1931–1960 period.

TABLE 16.—*Probabilities of last freezing temperatures in spring and first in fall*

Probability	Dates for given probability and temperatures				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	April 9	April 25	April 30	May 12	June 2
2 years in 10 later than	April 3	April 18	April 26	May 7	May 28
5 years in 10 later than	March 23	April 5	April 19	April 28/29	May 18
Fall:					
1 year in 10 earlier than	November 12	October 23	October 13	September 30	September 17
2 years in 10 earlier than	November 18	October 30	October 20	October 4	September 21
5 years in 10 earlier than	November 28	November 11	November 2	October 12	September 29

Much of the rainfall in summer falls during brief showers that affect only a small part of the county at any particular time. Occasionally, such rainfall is heavy and produces rapid runoff in the affected area. Maximum amounts of up to 1.95 inches in an hour have been measured in the county. Such an amount can be expected only about once every 25 years, but 1.5 inches in an hour can be anticipated once every 5 years. By contrast, most of the precipitation in fall, winter, and spring is more widespread and less intense and the storms are of longer duration, generally 6 to 24 hours or more. As much as 2.2 inches of rainfall in 24 hours can be expected about once a year and 3.3 inches in 24 hours once every 5 years.

Much of the precipitation that falls between the latter part of November and the end of March is snow. The average snowfall for a season ranges from close to 40 inches in the southwestern part of the county to slightly more than 50 inches in the northern and eastern parts. The total varies widely from year to year. Less than 10 inches has been recorded in some winters, and more than 90 inches during other winters in the areas where snow is heaviest. A total of 30 to 65 inches can be expected in most years. Total snowfall in one day seldom exceeds 6 inches, although 15 inches has been recorded on occasion and a total of as much as 28 inches for a 4-day period.

Geology

All of Mercer County was covered by glaciers at least twice, and perhaps several other times (*15*). It is estimated that the most recent glaciation of this region ended 10 to 15 thousand years ago.

Glaciation affected the surface features of the county. As the glaciers moved southward, they scoured and smoothed hilltops and filled many valleys. Vast quantities of clay, silt, sand, gravel, cobblestones, and boulders were incorporated into the advancing ice. Part of this material became trapped under and was overridden by the ice and became compact glacial till. When the glaciers retreated, the meltwater carried more of this material out from the ice front and deposited it in layers and pockets of sorted materials known as outwash. The numerous knobs, mounds, and terraces along valley walls are kame deposits of clean-sorted sand and gravel. These deposits are as much as 300 feet deep.

Sandstone, shale, small amounts of limestone, and small amounts of coal of two periods of geologic time underlie the glacial deposits. The oldest of these rocks are of the Mississippian System. The formations are remains of geological erosion over 200 million years ago. The strata are level bedded and dip slightly to the southeast. Generally, it is not feasible to mine the coal in the Mississippian. Some oil and some gas have been produced from these formations.

Overlying the Mississippian rocks in parts of the county are sandstone, shale, limestone, and coal of a younger system, the Pennsylvanian. These are much like the Mississippian Formations in content and arrangement, but there is considerably more coal and it is nearer the present surface. Most of the coal obtained by strip mining is from the Pennsylvanian Formations.

Oil and gas are also produced from formations of the Devonian System, which are below and are older than the Mississippian. Water for domestic use can be obtained from wells in all parts of the county. Aquifers occur in both the glacial deposits and the sandstone bedrock. The quality of the water is generally satisfactory. Gravel and sand are mined from the many glacial outwash deposits.

Land Use, Crops, and Livestock

In 1964, there were 2,072 farms in Mercer County, of which 1,112 were classified as commercial farms. The average size was 114.9 acres, and the total area in farms was 238,098 acres.

The acreages of the principal field crops in 1964 were as follows:

	Acres
Corn for grain	15,512
Corn for silage	4,753
Wheat	7,276
Oats	14,949
Hay (alfalfa, clover, timothy)	39,689
Potatoes (Irish)	339
Vegetables (other than potatoes)	379

Apples and peaches were major fruit crops in 1964. The harvest of apples amounted to 1,244,052 pounds, and the harvest of peaches to 379,476 pounds.

In 1964 there were 40,690 cattle and calves on farms in the county, and 15,611 of these were milk cows. Other livestock included 10,270 hogs and pigs and 5,250 sheep and lambs. Poultry numbered 181,094.

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Glossary

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Calcareous. Of a soil, containing enough calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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 clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

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 and brittle; little affected by moistening.

Cover crops. A close-growing crop grown primarily to improve the soil and to protect it between regular crops; or a crop grown between trees in orchards or between vines in vineyards.

Crop residue management. A system of utilizing crop residue to control erosion, by incorporating it into the soil or by leaving it on the surface during periods of critical erosion hazard.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artifically.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

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

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

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

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending 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 precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

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

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes 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 characteristic of the soil are largely confined to the solum.

Stone line. A concentration of coarse rock fragments in soils that generally represents an old weathering surface. In a cross section, the line may be one stone or more thick. The line generally overlies material that weathered in place, and it is ordinarily overlain by sediment of variable thickness.

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

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth in nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Well-graded soil. A soil or soil material consisting of particles that are 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.

GUIDE TO MAPPING UNITS

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

Estimated productivity ratings, table 1, page 10.
Woodland, table 2, page 12, and table 3, page 16.

Engineering uses, table 4, page 18; table 5, page 20; and table 6, page 22.

Wildlife habitat, table 10, page 41.
Acreage and extent, table 11, page 44.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
BrB2	Braceville gravelly loam, 3 to 8 percent slopes, moderately eroded	45	IIe-2	6
BrC2	Braceville gravelly loam, 8 to 15 percent slopes, moderately eroded	45	IIIe-2	7
BvA	Braceville silt loam, 0 to 3 percent slopes	45	IIw-1	7
BvB2	Braceville silt loam, 3 to 8 percent slopes, moderately eroded	45	IIe-2	7
BvC2	Braceville silt loam, 8 to 15 percent slopes, moderately eroded	46	IIIe-2	8
Ca	Caneadea silt loam	46	IIIw-3	8
CdA	Canfield silt loam, 0 to 3 percent slopes	47	IIw-1	7
CdB2	Canfield silt loam, 3 to 8 percent slopes, moderately eroded	47	IIe-2	6
CdC2	Canfield silt loam, 8 to 15 percent slopes, moderately eroded	48	IIIe-2	7
CdC3	Canfield silt loam, 8 to 15 percent slopes, severely eroded	48	IVe-2	9
CdD2	Canfield silt loam, 15 to 25 percent slopes, moderately eroded	48	IVe-2	9
CdE	Canfield silt loam, 25 to 35 percent slopes	49	VIe-1	9
Cf	Chenango fine sandy loam, flooded	49	IIs-1	7
Ch	Chenango fine sandy loam, low terrace	49	IIs-1	7
ClA	Chenango gravelly loam, 0 to 3 percent slopes	50	IIs-1	7
ClB2	Chenango gravelly loam, 3 to 8 percent slopes, moderately eroded	50	IIe-1	6
ClC2	Chenango gravelly loam, 8 to 15 percent slopes, moderately eroded	50	IIIe-1	7
ClD2	Chenango gravelly loam, 15 to 25 percent slopes, moderately eroded	50	IVe-1	9
CnC2	Chenango gravelly loam, moderately eroded, rolling	50	IVe-2	9
CnD2	Chenango gravelly loam, moderately eroded, hilly	50	VIe-1	9
CoA	Chenango silt loam, 0 to 3 percent slopes	50	IIs-1	7
CoB2	Chenango silt loam, 3 to 8 percent slopes, moderately eroded	50	IIe-1	6
CoC2	Chenango silt loam, 8 to 15 percent slopes, moderately eroded	51	IIIe-1	7
CoD2	Chenango silt loam, 15 to 25 percent slopes, moderately eroded	51	IVe-1	9
FeA	Frenchtown silt loam, 0 to 3 percent slopes	52	IIIw-1	7
FeB2	Frenchtown silt loam, 3 to 8 percent slopes, moderately eroded	52	IIIw-2	8
FhB	Frenchtown very stony silt loam, 0 to 8 percent slopes	52	VIIs-2	11
Fr	Frenchtown and Luray silt loams	53	IIIw-6	9
Ha	Halsey silt loam	53	IIIw-5	9
LoC	Lordstown silt loam, 5 to 15 percent slopes	54	IIIe-3	7
LoD	Lordstown silt loam, 15 to 25 percent slopes	55	IVe-3	9
LrD	Lordstown very stony silt loam, 8 to 25 percent slopes	55	VIIs-1	10
LrE	Lordstown very stony silt loam, 25 to 45 percent slopes	55	VIIs-1	10
Md	Mine dumps	55	------	--
Mp	Muck and peat	56	------	--
Pa	Papakating silt loam	56	IVw-1	9
RaA	Ravenna silt loam, 0 to 3 percent slopes	57	IIw-3	7
RaB2	Ravenna silt loam, 3 to 8 percent slopes, moderately eroded	57	IIIe-4	7
RaC2	Ravenna silt loam, 8 to 15 percent slopes, moderately eroded	58	IVe-4	9
RaC3	Ravenna silt loam, 8 to 15 percent slopes, severely eroded	58	VIe-2	9
RaD2	Ravenna silt loam, 15 to 25 percent slopes, moderately eroded	58	VIe-2	9
ReC	Ravenna very stony silt loam, 0 to 15 percent slopes	58	VIs-1	10
Rf	Red Hook silt loam, flooded	59	IIw-2	7
Rh	Red Hook silt loam, low terrace	59	IIw-2	7
RoB2	Red Hook silt loam, 3 to 8 percent slopes, moderately eroded	59	IIIw-5	9
StB	Strip mine spoil, gently sloping	60	------	--
StC	Strip mine spoil, moderately steep	60	------	--
StE	Strip mine spoil, steep	60	------	--
Un	Unadilla silt loam	61	I-1	6
Ur	Urban land	61	------	--
Wa	Wayland silt loam, coarse variant	62	IIIw-4	8

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