SOIL SURVEY

Henry County Ohio

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Lands and Soil
and
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
Issued November 1974

Major fieldwork for this soil survey was done in the period 1963-1966. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service, the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Henry County Soil and Water Conservation District.

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 farming, industry, and recreation.

Locating Soils

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

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

Finding and Using Information

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

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

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

Foresters and others can refer to the section "Woodland Use of the Soils" where the woodland in the county is discussed and the potential productivity of selected soils is given.

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

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Planning for Town and Country Use."

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

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

Newcomers in Henry County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication and in the section "Additional Facts About the County."

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SOIL SURVEY OF HENRY COUNTY, OHIO

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UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL, AND THE OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

HENRY COUNTY is in the northwestern part of Ohio (fig. 1). It has a total area of approximately 416 square miles, or 266,240 acres. Napoleon, the county seat and largest community, is on the banks of the Maumee River, somewhat northwest of the geographical center of the county. Smaller towns are Deshler, Hamler, Holgate, Liberty Center, Malinta, McClure, and Ridgeville Corners. In 1970, the population of the county was 27,058, and the population of Napoleon was 7,791.

The county lies entirely within an area called the Glacial Lake Plain. It is typified by large areas of level or nearly level soils, which are broken only by sand ridges formed during the glacial period and by slope breaks along the rivers and streams.

The elevation ranges from 625 feet above sea level where the Maumee River enters Wood County to 750 feet about 2 miles northwest of Ridgeville Corners.

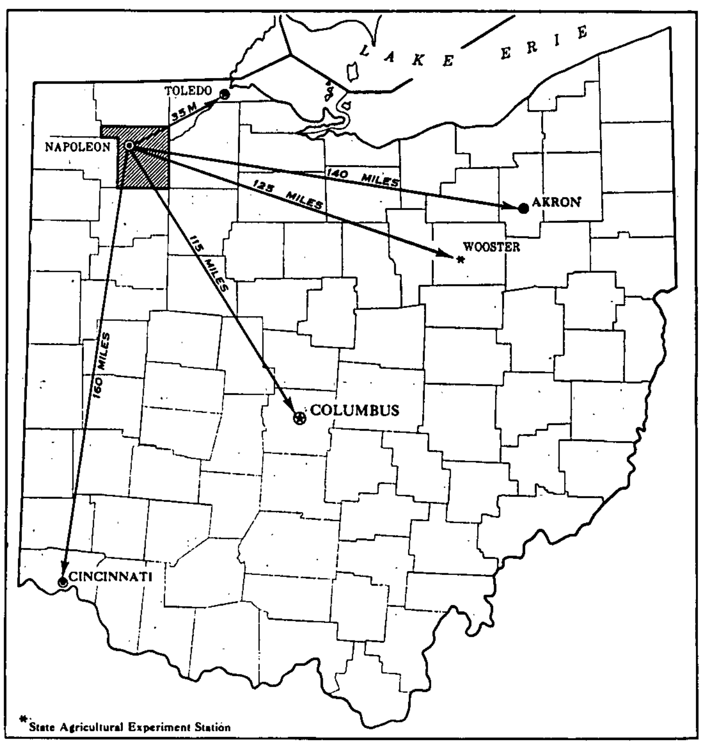

Figure 1.—**Location of Henry County in Ohio.**

About 95 percent of Henry County is used for farming. Industry, especially food processing, provides many jobs off the farm. Cash-grain farming is dominant in the county, but dairying, steer feeding, producing hogs, and producing eggs also are important. Sugar beets and tomatoes are the commonly grown specialty crops.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Henry 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. 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.

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. Hoytville and Nappanee, 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 layer and in slope, erosion, 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, St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded, is one of several phases within the St. Clair 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 aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in 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 soil of some kind 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. Only one such kind of mapping unit is shown on the soil map of Henry County, the 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 uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Haney and Rawson loams, 6 to 12 percent slopes, is the only undifferentiated soil group in this county.

In most areas surveyed there are places where the soil material is so shallow, so severely eroded, or so variable that it has not been 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. Cut and fill land is a land type in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also 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 soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They 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 current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Henry 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 land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, drainage, and other characteristics that affect their management.

The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 1, the words, "clayey soils," refer to the texture of the surface layer.

The soil associations in Henry County are discussed in the following pages.

1. Hoytville association

Very poorly drained, nearly level, dominantly clayey soils formed in wave-modified glacial till

This association is on a nearly level glacial till plain that is broken at wide intervals by tributary streams of the Maumee River. The till plain has been beveled and reworked by lake water in the postglacial period. This association occupies about 35 percent of the county and is the largest.

About 90 percent of the association is Hoytville soils, and the remaining 10 percent is Nappanee, Haskins, Mermill, and other soils.

The Hoytville soils are dark colored and very poorly drained. They are nearly level, have a seasonal high water table, and are subject to ponding in low areas. They have a clayey subsoil and, in most places, a clayey surface layer. The somewhat poorly drained Nappanee and Haskins soils are lighter colored than the Hoytville and the very poorly drained Mermill soils. The Nappanee soils generally are on slope breaks along streams, but they also are in small isolated areas surrounded by dark-colored Hoytville soils. They have a clayey subsoil and a seasonal high water table.

This association was part of the Black Swamp that the early settlers saw in the northwestern part of what is now Ohio. Today, however, surface and tile drains remove excess water to numerous, deep, roadside ditches and streams. The soils still are naturally wet in winter and spring, but artificial drainage has helped to lower the seasonal high water table. Maintenance of artificial drainage systems is the major management need in this association. The hazard of erosion is little or none, and most of the association is used for cultivated crops. A few undrained areas remain in trees.

The Hoytville soils are important to farming and are intensively used for corn, soybeans, wheat, tomatoes, and sugar beets. They have a deep rooting zone when the water table is low in summer, and they have a high available water capacity.

The seasonal high water table and slow permeability of the soils in this association are limitations to many nonfarm uses, including septic tank filter fields. The basements of homes are commonly wet unless the foundations are adequately drained.

2. *Hoytville-Nappanee association*

Very poorly drained and somewhat poorly drained, nearly level to gently sloping, dominantly clayey soils formed in wave-modified glacial till

This association consists of dark-colored Hoytville soils and lighter colored Nappanee soils. These soils are nearly level and occupy a glacial till plain that has been beveled and reworked by lake water in the postglacial period. Much of the association is dissected by small tributaries of the Maumee River. The extreme northwestern and southwestern areas of this association are less highly dissected than other areas. This association occupies about 27 percent of the county.

About 70 percent of the association is Hoytville soils, 10 percent is Nappanee soils, and the remaining 20 percent is Mermill, Haskins, Rimer, and other soils.

The Hoytville soils are dark colored and very poorly drained. The Nappanee soils are somewhat poorly drained and lighter colored than the Hoytville soils. A large acreage of Nappanee soils is on slope breaks along streams. The Hoytville and Nappanee soils formed in wave-worked glacial till and have a clayey subsoil and a seasonal high water table. The Mermill soils are very poorly drained, and the Haskins and Rimer soils are somewhat poorly drained.

The dominant soils in this association are saturated with excess water in winter and spring, but extensive drainage throughout the association helps to remove much excess water. Numerous, deep, roadside ditches provide outlets for many tile and surface drains. Maintenance of artificial drainage is the major management need for the soils in this association. Erosion is a hazard on sloping Nappanee soils along streams.

Most of the soils in this association are used for cash crops. The Hoytville soils are important to farming and are used intensively for corn, soybeans, and wheat, and for sugar beets, tomatoes, and other specialty crops. The Nappanee soils are not so well suited to crops as the Hoytville soils but are widely used for corn, soybeans, and wheat.

Limitations for many nonfarm uses, including septic tank filter fields, are a seasonally high water table and slow or very slow permeability. Houses on both Hoytville and Nappanee soils commonly have wet basements unless the foundations are properly drained.

3. *Millgrove-Mermill-Haskins association*

Very poorly drained and somewhat poorly drained, nearly level, loamy soils formed mainly in water-worked material

This association is characterized by moderate to large expanses of nearly level, dark-colored soils and small to moderate areas of lighter colored soils on low rises. The association mainly occurs in a fairly broad area south of, and roughly parallel to, the Maumee River. This association occupies about 16 percent of the county.

About 30 percent of the association is Millgrove soils, about 25 percent is Mermill soils, about 11 percent is Haskins soils, and the remaining 34 percent is Digby, Rimer, Seward, and other soils in areas along the Maumee River that are subject to flooding.

The Millgrove and Mermill soils are dark colored and very poorly drained. The Millgrove soils formed in thick loamy material underlain by sand and gravel, but the Mermill soils formed in moderately deep loamy material and underlying clay. The somewhat poorly drained Haskins soils formed in material similar to that in which Mermill soils formed, but they are lighter colored than both the Mermill and Millgrove soils. The Digby and Rimer soils are somewhat poorly drained, and the Seward soils are moderately well drained.

The dominant soils in this association have a seasonally high water table in winter and spring. They can, however, be easily drained with surface drains and tile installations. Maintenance of artificial drainage systems is the major management need in this association. There is little or no hazard of erosion.

Most of the acreage in this association is used mainly for such cash crops as corn, soybeans, and wheat. Tomatoes are grown to some extent, but growers have had problems with fruit color and disease. If these soils are adequately drained, they are suited to many kinds of truck crops. They are well suited to irrigation.

The seasonally high water table in the dominant soils is a limitation to many nonfarm uses, including septic tank filter fields. Houses on Millgrove, Mermill, and Haskins soils are likely to have wet basements unless the foundations are properly drained.

4. *Granby-Ottokee-Tedrow association*

Very poorly drained, moderately well drained, and somewhat poorly drained, nearly level to gently sloping, sandy soils formed in lacustrine and windblown material

This association is characterized by highly contrasting areas of nearly level, dark-colored, sandy soils and gently sloping, lighter colored, sandy soils (fig. 2). The most extensive area of this association is in the northeastern part of the county. It is part of a large area in northwestern Ohio known locally as the Oak Openings. This association occupies about 8 percent of the county.

About 29 percent of the association is Granby soils, about 24 percent is Ottokee soils, about 12 percent is Ted-

Figure 2.—**Dark-colored Granby soils and lighter colored Ottokee soils in soil association 4. These are sandy soils on the lake plain.**

Figure 3.—**Planting of white pine on Ottokee fine sand in the Maumee State Forest.**

row soils, and the remaining 35 percent is Oakville, Spinks, Arkport, Galen, Adrian, and other soils.

The nearly level Granby soils are dark colored and very poorly drained. The gently sloping Ottokee soils are lighter colored and moderately well drained. The somewhat poorly drained Tedrow soils generally are in areas between the Granby and Ottokee soils. Granby and Tedrow soils have a seasonally high water table; Ottokee soils have a seasonally high water table for only short periods. Granby and Tedrow soils are commonly too wet in spring and too dry in summer for optimum plant growth. Oakville, Spinks, Arkport, and Ottokee are some of the more droughty soils in the county. Adrian soils are poorly drained, organic soils.

Seasonal wetness is the dominant limitation on the nearly level soils, and soil blowing and droughtiness are hazards on the gently sloping soils on knolls. The Granby and Tedrow soils can be artifically drained. The Granby soils tend to flow and plug the tile lines when they are saturated. Because Granby soils are in low areas, they commonly lack outlets, and drain pumps are used in places.

The soils in this association are mainly used for such cash crops as corn, soybeans, and wheat. A large acreage of woodland is in the Maumee State Forest. Areas of woodland, other than those in the State forest, are being cleared and converted to cropland. Large plantings of white pine and other evergreens have been made on the droughty soils in Maumee State Forest (fig. 3). Trees grow well on Ottokee soils, and these soils are suited to Christmas tree production. Such special crops as cabbage, carrots, strawberries, cucumbers, peppers, and asparagus are grown on Ottokee soils. The major soils in this association are suitable for irrigation.

The dominant soils in this association differ in limitations for nonfarm uses. Granby and Tedrow soils have a seasonally high water table, and Ottokee soils are sandy and droughty. Houses on Granby and Tedrow soils are likely to have wet basements unless the foundations are properly drained.

5. *Toledo-Fulton-Lenawee association*

Very poorly drained and somewhat poorly drained, nearly level to gently sloping soils formed in lacustrine sediment

This association occupies nearly flat landscapes that have largely been cleared of trees. It mainly occurs in scattered areas that roughly parallel the Maumee River. One area is in the northwestern corner of the county. This association occupies about 7 percent of the county.

About 38 percent of the association is Toledo soils, about 15 percent is Lenawee soils, about 26 percent is Fulton soils, and the remaining 21 percent is Del Rey, Shinrock, Lucas, and other soils.

The nearly level Toledo and Lenawee are dark colored and very poorly drained. The Fulton soils are lighter colored and slightly more sloping than the Toledo and Lenawee soils, and they are somewhat poorly drained. The Toledo and Fulton soils formed in material relatively high in content of clay. Lenawee soils formed in lacustrine material that has a higher content of sand than the material in which the Toledo and Fulton soils formed. The soils in this association have a seasonally high water table.

Seasonal wetness is the dominant limitation of the soils in this association, but extensive artificial drainage has greatly reduced this limitation. Numerous, deep, roadside ditches provide outlets for tile and surface drains. Maintenance of these artificial drainage systems is the major management need in the association. There is little or no hazard of erosion, and most of the acreage is used mainly for cash crops.

The Toledo and Lenawee soils are well suited to corn, soybeans, and wheat. Sugar beets and tomatoes are grown on a small acreage of Lenawee soils and to a lesser extent on Toledo soils. The Fulton soils are moderately well suited to field crops but are poorly suited to sugar beets and tomatoes.

Seasonal wetness and moderately slow to slow permeability are the dominant limitations to many nonfarm uses, including septic tank filter fields. Houses on Toledo or Lenawee soils are likely to have wet basements unless the foundations are properly drained.

6. *Colwood-Kibbie association*

Very poorly drained and somewhat poorly drained, nearly level soils formed in deltaic silt and fine sand

This association is entirely in Liberty Township. It occupies about 3 percent of the county.

About 30 percent of the association is Colwood soils, about 15 percent is Kibbie soils, and the remaining 55 percent is Millgrove, Mermill, Tuscola, Lenawee, Tedrow, and Ottokee soils.

The dark-colored, very poorly drained Colwood soils are in broad, flat areas. The lighter colored, somewhat poorly drained Kibbie soils are in small, slightly higher areas. Most of the other soils in this association are either sandy soils or loamy soils.

The dominant soils and many of the other soils in this association are waterlogged during wet periods, but surface and tile drains effectively help to remove the excess water. Natural drainageways generally provide adequate outlets for drains. Unless the soils are adequately drained, trafficability is difficult during wet weather.

The Colwood soils are well suited to crops and are important soils to farming in the county. The Kibbie soils also are well suited to crops.

The soils in this association are used mainly for such cash crops as corn, soybeans, and wheat. Some sugar beets and tomatoes are grown, but the acreage is small. A larger acreage than presently used is suited to specialty crops, including some kinds of truck crops. The dominant soils are suitable for irrigation.

Seasonal wetness is the major limitation to many nonfarm uses, including septic tank filter fields and building sites. Houses on Colwood, Millgrove, Mermill, and Lenawee soils are likely to have wet basements unless the foundations are properly drained. The Tuscola and Ottokee soils have fewer limitations for building sites than the other soils in this association.

7. *Latty association*

Very poorly drained, nearly level, clayey soils formed in lacustrine sediment

This association occupies two areas in the county. The large area is in Ridgeville Township, and the smaller area is in the southwestern part of Pleasant Township. Both areas are broad, flat, and relatively treeless. This association occupies about 1 percent of the county.

About 70 percent of the association is Latty soils, and the remaining 30 percent is Nappanee, Haskins, Rawson, Seward, and other soils. The soils of minor extent are mostly in the Ridgeville Township area of this association.

The major limitation is a seasonally high water table during wet periods. The seasonally high water table is lowered moderately well by using tile drains. Numerous, deep, roadside ditches provide outlets for tile and surface drains. The Rawson and Seward soils are better drained than the other soils in this association.

Most of the soils in this association are used for cash crops, mainly corn, wheat, and soybeans. Sugar beets and tomatoes are grown on a limited acreage. The Latty soils are well suited to crops but are clayey and have poor tilth and poor drainage. These limitations restrict their use for specialty crops.

Very slow permeability and very poor natural drainage are dominant limitations to many nonfarm uses, including septic tank filter fields and building sites. Houses on Latty soils are likely to have wet basements unless the foundations are properly drained. The Rawson and Seward soils have fewer limitations for building sites than the other soils in this association.

8. *Oshtemo-Haskins-Haney association*

Well drained, somewhat poorly drained, and moderately well drained, nearly level to sloping, loamy soils in loamy material over sand, gravel, clay, or glacial till

This association occupies long, low beach ridges that mark the shorelines of postglacial lakes (fig. 4). These ridges are prominent on the landscape. They are in the southwestern and northwestern parts of the county. This association occupies less than 1 percent of the county.

About 26 percent of the association is Oshtemo soils, 26 percent is Haskins soils, 20 percent is Haney soils, and the remaining 28 percent is Rawson, Digby, Rimer, Seward, Vaughnsville, Mermill, Nappanee, Millgrove, and other soils.

The gently sloping, well drained Oshtemo soils and the gently sloping, moderately well drained Haney soils formed in deep, loamy soil material that has a moderate to high content of sand. The nearly level, somewhat poorly drained Haskins soils formed in loamy material that is underlain by clay.

A seasonally high water table is not a limitation in the Oshtemo and Haney soils, but it is a limitation in the Haskins soils and some of the other soils. Artificial drainage helps to reduce the wetness in these soils.

Wheat is the principal crop grown throughout this association. Corn and soybeans are also grown but to a lesser extent. This is especially true on Oshtemo soils, because they have a low available moisture capacity. Alfalfa and clover are commonly grown for hay. Apple, peach, and vine crops are adapted to the better drained Oshtemo and Haney soils. These soils are well suited to irrigation.

The Oshtemo and Haney soils of this association have fewer limitations for residential building sites than most other soils in the county, and their use for this purpose is increasing. The ridge topography of this association is commonly used for roadways. The seasonally high water table in the Haskins soils is a limitation for building sites and septic tank filter fields.

9. *Sloan-Ross-Shoals association*

Very poorly drained, well-drained, and somewhat poorly drained, nearly level, loamy soils formed in alluvium

This association occupies long areas that range from one-eighth to one-fourth mile in width. The areas are on the flood plains of the Maumee River. This association occupies about 1 percent of the county.

About 35 percent of the association is Sloan soils, about 18 percent is Ross soils, about 18 percent is Shoals soils, and the remaining 29 percent is Medway, Genesee, Wabasha, and other soils.

The Sloan soils are dark colored and very poorly drained. The Ross soils are dark colored and well drained.

Figure 4.—**Oshtemo sandy loam on a beach ridge in soil association 8. Beach ridges are used for roads, homesites, and farming.**

The lighter colored Shoals soils are somewhat poorly drained. These dominant soils formed in loamy sediment washed from uplands. They are subject to periodic flooding and sediment deposition.

The Sloan and Shoals soils are generally waterlogged in winter and spring because the water table is high. Excess water can be readily removed by tile and surface drains, but providing outlets for the drains is almost impossible in some places. The Ross soils do not need artificial drainage. Flooding occurs in winter and spring, especially on the Sloan and Shoals soils. It occurs less commonly on the Ross soils, because they generally are in the highest areas on the flood plains.

The major soils in this association are important soils to farming. They are mainly used for cash crops. Corn and soybeans are the major crops. Winter small grains are infrequently grown on Shoals and Sloan soils, because they are subject to flooding and seasonal wetness. Small grains are more commonly grown on the well-drained Ross soils. The better drained Ross and Medway soils are well suited to specialty and truck crops. Tomatoes and sweet corn can be grown. The soils in this association, except the Wabasha soils, are suitable for irrigation.

Flooding is a severe limitation to most nonfarm uses, including building sites and septic tank filter fields.

10. Paulding association

Very poorly drained, nearly level soils formed in clayey lacustrine sediment

This association is in two small areas in the county. The larger area is in southwestern part of Ridgeville Township, and the smaller area is in the southwestern part of Pleasant Township. The areas are nearly flat. This association occupies less than 1 percent of the county.

About 86 percent of the association is Paulding soils, and the remaining 14 percent is Roselms, Fulton, Nappanee, and other soils.

The Paulding soils formed in lacustrine material that has a very high content of clay. The Roselms, Fulton, and Nappanee soils are in only the Ridgeville Township area.

The Paulding soils are very wet and are ponded in places during winter and spring. Removal of excess water generally is accomplished by surface drainage. Tile drains remove the water very slowly and generally are ineffective.

The soils in this association are used mostly for cash crops, mainly wheat and soybeans. A small acreage of corn is grown. Under good management, the acreage of Paulding soils in corn can be increased.

Very poor natural drainage and a very high content of clay are limitations of the Paulding and Roselms soils for most nonfarm uses, including septic tank filter fields. Houses on Paulding soils are likely to have wet basements unless the foundations are properly drained.

Use and Management of the Soils

This section discusses general farm management and explains the capability classification system used by the Soil Conservation Service. Yields are estimated for the principal crops grown in the county. In addition, woodland, wildlife habitat, engineering works, and town and country planning are discussed.

Management for Crops and Pasture

The principal crops grown in the county are corn, soybeans, wheat, and alfalfa for hay and meal. Also grown are smaller acreages of tomatoes, sugar beets, other vegetables, nursery crops, and some fruits. Only about 1 percent of the acreage in farms is in pasture.

This subsection discusses management of crops, including field crops, specialized crops and pasture; and irrigation.

Field crops

The different kinds of soils in Henry County vary in their suitability for specific crops, and they require widely different management, but some general, or basic, management is needed on practically all of the soils. These basic practices are maintaining an adequate level of fertility, utilizing crop residue, improving drainage, controlling erosion, and using proper tillage. Management of groups of similar soils is discussed in the subsection "Management by Capability Units."

Maintaining an adequate level of fertility.—About 76 percent of the acreage in the county consists of dark-colored soils. These soils are nearly neutral in reaction and contain a medium amount of phosphorus and a large amount of potassium. Most of the lighter colored soils are naturally acid and are low in plant nutrients. These soils should be tested, and lime and fertilizer should be applied on the basis of test results, the kind of crop grown, and the planned level of yield. For assistance in determining the kinds and amounts of fertilizer and lime required, farmers should consult representatives of the Ohio Agricultural Extension Service for recommendations for various crops and soils. The current "Ohio Agronomy Guide" (*5*)[1] also gives fertilizer recommendations. The

[1] Italic numbers in parentheses refer to Literature Cited, p. 126.

texture of the surface layer is important in the applications of fertilizer and herbicide. Generally, larger amounts of potassium are needed for sandy soils than for loams or silt loams. Loams and silt loams generally require larger amounts than do clayey soils.

Utilizing crop residue.—The organic-matter content of the Toledo, Hoytville, and other dark-colored soils is about 3.5 percent. Lighter colored soils, such as the Fulton and Nappanee soils, generally have an organic-matter content of about 1 to 3.5 percent, which is less than it should be. All crop residue should be mixed into the soil to maintain or increase the content of organic matter. Tilth and the amount of nitrogen in the soil are affected by the content of organic matter. Soybeans and similar crops supply only a small amount of residue, and if these are grown, the cropping system should include cover or sod crops.

Drainage.—Henry County is one of the most intensively drained counties in the United States. About 95 percent of the acreage has soils that are affected by seasonal wetness. Crops grow well, however, on somewhat poorly drained and very poorly drained soils if excess water is removed by tile drains, surface drains, or land smoothing, or by a combination of these practices. Where these practices are not used, surface ponding and excess soil wetness slow the growth of crops. Also, soils that are not adequately drained dry out and warm up slowly, and this delays tillage and planting.

The efficiency of artificial drainage in removing water varies on the different kinds of soils. Surface drainage generally is most efficient on the Paulding, Roselms, Latty, and other clayey soils. A slow rate of permeability allows a removal of a greater volume surface water before it enters the soil. Ponding occurs on low-lying soils, even on the Granby and other sandy soils, but the water can be effectively removed by surface drains.

Tile drains remove excess water from within the soil. The efficiency of this artificial drainage depends on soil permeability. Excess water is most readily removed from the Granby, Wauseon, Gilford, Tedrow, Rimer, and similar soils. Water removal is more difficult in the Colwood, Millgrove, Mermill, Kibbie, Digby, Haskins, and similar soils, but it is effective. Internal drainage is least effective in clayey soils. Removal is fair in the Lenawee, Hoytville, Del Rey, and Nappanee soils; poor in the Toledo, Fulton, and Latty soils; and very poor in the Paulding and Roselms soils. Although there is much artificial drainage in Henry County, many fields and farms remain inadequately drained.

The moderately well drained and well drained soils do not normally need artificial drainage, but the surface drains from adjacent soils run through many areas. In some places random tile drains are needed in somewhat poorly drained soils and in seep spots.

Although excess water is the major limitation on most of the soils in the county, some well drained and moderately well drained soils are too dry during part of the growing season unless rainfall is timely. The Oakville, Spinks, Ottokee, Seward, Oshtemo, Haney, St. Clair, and Lucas soils frequently lack sufficient moisture for growing summer crops. Intensive management is needed on these soils to help conserve soil moisture for crops.

Controlling erosion.—Erosion is a hazard on the gently sloping to very steep soils. About 2 percent of the acreage in the county consists of soils that are susceptible to erosion. Erosion control practices commonly used in the county are tilling on the contour; keeping tillage to a minimum; constructing terraces, waterways, and diversions; utilizing crop residue; and planting close-growing crops.

Tillage.—The tillage used in the county is primarily plowing and working the soils with a conventional plow, disc, or cultipacker. At least 30 percent of the acreage in the county could be tilled by a plow-plant or minimum tillage method. The Oshtemo, Millgrove, Mermill, Seward, Rimer, and other sandy and loamy soils are suited to this tillage method.

Clayey soils, such as the Hoytville, Paulding, Latty, and Nappanee soils, shoud be tilled when the moisture content is favorable and possible damage to the soil structure by compaction is slight. The dark-colored soils require less cultivation than the lighter colored soils. Generally, the moisture content of the soils is favorable for plowing in the fall. Many of these soils are too wet to be plowed in spring.

For specific information regarding erosion control, consult a representative of the Henry County Soil and Water Conservation District or the Ohio Agricultural Extension Service.

Specialized crops

Specialized crops are grown for sale only by farmers who can obtain contracts with packing or processing companies. Only tomatoes and sugar beets are grown on significant acreages. Specific information about these crops can be obtained from the Ohio Agricultural Extension Agent, the local soil and water conservation district, or field representatives of the commercial packing and processing companies.

Sugar beets.—This crop requires soils that have a high available moisture capacity, relatively high organic-matter content, and soil reaction in the 6.5 to 7.0 pH range. Deep, dark-colored, medium-textured or moderately fine textured soils are well suited to sugar beets. Good tilth and aeration of the soil are important in growing sugar beets. The Hoytville, Lenawee, Mermill, and Millgrove soils are most extensively used for sugar beets. Some beets are grown on the Latty and Toledo soils. Surface crusting and restricted soil aeration are limitations for use of these soils.

The dark-colored soils commonly used for growing sugar beets are very poorly drained. Surface and tile drainage have been developed to adequately control surface and internal water.

Processing companies normally avoid contracting for sugar beets on the Spinks, Ottokee, Seward, and other sandy soils. Beets grown on sands form multiple taproots and lack the shape that is most suitable for processing.

Tomatoes.—The soil conditions and fertility levels necessary for good growth of most specialty crops also are important in growing tomatoes. Tomatoes can be grown on a wide range of soils, but they grow best on medium-textured to moderately fine textured, dark-colored soils that have a deep rooting zone, high available moisture capacity, and high organic-matter content. Most of the contracted acreage is in areas of Hoytville, Lenawee, and Toledo soils. Mermill, Millgrove, Colwood, and Granby soils are also used, but it is difficult to control disease and weeds on these soils. Growers also have difficulty in meeting the requirement for fruit color on the loamy and sandy soils.

The tomato plant sends its roots deep and is likely to be injured by excess water in the soil. They become more susceptible to injury by water as the plant approaches maturity. Because surface flooding causes plant damage within hours, good drainage is essential, both on the surface and within the soil, where this crop is grown. The dark-colored soils commonly used for tomato production are very poorly drained. Surface and tile drainage have been developed to help control excessive surface and internal water, and this drainage also provides adequate soil aeration.

Vegetables.—Carrots, cabbage, cucumbers, potatoes, onions, and parsley are grown on small acreages. Some growers have contracts with packing companies for producing some of these crops. Nursery crops and some fruit also are grown on a small acreage.

Loamy and sandy soils that have good internal drainage are well suited to most vegetable crops. The soils warm up relatively early in spring, absorb water readily, and can be tilled throughout a wide range of moisture content without severe compaction or damage to soil structure.

Pasture

Only about 1 percent of the acreage in farms is used for permanent pasture. This is because only a small percentage of the acreage cannot be cropped and because most of the forage needed is provided by meadow crops. Many soils in the county could be used for producing high-quality permanent pasture.

Most areas in pasture are on eroded soils that formerly were cultivated, on sloping to steep soils, or on soils that are frequently flooded. Some pastures near farmsteads are used for feedlots or access lanes. Some open woodlots are pastured, but they generally have sparse forage plants.

Yields of pasture vary widely; they depend on the kind of soil and the lay of the land. The sloping to steep soils in pasture are in the St. Clair and Lucas series. These soils are commonly eroded, and the water available to plants is low because runoff is rapid. Pasture plants generally grow slowly on these soils. Pasture plants also grow slowly on the sandy Oakville, Spinks, Oshtemo, and Ottokee soils because the available moisture capacity is low. Forage plants grow satisfactorily on the less sloping St. Clair and Lucas soils and the gently sloping Nappanee and Fulton soils, but these soils are subject to erosion if the plant cover is removed by tillage or is reduced by overgrazing. Severe soil compaction occurs if livestock trample these soils during wet periods.

The Sloan and Shoals soils on flood plains potentially are well suited to permanent pasture. Areas of these soils commonly are small in size and irregular in shape. Flooding during the growing season damages cash crops, but the soils are fertile, have high available water capacity, and can produce good grass or grass-legume pasture. Surface and tile drains help to control excess water, especially where legumes are grown.

Permanent pasture needs about the same management as does cropland. Lime and fertilizer should be applied at rates indicated by soil tests. Control of weeds by periodic clipping and use of recommended herbicides encourages the growth of desirable plants. Proper stocking rates and controlled grazing also encourage the growth of desirable plants. Latest recommendations on seeding mixtures, herbicide treatment, and other management on specific soils can be obtained from the Ohio Agricultural Extension Agent or from the office of the Henry County Soil and Water Conservation District.

Irrigation

Henry County generally receives enough rainfall to supply moisture for crops, but intervals commonly occur when rainfall is insufficient. Supplemental irrigation of cropland or pasture during these dry periods helps to increase the growth of crops and forage plants.

The soils in Henry County vary in their suitability for irrigation. The sandy soils, such as the Ottokee, Tedrow, Seward, Rimer, Galen, Granby, Gilford, and Wauseon soils, are very permeable but lack adequate water-holding capacity. Irrigation of these soils has to be more frequent than on loamy soils. The soils that are most suitable for irrigation, from the standpoint of permeability and water-holding capacity, are the Oshtemo, Haney, Digby, Kibbie, Colwood, Millgrove, Mermill, Rawson, Genesee, Medway, and Ross soils. Digby, Kibbie, Colwood, Hoytville, Millgrove, and Mermill soils should be artificially drained before they are irrigated. The finer textured silty clay loam, clay, and silty clay soils, such as the Latty, Toledo, Nappanee, and Paulding soils, are poorly suited to irrigation because they are slowly permeable.

Before irrigation can be used, an adequate supply of water is necessary. Use of water in streams and ponds may be restricted, because it is controlled by the Ohio Department of Natural Resources, and water rights of the downstream users must be considered.

Additional information about the soils and their management for irrigation is available from the Henry County Soil and Water Conservation District and the Ohio Cooperative Extension Agent.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to 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 forest trees or engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, subclass, and 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, woodland, or wildlife. (None in Henry County.)

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

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

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes. (None in Henry County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small lettter, *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 but not in Henry County, shows that the chief limitation is climate that is too cold to 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 IIw-4 or IIIw-1. 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 paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In the following pages are descriptions of the capability units used in Henry County. The land types in the county, such as Clay pits and Gravel pits, were not assigned to a capability unit.

The descriptions of the capability units gives the properties and qualities of the soils within the unit. Because the soils in any one capability unit have about the same limitations and similar risks of damage, they need about the same kind of management. In some units, there are one or two soils that have properties or qualities different from those of the rest of the soils in the group. These exceptions are included in a capability unit because they have a small acreage that does not justify a separate description, or they are similar in many respects to the other soils in the unit. By including exceptions, the number of capability units is kept to a practical minimum. The exceptions are noted if there is a significant difference for either use or management.

Low, medium, or high available moisture capacity refers to the normal root depth of commonly grown field crops. The depth of the root zone refers to the depth of soil to a root restricting layer, such as dense clay, compact till, highly calcareous material, or bedrock. The soil reaction is for natural conditions and denotes the most acid condition in the root zone. The reaction in an individual soil area may differ because of management.

These descriptions note the dominant limitations of the soils for farm use, but they do not give specific recommendations for overcoming them. Erosion control or drainage, for example, can be achieved by many methods or combination of practices on any given field of any kind of soil. For specific information regarding erosion control, artificial drainage, use of recommended crop varieties, or other management practices, the reader should contact the local soil and water conservation district or the Ohio Agricultural Extension Agent.

CAPABILITY UNIT I-1

This unit consists of soils in the Haney series. These soils are moderately well drained and nearly level. They are on beach ridges, outwash plains, and terraces adjacent to the Maumee River. These soils have a deep root zone, moderate permeability, medium available moisture capacity, and a medium capacity to store and release plant nutrients.

These soils have no limitations to use for field crops or pasture. The hazard of erosion is slight or none.

Soils in this unit are suited to all of the field crops and hay or pasture plants commonly grown in the county. Under good management, the soils can be used for row crops year after year, and they are suited to the specialty crops grown in the county. Haney fine sandy loam is better suited to specialty crops than Haney loam, because it dries out and warms up more quickly in spring. Both soils are well suited to irrigation.

CAPABILITY UNIT IIe-1

This unit consists of loamy, gently sloping, moderately well drained soils in the Haney, Rawson, and Tuscola series. These soils are on stream terraces, in deltaic areas, and on beach ridges. They have a deep or moderately deep root zone; moderate permeability, except for the Rawson soils, which have slow or very slow permeability; medium to high available moisture capacity; and a medium capacity to store and release plant nutrients. In some places the Haney soils have sandy and gravelly material at depths of 26 inches or more. The Rawson soils have clayey underlying material. Unless the soils in this unit have been limed, they are medium acid or strongly acid in the upper part of the subsoil. If they are cultivated and not protected, a moderate hazard of erosion is the major limitation. Fertility, soil structure, and the organic-matter content need to be maintained if these soils are cultivated.

These soils are suited to all row crops, small grains, hay crops, and pasture crops commonly grown in the county. They also are suited to adapted specialty crops and to fruit trees. The sandy loam soils are better suited to specialty crops than the loam soils, because they dry out and warm up earlier in spring. These soils are all suited to irrigation.

CAPABILITY UNIT IIe-2

This unit consists of sandy, moderately well drained and well drained, gently sloping soils in the Arkport, Galen, and Seward series. These soils are on beach ridges and low sandy knolls. They have a deep root zone; moderately rapid permeability, except for the Seward soils, which have slow or very slow permeability; low available moisture capacity; and a low to medium capacity to store and release plant nutrients. The Arkport and Galen soils have underlying material of fine sand, and the Seward soils have fine-textured underlying material or are stratified at a depth of 24 inches or more. Because this material restricts the downward movement of water, the Seward soils are less droughty than the other soils in the unit. The root zone is medium acid or strongly acid in some places.

The major limitations to use of these soils are a moderate hazard of erosion and moderate droughtiness. In spring soil blowing is a hazard in cultivated fields and in areas lacking a thick plant cover. Maintaining fertility and the organic-matter content is difficult on these sandy soils.

These soils are suited to the row crops and pasture plants commonly grown in the county. Under good management, the soils can be planted to row crops year after year where slopes are no more than 4 percent. The soils are well suited to specialty crops only if they are very intensively managed and are irrigated. They are suited to irrigation. They dry and warm readily in spring.

CAPABILITY UNIT IIw-1

Shoals silt loam is the only soil in this unit. This soil is nearly level and somewhat poorly drained. It is in lowlying areas on flood plains that border the major streams in the county. It is subject to flooding and has a seasonally high water table. This soil has a deep root zone when the water table is low. It is moderately permeable, has a high available moisture capacity, and has a high capacity to store and release plant nutrients. The root zone is mildly alkaline in most places.

Seasonal wetness and flooding are the major limitations to the use of this soil. Good soil structure is difficult to maintain because the soil is commonly worked or pastured when wet. If it is worked or pastured when wet, the resulting compaction and the destruction of soil structure make the soil more difficult to till and pastures become less productive.

Artificially drained areas of this soil are well suited to such row crops as corn and soybeans. Because of flooding, however, they are not so well suited to small grains and some hay crops. Undrained areas are commonly too wet for cultivation. Hay and pasture plants that tolerate wet conditions are adapted to this soil. In some places the soil is frequently flooded and is better suited to permanent cover, either trees or grass, than to cultivated crops. This soil is suited to tile drains, but drainage outlets are difficult to establish in places because the soil is low in relation to nearby streams.

CAPABILITY UNIT IIw-2

This unit consists of moderately well drained and well drained, nearly level soils in the Genesee, Medway, and Ross series. The Ross and Medway soils are darker colored than the Genesee soils. All the soils are on flood plains of the major streams and are subject to flooding during major floods. They have a deep root zone, moderate permeability, high available moisture capacity, and a high capacity to store and release plant nutrients. The root zone is neutral to mildly alkaline in most places.

The major limitation to use of these soils is wetness caused by occasional flooding and runoff from adjacent slopes. Tile drainage is normally not needed on these soils, but surface drains can be used to drain excess water from low areas.

These soils are well suited to such row crops as corn and soybeans. Flooding early in spring is likely to damage crops of small grain. The soils are well suited to the specialty crops commonly grown in the county if the crops are planted after the normal flood season in spring. They are well suited to irrigation. Under good management, row crops can be grown year after year with little or no risk.

CAPABILITY UNIT IIw-3

This unit consists of dark-colored, very poorly drained, nearly level soils in the Colwood, Lenawee, Mermill, and Millgrove series. These soils have a deep or moderately deep root zone when the water table is low, moderate to very slow permeability, medium to high available moisture capacity, and a very high capacity to store and release plant nutrients. The Millgrove soils are underlain by sand and gravel at a depth of 24 inches or more. Strata of clay or sandy and clayey material underlie the Mermill soils. Soils in the unit are slightly acid to alkaline.

A seasonally high water table is the major limitation to the use of these soils for farming. Good soil structure is difficult to maintain because the soils are commonly worked when too wet. The resulting compaction and destruction of structure makes the soils more difficult to till. Good structure is more difficult to maintain in Lenawee silty clay loam, Mermill clay loam, and Millgrove clay loam than it is in the other soils in this unit, because they have a higher content of clay in the surface layer. The seasonal high water table can be lowered by tile drains if outlets are obtainable.

The soils in this unit are well suited to all the row crops, small grain, and hay and pasture plants commonly grown in the county. If these soils are well drained, they also are well suited to adapted specialty crops. The soils can be used for row crops year after year if good management is practiced. They are suited to irrigation.

CAPABILITY UNIT IIw-4

This unit consists of loamy and sandy, dark-colored soils in the Gilford and Wauseon series. These soils are nearly level and are very poorly drained. They have a deep root zone when the water table is low, medium available moisture capacity, and a medium to high capacity to store and release plant nutrients. The Gilford soils have moderately rapid permeability, and the Wauseon soils have moderately rapid permeability in the upper 36 inches and very slow permeability below a depth of 36 inches. Soils in the unit are neutral to alkaline.

Because of a seasonal high water table, moderate wetness is the major limitation to the use of these soils. In spring, cultivated and unprotected areas are subject to soil blowing, particularly areas of Wauseon loamy fine sand. Both tile and surface drainage can be used to remove excess water, but tile lines tend to plug with sand.

If these soils are artificially drained, they are well suited to adapted specialty crops and such row crops as corn and soybeans. Small grain can be damaged by a seasonally high water table and ponding in spring. Hay and pasture plants that tolerate wetness are adapted to these soils. The soils are suited to irrigation.

CAPABILITY UNIT IIw-5

All of the soils in this unit are in the Hoytville series. These soils are dark colored, very poorly drained, and nearly level. They have a deep root zone when the water table is low, slow permeability, high available moisture capacity, and a very high capacity to store and release plant nutrients. The root zone is neutral.

Moderate wetness, caused by a seasonally high water table, is the major limitation to the use of these soils for farming. Good soil structure is difficult to maintain, especially if the soils are worked or pastured when wet. The compaction and destruction of soil structure results in poor tilth. Excess water can be removed by tile drains, and drainage ditches provide outlets for the tile and for surface drains.

These soils can be cultivated year after year if good management is used. If they are adequately drained, they are well suited to all field crops and specialty crops commonly grown in the county. These soils are suited to irrigation, but they have relatively slow infiltration rates. Hoytville clay can be tilled in fall (fig. 5).

***Figure 5.*—Fall-plowed Hoytville clay. Freezing and thawing help to break down the clods, as well as the soil structure. Capability unit IIw-5.**

CAPABILITY UNIT IIw-6

This unit consists of nearly level, somewhat poorly drained soils in the Del Rey, Digby, Haskins, Kibbie, and Vaughnsville series. These soils have a seasonally high water table, and they stay wet until late in spring unless they are artificially drained. They have a moderately deep to deep root zone, moderate to very slow permeability, medium to high available moisture capacity, and a medium capacity to store and release plant nutrients. They range from medium acid to mildly alkaline in the root zone.

Moderate wetness is the major limitation to the use of these soils for farming. Good soil structure is difficult to maintain if the soils are worked when wet. The resulting compaction and deterioration of soil structure cause poor tilth. The seasonal high water table can be lowered by tile drains where drainage ditches provide adequate outlets.

The soils in this unit are well suited to all row crops, small grains, and hay and pasture plants commonly grown in the county. They are suited to the specialty crops grown in the area. These soils can be used for row crops year after year if good management is used.

CAPABILITY UNIT IIw-7

This unit consists of sandy, nearly level, somewhat poorly drained soils in the Rimer and Tedrow series. These soils have a moderately deep to deep rooting zone. They are rapidly permeable in the upper 20 to 40 inches. They have medium to low available moisture capacity and a moderate to low capacity to store and release plant nutrients. These soils are slightly acid to neutral.

The major limitation to the use of these soils for farming is moderate wetness caused by a seasonal high water table. Soil blowing is a hazard if the soils are not protected by a thick plant cover in spring. The seasonally high water table can be lowered by tile drains where outlets are available. The soils dry and warm readily in spring if they are drained.

These soils are well suited to all field crops commonly grown in the county. They can be cultivated year after year if good management is used. Vegetation or stubble on the surface helps to reduce soil blowing. The soils are suited to irrigation.

CAPABILITY UNIT IIs-1

Galen fine sand, 0 to 2 percent slopes, is the only soil in this unit. It is a moderately well drained soil and has a deep root zone, moderately rapid permeability, low available moisture capacity, and a medium to low capacity to store and release plant nutrients. The upper part of the root zone is medium acid or strongly acid.

Moderate droughtiness is the major limitation to the use of this soil for farming. Soil blowing is a hazard in spring if the soil is not protected by a thick plant cover. This soil has a low organic-matter content. Green-manure crops and plant residue returned to the soil help to increase the organic-matter content.

This soil is suited to row crops and pasture crops commonly grown in the county. It is not well suited to specialty crops commonly grown in the county, but these crops can be grown if very intensive management is used. This soil is suited to irrigation.

CAPABILITY UNIT IIs-2

Shinrock silt loam, sandy subsoil variant, 0 to 2 percent slopes, is the only soil in this unit. It is moderately well drained. It has a deep root zone, moderately slow permeability, medium available moisture capacity, and a medium capacity to store and release plant nutrients.

Droughtiness is a moderate limitation to the use of this soil for farming. During spring, soil blowing is a hazard in cultivated and open fields. The silt loam surface layer is subject to crusting after hard rains. Good soil structure can be maintained by planting crops that supply a large amount of residue.

This soil is suited to all of the field crops, specialty crops, and hay and pasture plants commonly grown in the county. It can be used for row crops yearly if intensive management is used. It is suited to irrigation.

CAPABILITY UNIT IIIe-1

This unit consists of sloping, moderately well drained soils in the Haney, Rawson, and Tuscola series. Some of these soils are moderately eroded. All the soils have a moderately deep to deep root zone. They have moderate permeability, except for the Rawson soils, which have very slow permeability. The soils have medium to high available moisture capacity and a medium to high capacity to store and release plant nutrients.

A severe hazard of erosion is the major limitation to the use of these soils for cultivated crops. Maintenance of fertility, good soil structure, and the organic-matter content is needed if the soils are intensively cultivated. Erosion is difficult to control if the soils are cultivated year after year. Close-growing crops of hay and pasture plants grown in rotation with cultivated crops help to control erosion.

These soils are suited to the field crops and hay and pasture plants commonly grown in the county. They are not well suited to specialty crops unless very intensive management is used. Areas in pasture are subject to erosion if they are overgrazed.

CAPABILITY UNIT IIIe-2

This unit consists of moderately well drained, gently sloping, moderately eroded soils in the Lucas and St. Clair series. These soils have a moderately deep root zone, slow to very slow permeability, and a medium to low available moisture capacity. Because of cultivation and erosion, the present surface layer is a mixture of the original surface layer and part of the subsoil. This surface layer is sticky when wet and difficult to till. The root zone is strongly acid to slightly acid.

A severe hazard of erosion is the major limitation to the use of these soils. Maintaining good soil structure and an adequate organic-matter content is needed if these soils are cultivated. Artificial drainage is not generally needed, but seeps may cause wet spots during prolonged wet weather.

These soils are suited to the field crops and hay and pasture plants commonly grown in the county. They are not well suited to specialty crops. Row crops can be grown, but erosion is difficult to control if they are grown year after year. Good management helps to control soil erosion where row crops are grown. Close-growing crops that provide a fairly complete plant cover during most of the growing season reduce the hazard of erosion. If grazing is controlled in pastures, an adequate plant cover can check soil losses.

CAPABILITY UNIT IIIe-3

This unit consists of sandy, well drained or moderately well drained, sloping soils in the Arkport, Seward, and Spinks series. These soils have a moderately deep to deep root zone, rapid to moderately rapid permeability, and a low to very low available moisture capacity. The Seward soils are underlain by clayey material at a depth of 22 inches or more. Permeability in the clayey material is slow. The root zone is medium acid to neutral.

A severe hazard of erosion is the major limitation to the use of these soils for cultivated crops. Soil blowing is a hazard in spring if the soils are not protected by thick plant cover. These soils have a low organic-matter content and are droughty.

Soils in this unit are suited to all row crops and hay and pasture plants that are commonly grown in the county. A reduction in yields can be expected during long dry periods. These soils are suited to row crops if good management is used, but erosion is difficult to control if row crops are grown year after year. Overgrazing increases the hazard of erosion in pastures.

CAPABILITY UNIT IIIw-1

This unit consists of deep, dark-colored, very poorly drained soils in the Cohoctah, Sloan, and Wabasha series. These nearly level soils are on low-lying flood plains adjacent to streams in the county (fig. 6). The root zone of the soils is deep when the water table is low. The Cohoctah soils have moderately rapid permeability, but Sloan soils have moderate permeability, and Wabasha soils have very slow permeability. The Wabasha soils are more clayey throughout than either the Sloan or Cohoctah soils. The soils in this unit have a medium to high available moisture capacity. They are neutral to mildly alkaline.

Wetness, caused by a seasonal high water table and flooding, is the major limitation to the use of these soils for farming. Tile and surface drains help to remove excess water where adequate outlets can be provided for the drains. Runoff from adjacent slopes can be intercepted by diversions along the base of the slope. Good

Figure 6.—**Sloan silty clay loam on flood plain below Lucas silty clay loam, 2 to 6 percent slopes, moderately eroded, on an adjacent slope. The Sloan soil is in capability unit IIIw-1, and the Lucas soil is in capability unit IIIe-2.**

soil structure is difficult to maintain if the soils are worked or pastured when wet.

If these soils are drained, they are suited to such row crops as corn and soybeans. Winter grains are not generally grown, because of winter flooding. Areas that are frequently flooded throughout the year are better suited to pasture or trees than to field crops.

CAPABILITY UNIT IIIw-2

Only Toledo soils are in this unit. These soils are dark colored, very poorly drained, and nearly level. They formed in clayey lacustrine sediment. They have slow permeability and a seasonally high water table. The root zone is mostly moderately deep in summer or when the water table is lowered by artificial drainage. A clayey subsoil and the seasonally high water table tend to restrict the depth of the rooting zone for most annual crops. These soils are neutral to mildly alkaline.

Seasonal wetness is the major limitation to the use of these soils. Unless the soils are artificially drained, they are slow to warm up and dry out in spring. A combination of surface drains and tile has generally been most effective in removing excess water. Good tilth is easier to maintain on these soils than on lighter colored soils, because the organic-matter content is higher. It is, however, generally harder to maintain than on other dark colored soils. Toledo silty clay can be tilled only within a narrow range of moisture content; the range is narrower than that for Toledo silty clay loam. These soils tend to crack to some extent during dry periods.

These soils are suited to row crops, small grains, hay and pasture crops, and specialty crops. They can be cultivated year after year if good management is used. Areas that are not artificially drained are commonly used for pasture or trees because they generally are too wet for cultivated crops. If the soils are trampled and compacted by livestock when wet, the growth of pasture plants is reduced.

CAPABILITY UNIT IIIw-3

This unit consists of nearly level or gently sloping, somewhat poorly drained soils in the Fulton, Nappanee, and Roselms series. These soils have a seasonally high water table and stay wet until late in spring unless they are artificially drained. They have slow to very slow permeability, medium available moisture capacity, and a medium capacity to store and release plant nutrients. They have a clayey subsoil. The present suface layer of the moderately eroded Nappanee soil is a mixture of the original surface layer and part of the subsoil, and it is more clayey than that of the uneroded Nappanee soils. Unless the soils in this unit have been limed, they are strongly acid to medium acid in the root zone.

Seasonal wetness is the major limitation to the use of these soils. Erosion is a hazard on the gently sloping soils. Good soil structure is difficult to maintain if the soils are tilled when wet. Where the structure has been destroyed or the surface layer has been compacted, the soils are in poor tilth. The soils in this unit that have a loam surface layer generally have good tilth. Crusting of the surface layer occurs after planting in spring, especially where the surface layer is silty clay loam. The seasonally high water table can be lowered by tile drains, but drainage by tile is fairly slow.

These soils are suited to the row crops, small grains, and hay and pasture crops commonly grown in the county. They are poorly suited to specialty crops. The nearly level soils are suited to a more intensive cropping system than are the gently sloping and the moderately eroded soils. Row crops can be grown year after year on the nearly level soils and on the gently sloping soils where slopes are no more than 4 percent. If the soils are trampled by livestock when wet, the growth of pasture plants is reduced.

CAPABILITY UNIT IIIw-4

Granby loamy fine sand is the only soil in this unit. It is dark colored, nearly level, and very poorly drained. This soil has a deep root zone when the water table is low. It has rapid permeability, low available water capacity, and a medium capacity to store and release plant nutrients. It is neutral in most places. Some areas of this soil have a 3- to 7-inch layer of muck on the surface.

Wetness, caused by a seasonally high water table, is the major limitation to use of this soil, but the soil is droughty during long, dry periods. In spring, unprotected cultivated fields are subject to soil blowing. The seasonally high water table can be lowered by tile drains if suitable outlets are available or if pumps are used at the outlets. Construction of ditches is difficult.

This soil is well suited to corn, soybeans, and other row crops. Undrained areas are generally too wet for crops. Small grain is commonly damaged by the high water table and by ponding in spring. This soil is suited to hay and pasture plants that tolerate wetness. It is suited to irrigation and adapted specialty crops if intensive management is used.

CAPABILITY UNIT IIIw-5

This unit consists of nearly level, very poorly drained, clayey soils in the Latty and Paulding series. These soils formed in lacustrine clay sediment. Permeability is very slow, and the soils are saturated for long periods in winter and spring. The high content of clay restricts the development of plant roots and movement of air and water in the subsoil. Because of a very high content of clay, more than 60 percent, the Paulding soils are especially difficult to manage.

Seasonal wetness is the major limitation to the use of the soils in this unit. They warm and dry slowly in spring, even if they are artificially drained. Both tile and surface drainage can be used, but tile drainage is slow. Good tilth is difficult to maintain. These soils crust badly and crack readily during dry periods. They can be tilled only within a narrow range of moisture content. Tilling at the proper time is important.

These soils generally are suited to row crops, small grains, and hay and pasture plants. Paulding soils generally are less well suited to row crops, especially corn, unless good management is used. Soils in this unit can be row cropped continuously without eroding, but good management is needed to produce a satisfactory crop. The soils are highly susceptible to compaction if they are trampled by livestock when wet.

CAPABILITY UNIT IIIs-1

This unit consists of moderately well drained and well drained, nearly level or gently sloping soils in the Oshtemo, Ottokee, and Spinks series. These soils have a deep root zone, rapid or moderately rapid permeability, low to very low available moisture capacity, and a low capacity to store and release plant nutrients. The upper part of the root zone is medium acid to neutral.

Droughtiness is a severe limitation to the use of these soils for farming. Soil blowing is a hazard in cultivated and open fields. These soils have a low organic-matter content. Crop residue and green-manure crops returned to the soil help to increase the organic-matter content.

These soils are suited to row crops and pasture plants commonly grown in the county. Summer crops, however, commonly are affected by lack of sufficient moisture. These soils also are suited to small grains that mature before prolonged dry periods. They are not well suited to specialty crops unless very intensive management is used. Growth of forage plants is improved if deep-rooted legumes are used in a legume-grass mixture. Reduction in crop growth can be expected if moisture is limited during prolonged dry periods.

CAPABILITY UNIT IVe-1

This unit consists of well drained and moderately well drained, sandy soils in the Seward and Spinks series. These soils are moderately steep and have a moderately deep to deep root zone. They have low available moisture capacity. The Seward soils have clayey material and slow permeability at a depth of 26 inches or more. Water moves across the surface of this clayey material, and seep spots occur where the water comes out on side slopes. The Spinks soils have moderately rapid permeability. Soils of both series have a low capacity to store and release plant nutrients. The root zone ranges from medium acid to neutral.

A severe hazard of erosion and severe droughtiness are the major limitations to the use of these soils. Droughtiness severely reduces crop growth during extended dry periods. In fields not protected by a thick plant cover, the hazard of soil blowing is severe. Erosion is difficult to control on these soils unless close-growing crops are grown. The soils have a low organic-matter content. Green-manure crops and crop residue help to increase the organic-matter content if they are returned to the soil.

These soils are suited to row crops and hay and pasture plants commonly grown in the county. A reduction in the growth of all crops can be expected during extended dry periods. Fields in hay and pasture are subject to severe soil losses through erosion unless a thick plant cover is maintained. These soils are suited to irrigation if water is applied at such a rate that runoff and erosion are avoided.

CAPABILITY UNIT IVe-2

This unit consists of moderately well drained, sloping, eroded soils in the Lucas and St. Clair series. Slopes generally are short. These soils have a moderately deep root zone, very slow permeability, medium to low available moisture capacity, and a medium capacity to store and release plant nutrients. The root zone is strongly acid to slightly acid in the upper part. The present surface layer is a mixture of the original surface layer and part of the subsoil, and it is sticky and difficult to till.

A very severe hazard of erosion is the major limitation to the use of these soils. It is difficult to maintain fertility, good soil structure, and the organic-matter content if the soils are tilled frequently. Good tilth also is difficult to maintain. Where the soils have been worked or pastured when wet, serious compaction and the destruction of soil structure occur.

These soils are suited to all row crops, small grain, and hay and pasture plants commonly grown in the county. Plant growth generally is not satisfactory, however, because of poor tilth and the damage caused by erosion. Minimum tillage lessens surface crusting. Crops that provide a thick cover help to reduce erosion and to maintain good tilth. Fields in hay and pasture are subject to severe erosion unless a thick plant cover is maintained.

CAPABILITY UNIT IVw-1

This unit consists of dark-colored, very poorly drained, nearly level, mucky soils in the Adrain and Warners series. The Adrain soil consists of muck over sand, and the Warners soil is mixed muck and mineral material over marl. Both soils have moderately rapid permeability, medium to high available moisture capacity, and a high capacity to store and release plant nutrients. The root zone of these soils is limited by either the depth to the water table, or in the Warners soil, the depth to marl.

Because of a high water table and runoff from adjacent slopes, wetness is a very severe limitation to the use of these soils. Runoff can be diverted in places by constructing diversions. Soil blowing is a hazard in spring if the muck is dry and the surface is exposed.

Drained areas of these soils are well suited to such row crops as corn, but they are of limited use for small grains and hay crops. It the soils are used for hay or pasture, water-tolerant plants should be grown. Excessive tillage should be avoided because it causes rapid oxidation of the organic matter and the subsequent destruction of the mucky surface layer.

CAPABILITY UNIT IVs-1

Oakville fine sand, 2 to 12 percent slopes, is the only soil in this unit. This soil is well drained. It has a deep root zone, rapid permeability, very low available moisture capacity, and a very low capacity to store and release plant nutrients. It is medium acid to strongly acid in the upper part of the root zone.

Severe droughtiness and a moderately severe hazard of soil blowing are the major limitations to the use of this soil for farming. The soil has a low organic-matter content. Green-manure crops and crop residue returned to the soil help to increase the organic-matter content.

This soil is suited to row crops and pasture plants commonly grown in the county. All crops are affected by a lack of soil moisture during extended dry periods. This soil is poorly suited to specialty crops but is well suited to irrigation.

CAPABILITY UNIT VIe-1

This unit consists of sloping, moderately well drained, severely eroded soils in the Lucas and St. Clair series. These soils have a shallow root zone, very slow permeability, a low available moisture capacity, and a medium capacity to store and release plant nutrients. The root zone is medium acid or strongly acid. The surface layer is sticky and difficult to till.

The effects of past erosion and a severe hazard of further erosion are the major limitations to the use of these soils for farming. The soils are better suited to legume-grass meadows or pastures than to cultivated crops. If the soils are pastured when wet, serious compaction and the destruction of soil structure generally occur. Growth of pasture plants is poor in these compacted areas and generally is poor in other areas.

These soils are suited to all hay crops and pasture plants commonly grown in the county. They are poorly suited to row crops or specialty crops. Reseeding occasionally with winter grains is satisfactory if tillage operations are kept to a minimum.

CAPABILITY UNIT VIIe-1

This unit consists of sloping to very steep, moderately well drained, clayey soils in the Lucas and St. Clair series. These soils mostly have a shallow root zone, very slow permeability, low available moisture capacity, and a medium capacity to store and release plant nutrients. They are severely eroded, and the surface layer is sticky and clayey and difficult to till. The root zone is medium acid or strongly acid.

A very severe hazard of erosion is the major limitation to the use of these soils. The soils are not suitable for cultivation, because runoff is very rapid and operation of equipment on the steeper slopes is hazardous.

These soils are not suited to cultivated crops or hay crops. They are better suited to permanent pasture, because soil losses through erosion are likely to be excessive if tame pastures are reseeded. The soils should be protected from overgrazing so that an adequate plant cover protects them from erosion.

Estimated Yields

Table 1 lists, for most soils in the county, the average yields per acre of principal crops. The yields are averages of those expected over a period of several years under two levels of management—prevailing, or average, management, and improved management. The yields estimated for average management are shown in columns A, and those for improved management are shown in columns B.

The following soils and land types are not listed in table 1, because they generally are not used for crops: Clay pits; Cut and fill land; Gravel pits; Lucas silty clay, 12 to 45 percent slopes, severely eroded; St. Clair silty clay, 6 to 12 percent slopes, severely eroded; St. Clair silty clay, 12 to 18 percent slopes, severely eroded; St. Clair silty clay, 18 to 25 percent slopes, severely eroded; St. Clair silty clay, 25 to 45 percent slopes, severely eroded; Spinks fine sand, 12 to 18 percent slopes; and Urban land.

Under improved management—

1. Practices are used that increase the intake of water and the available water capacity. Excess water is disposed of by safe and appropriate means.
2. Practices are used that help to control erosion.
3. Weeds, diseases, and insects are controlled.
4. Fertility is maintained at the highest level. Lime and fertilizer are applied according to the needs of the crop. The fertilizer contains trace elements (zinc, cobalt, manganese, copper, and the like) if these elements are needed.
5. Crop varieties suited to the soil are selected.
6. All farming operations are done at the proper time and in the proper way.

Under average management the farmer uses some, but not all, of the practices listed for improved management, or the practices used are not adequate for the needs of the crop.

The yields in table 1 do not apply to a specific field for any particular year because the soils vary from place to place, management varies from farm to farm, and the weather varies from year to year.

These yields are intended only as a guide that shows relative productivity of the soils, the response of the soils to management, and the relationship of the soils to each other. The general level of crop yield may change as new methods of management and new varieties of crops are developed, but the relationship of the soils to each other is not likely to change.

The estimated yields are assumed averages that can be expected over a period of 5 years if weather conditions are average. They are based on the "Productivity Guide for Ohio Soils" (*6*), observations and field trials of the Ohio Cooperative Extension Service, information obtained from farmers, and direct observations by the soil scientists and district conservationists of the Soil Conservation Service. Also used are results obtained in field trials and experiments at the Ohio Agricultural Research and Development Center and its substations. Considered in making the estimates were the prevailing climate and characteristics of the soils.

The hay yields shown in column A are for mixtures of red clover and timothy. Yields in column B are for the best adapted legumes, grasses, or both.

Cow-acre-days are not given for pasture in the table. They can be calculated from the hay yields indicated in table 1 by converting tons of hay to pounds by multiplying tons by 2,000 and then dividing by 40. The result is the cow-acre-days per year of pasture. Example: 5-ton hay yield × 2,000=10,000 pounds. 10,000 divided by 40=250 cow-acre-days per year of pasture.

TABLE 1.—*Estimated average acre yields of principal crops under two levels of management* [1]

[Yields in columns A can be expected under the average, or prevailing, management now used in the county. Those in columns B can be expected under improved management. Absence of a yield figure means that the crop is not commonly grown under the management level indicated or that the particular soil is not suited to the specific crop]

Soil	Corn		Soybeans		Wheat		Oats		Hay		Tomatoes [2]	Sugar beets [3]
	A	B	A	B	A	B	A	B	A	B	B	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons/acre*	*Tons/acre*	*Tons/acre*	*Tons/acre*
Adrian muck	82	115	28	36	----	----	----	----	----	----	----	----
Arkport fine sand, 2 to 6 percent slopes	50	78	19	27	27	38	46	73	2.1	3.8	----	----
Arkport fine sand, 6 to 12 percent slopes	44	68	16	23	24	33	43	67	1.8	3.2	----	----
Cohoctah fine sandy loam [4]	80	119	28	44	27	42	54	88	2.5	4.8	24.0	19.5
Colwood loam	98	137	35	49	38	58	74	95	3.8	6.0	29.3	23.2
Colwood silt loam	93	132	31	46	35	54	69	89	3.6	5.6	28.7	22.6
Del Rey loam, 0 to 2 percent slopes	80	105	30	42	32	44	55	75	2.7	4.4	18.5	12.0
Del Rey silt loam, 0 to 2 percent slopes	76	102	28	40	30	42	52	73	2.6	4.2	18.2	11.7
Digby fine sandy loam, 0 to 2 percent slopes	82	110	34	41	38	47	66	80	2.5	4.8	19.4	12.8
Digby loam, 0 to 2 percent slopes	84	114	36	43	40	48	67	82	2.6	4.9	20.0	13.0
Fulton loam, 0 to 2 percent slopes	62	96	26	36	30	42	52	73	2.5	4.2	17.5	11.0
Fulton loam, 2 to 6 percent slopes	60	94	24	34	28	40	49	71	2.3	4.0	16.5	10.7
Fulton silty clay loam, 0 to 2 percent slopes	58	93	23	33	27	39	50	70	2.3	4.0	16.2	10.4
Fulton silty clay loam, 2 to 6 percent slopes	56	90	21	31	25	37	47	66	2.1	3.8	15.8	10.0
Fulton loam, sandy subsoil variant, 0 to 2 percent slopes	63	98	26	37	30	43	54	74	2.6	4.4	17.7	11.3
Galen fine sand, 0 to 2 percent slopes	58	88	25	36	32	42	58	78	2.6	4.2	----	----
Galen fine sand, 2 to 6 percent slopes	55	86	23	32	30	41	56	76	2.3	4.0	----	----
Genesee loam [4]	90	120	31	42	33	44	55	88	3.2	5.0	22.5	14.5
Gilford fine sandy loam	98	126	32	48	35	50	70	87	3.5	5.4	25.0	21.0
Granby loamy fine sand	86	116	30	44	34	46	62	77	3.0	4.6	22.5	19.5
Haney fine sandy loam, 0 to 2 percent slopes	81	95	30	36	37	46	70	80	2.2	4.0	18.5	12.5
Haney fine sandy loam, 2 to 6 percent slopes	79	91	28	33	35	44	68	78	2.0	3.8	17.5	11.5
Haney loam, 0 to 2 percent slopes	83	98	32	38	38	48	72	82	2.4	4.4	19.0	13.0
Haney loam, 2 to 6 percent slopes	81	95	30	36	36	46	70	80	2.2	4.0	18.5	12.5
Haney and Rawson loams, 6 to 12 percent slopes	65	80	19	28	30	38	55	73	1.8	3.6	----	----
Haskins fine sandy loam, 0 to 2 percent slopes	72	105	30	43	30	44	50	85	2.2	4.0	19.0	12.0
Haskins loam, 0 to 2 percent slopes	74	108	31	44	32	46	52	86	2.4	4.4	19.5	12.5
Haskins fine sandy loam, stratified substratum, 0 to 2 percent slopes	74	110	30	44	31	47	51	85	2.3	4.2	19.5	12.5
Hoytville clay loam	88	126	32	44	33	50	62	88	3.3	5.4	29.0	22.0
Hoytville clay	86	124	30	42	31	48	60	85	3.0	5.0	28.5	21.0
Hoytville clay, thin solum variant	83	120	27	39	29	46	55	80	2.8	4.8	27.2	20.0
Kibbie fine sandy loam, 0 to 2 percent slopes	80	106	30	42	30	44	50	80	2.5	4.2	19.5	12.0
Kibbie loam, 0 to 2 percent slopes	82	109	31	45	33	46	53	84	2.6	4.5	19.8	12.3
Latty clay	78	110	30	42	33	45	55	78	2.8	4.7	24.5	19.0
Lenawee loam	85	121	32	46	32	50	62	86	3.2	5.2	29.0	22.0
Lenawee silty clay loam	83	118	30	43	30	48	58	83	3.0	5.0	28.0	21.0
Lucas silty clay loam, 2 to 6 percent slopes, moderately eroded	56	90	19	29	25	38	46	74	2.0	3.6	14.0	9.3
Lucas silty clay loam, 6 to 12 percent slopes, moderately eroded	52	83	15	22	20	32	43	70	1.6	3.0	----	----
Lucas silty clay, 6 to 12 percent slopes, severely eroded	----	----	----	----	16	28	40	65	1.4	2.5	----	----
Medway silt loam [4]	93	122	31	42	33	44	55	88	3.4	5.5	24.0	16.5
Mermill loam	90	126	30	44	33	51	62	93	3.6	5.6	27.3	22.8
Mermill clay loam	87	126	28	43	31	48	59	90	3.2	5.3	26.7	22.0
Mermill loam, stratified substratum	100	132	32	47	34	53	63	95	3.8	5.8	27.8	23.0
Millgrove loam	85	120	30	36	35	45	75	90	3.8	5.9	29.0	23.2
Millgrove clay loam	80	110	28	31	28	40	70	85	3.5	5.3	28.5	22.6
Nappanee loam, 0 to 2 percent slopes	62	95	24	34	27	38	44	70	2.5	4.2	18.0	11.5
Nappanee loam, 2 to 6 percent slopes	60	92	23	32	28	40	48	68	2.3	4.0	17.6	11.2
Nappanee silty clay loam, 0 to 2 percent slopes	59	91	21	31	28	39	48	68	2.4	4.0	17.7	10.8
Nappanee silty clay loam, 2 to 6 percent slopes	56	88	19	30	26	38	46	66	2.2	3.8	16.8	10.4
Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded	52	84	16	26	24	36	44	64	2.0	3.5	15.2	9.8
Oakville fine sand, 2 to 12 percent slopes	45	65	16	21	20	30	35	45	1.8	3.0	----	----
Oshtemo sandy loam, 2 to 6 percent slopes	50	78	19	25	28	37	45	65	2.3	3.6	----	----
Ottokee fine sand, 1 to 5 percent slopes	55	86	22	32	29	39	51	72	2.3	3.3	----	----
Paulding clay	66	100	25	38	29	38	38	58	2.5	4.0	----	----
Rawson sandy loam, 2 to 6 percent slopes	81	101	26	33	35	43	57	82	2.0	3.7	16.0	10.0
Rawson loam, 2 to 6 percent slopes	85	108	30	38	38	46	60	85	2.4	4.7	18.3	12.5
Rawson fine sandy loam, stratified substratum, 2 to 6 percent slopes	84	106	29	37	37	45	61	86	2.3	4.6	17.6	12.

See footnotes at end of table.

TABLE 1.—*Estimated average acre yields of principal crops under two levels of management* [1]—Continued

Soil	Corn		Soybeans		Wheat		Oats		Hay		Tomatoes [2]	Sugar beets [3]
	A	B	A	B	A	B	A	B	A	B	B	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons/acre*	*Tons/acre*	*Tons/acre*	*Tons/acre*
Rimer loamy fine sand, 0 to 2 percent slopes	58	88	24	36	23	38	43	72	2.1	3.7	----	----
Rimer loamy fine sand, stratified substratum, 0 to 2 percent slopes	60	92	25	38	25	40	44	73	2.2	4.0	----	----
Roselms silty clay loam, 0 to 2 percent slopes	41	58	20	27	23	31	37	63	1.8	3.4	----	----
Ross loam [4]	93	122	31	42	33	55	55	88	3.5	5.6	24.2	16.8
St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded	55	92	21	30	26	38	47	74	2.2	3.8	14.3	9.7
St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded	51	84	17	24	22	33	42	67	1.8	3.1	----	----
Seward loamy fine sand, 2 to 6 percent slopes	56	85	22	33	26	37	42	70	2.0	3.2	----	----
Seward loamy fine sand, 6 to 12 percent slopes	50	76	18	23	21	30	36	64	1.6	2.6	----	----
Seward loamy fine sand, 12 to 18 percent slopes	----	----	----	----	16	24	32	58	1.3	2.3	----	----
Seward loamy fine sand, stratified substratum, 2 to 6 percent slopes	57	86	23	33	26	38	43	72	2.2	3.6	10.2	9.4
Seward loamy fine sand, stratified substratum, 6 to 12 percent slopes	54	80	20	30	23	34	40	68	2.0	3.2	----	----
Shinrock silt loam, sandy subsoil variant, 0 to 2 percent slopes	78	103	28	40	31	44	47	75	2.6	4.2	17.6	11.8
Shoals silt loam [4]	76	110	29	42	26	40	55	77	2.8	4.6	16.0	12.0
Sloan silty clay loam [4]	80	119	28	44	27	42	54	88	2.5	4.8	24.0	19.5
Spinks fine sand, 2 to 6 percent slopes	50	78	19	27	27	38	46	73	2.1	3.8	----	----
Spinks fine sand, 6 to 12 percent slopes	44	68	16	23	24	33	43	67	1.8	3.2	----	----
Tedrow loamy fine sand, 0 to 2 percent slopes	54	86	22	32	24	36	45	75	2.1	3.4	10.2	9.5
Tedrow loamy fine sand, silty subsoil variant, 0 to 2 percent slopes	57	90	25	35	24	38	44	74	2.3	3.7	10.4	9.6
Toledo silty clay loam	84	124	34	44	34	46	66	86	3.2	4.8	27.0	20.5
Toledo silty clay	82	122	31	42	32	44	63	82	3.0	4.6	26.0	19.7
Tuscola loam, 2 to 6 percent slopes, moderately eroded	80	110	24	38	29	44	50	79	3.1	4.4	18.5	11.8
Tuscola loam, 6 to 12 percent slopes, moderately eroded	75	102	21	33	25	40	45	75	2.8	3.9	----	----
Vaughnsville loam, 0 to 2 percent slopes	89	112	30	39	36	44	64	75	2.4	4.0	18.0	11.5
Wabasha silty clay [4]	83	116	28	40	33	44	56	82	2.9	4.5	22.5	15.5
Warners muck	65	90	30	40	32	44	58	72	2.5	4.2	----	----
Wauseon fine sandy loam	94	128	32	48	33	49	64	88	3.4	5.0	25.0	19.5
Wauseon loamy fine sand, stratified substratum	94	124	30	46	32	45	65	89	3.0	4.7	24.5	18.5

[1] See text for definition of levels of management.
[2] Only improved management considered profitable; soils not rated below yield of 10 tons.
[3] Only improved management considered profitable; soils not rated below yield of 9 tons.
[4] Soils subject to flooding; yields given are for areas where flooding is not a hazard or is controlled.

Woodland Use of the Soils

This subsection describes the original forest and the present woodland that covered Henry County. It also gives the potential productivity of woodland and describes windbreaks in the county.

When Henry County was settled in the 1800's most of the county was covered by a forest of swamp hardwoods (*11*). This type of forest occurred in all the soil associations except 4, 8, and 9. The location of these associations is shown on the colored general soil map at the back of this survey. Oak-hickory forest grew on the beach ridges that make up soil association 8 and on the sandy knolls in soil association 4. Early settlers named this area the Oak Openings because grasses grew in areas of the oak forest. Mixed hardwoods grew in soil association 9 along the Maumee River.

Much of the originally wooded landscape is now farmland. Only about 5 percent of the total acreage remains in trees. The woodlots are on level and sloping soils. These woodlots vary in size, but most of them range from 2 to 15 acres. The percentage of the landscape in trees ranges from about 10 percent in Ridgeville, Napoleon, and Washington Townships to less than 1 percent in Richfield and Bartlow Townships. Of the 10 soil associations in the county, the Hoytville and the Oshtemo-Haskins-Haney associations have the smallest acreage in trees.

Wooded areas are still being cleared for farming and other uses. In the 1967 Conservation Needs Inventory, it was estimated that tree clearing would continue at the rate of about 200 acres per year. Only a few trees are replanted. Most of the tree planting is in Washington Township on State land. These plantings have been mostly conifers, but a few private landowners have planted hardwoods. Plantings for field and farmstead windbreaks are increasing.

Studies of the quality of woodland sites have been made on some of the soils in Henry County. Table 2 gives the potential productivity of soils in selected series for which data are available.

The flat lake plain of Henry County provides few obstructions to winds that sweep across the county. Widely scattered woodlots do obstruct the wind, but these wooded areas are gradually being cleared. The hazard of soil blowing is becoming more severe, especially on the Arkport, Spinks, Oakville, and other sandy soils. The most severe erosion occurs on sandy knolls in soil associations 3 and 4. Protection against the wind is possible where adapted trees are planted. Farmsteads, livestock, and field crops can be protected by a windbreak of trees.

The kinds of trees planted in windbreaks depend on the kind of soil. Arborvitae is adapted to the dark-colored, very poorly drained soils that occur in soil associations 1, 2, 5, 7, and 9. Austrian pine growns on many kinds of soils, including those that are acid to slightly alkaline. White pine, red pine, and Scotch pine are adapted to soils on the sandy knolls, ridges, and beach ridges in soil associations 3, 4, and 8. Norway spruce and eastern redcedar grow on a wide range of soils, but they are not well suited to very poorly drained soils.

The service forester of the Ohio Division of Forestry is available for assistance in marking of timber and management of wooded areas, and for information on tree planting and improving timber stands. Information on soils suited to woodland or windbreaks is available from the office of the Henry County Soil and Water Conservation District.

Soils and Wildlife Habitat

This subsection discusses some general requirements for suitable wildlife habitat and describes the wildlife in Henry County. It also rates each soil in the county for its suitability for eight elements of wildlife habitat and for three kinds of wildlife.

Wildlife species and abundance in any area depend largely on an adequate distribution of food, shelter, and water. Various kinds of habitat elements are required to serve the needs of various species. The absence, inadequacy, or inaccessibility of any one of the required habitat elements may result in scarcity or absence of a kind of wildlife.

Many of the habitat needs of wildlife are provided by various kinds of vegetation and by suitable water areas or watering places. Soil characteristics influence the adaptability, growth, and productivity of plants. They also affect the availability and distribution of water needed by wildlife. Knowledge about these relationships is an aid in managing both vegetation and water. Soils are managed to encourage wildlife by planting, inducing natural establishment, or manipulating existing vegetation, or by a combination of such measures. Water management requires creating or improving water areas and water supplies.

The game species common in Henry County include pheasant, quail, rabbit, squirrel, and raccoon. Some whitetail deer occur, but the population is very small. Deer in the county are most common in the Maumee State Forest and along the major tributaries of the Maumee River.

Pheasants are plentiful but the population has declined during the past few years. Rabbits are common in the better habitats. Quail are more abundant than they formerly were. Squirrels and raccoon are common, but the populations are declining because woodland habitats are being cleared.

Fishing as a recreational activity has decreased in the Maumee River and its tributaries because of increasing pollution.

Information in this section can be used to aid in:

1. Broad-scale planning for wildlife habitat, wildlife refuges, parks, nature study areas, and recreational developments.
2. Selecting the better soils for creating, improving, or maintaining the various kinds of wildlife habitat elements.
3. Determining the relative degree of management required to attain satisfactory results.
4. Determining the sites on which it is too difficult or not feasible to attempt wildlife habitat management.
5. Determining areas desirable for habitat preservation, or suitable for acquisition for wildlife habitat.

Suitability of soils for wildlife

The soils of Henry County are rated in table 3 for their suitability for creating, improving, or maintaining eight habitat elements and for their suitability for three classes of wildlife. Numbers indicate the ratings as follows: 1, well suited; 2, suited; 3, poorly suited; and 4, unsuited. A rating of *well suited* means that the soil has few or no limitations to use for the element of wildlife habitat. A rating of *suited* indicates that the habitat element can be created, improved, or maintained, but that there are moderate limitations that affect management. *Poorly suited* indicates that the habitat element can be created, improved, or maintained, but that limitations are severe. A rating of *unsuited* indicates that the habitat cannot be created, improved, or maintained, or that it is impractical to do so under prevailing conditions.

The following lists important plants or describes the elements of wildlife habitat given in table 3 (*1*).

Grain and seed crops.—Corn, soybeans, oats, barley, rye, and wheat.

Legumes and grasses.—Alfalfa, ladino clover, red clover, sweetclover, birdsfoot trefoil, fescue, bromegrass bluegrass, and timothy.

TABLE 2.—*Potential woodland productivity of soils in selected series*

Soil series	Average site index [1] for—		
	Upland oaks	White pine	Red pine
Arkport	100		
Granby	75–85		
Hoytville	65–75		
Oakville	65–75	75–85	75–85
Ottokee	65–75	75–85	85–95
Seward	55–65		
Spinks		85–95	75–85

[1] Site index is a numerical comparison of tree-growing site quality. The index represents the potential average height of a species at the age of 50 years (*12*).

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

Soil series and map symbols	Elements of wildlife habitat: Grain and seed crops	Legumes and grasses	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water velopments	Ponds	Kinds of wildlife: Openland	Woodland	Wetland
Adrian: Ad	4	3	4	4	4	1	1	1	4	4	1
Arkport: ArB, ArC	2	2	2	3	2	4	4	4	2	3	4
Clay pits: Ca. Properties too variable to be rated.											
Cohoctah: Ch	3	2	2	1	1	2	2	4	2	1	3
Colwood: Cn, Co	4	3	3	1	1	1	1	2	3	1	1
Cut and fill land: Cu. Properties too variable to be rated.											
Del Rey: DeA, DfA	2	2	1	1	3	2	2	3	1	2	3
Digby: DuA, DyA	2	2	1	1	3	2	2	4	1	2	3
Fulton:											
FsA, FuA	2	2	2	1	3	2	3	3	2	2	3
FsB, FuB	2	2	2	1	3	3	4	4	2	2	4
Fulton, sandy subsoil variant:											
FvA	2	2	2	1	3	3	2	3	2	2	2
Galen: GaA, GaB	2	2	2	3	2	4	4	4	4	3	4
Genesee: Gm	1	1	1	1	3	4	4	4	1	1	4
Gilford: Go	4	3	3	1	1	1	[1] 1–3	[1] 1–3	3	1	1–2
Granby: Gr	4	3	3	1	1	2	[1] 1–3	[1] 1–3	3	1	1–3
Gravel pits: Gv. Properties too variable to be rated.											
Haney:											
HaA, HdA	1	1	1	2	3	3	3	4	1	1	3
HaB, HdB	1	1	1	2	3	4	4	4	1	1	4
HeC	2	1	1	2	3	4	4	4	1	1	4
Haskins: HkA, HlA, HnA	2	2	1	1	3	2	2	3	1	2	2
Hoytville: Ho, Hv, Hw	4	3	3	1	1	3	1	2	3	1	2
Kibbie: KfA, KlA	2	2	1	1	3	2	2	4	1	2	2
Latty: La	4	3	3	1	1	3	2	2	3	1	2
Lenawee: Le, Lf	4	3	3	1	1	3	2	2	3	1	2
Lucas:											
LwB2	2	2	2	2	3	4	4	4	2	3	4
LwC2	2	2	2	2	3	4	4	4	2	3	4
LxC3	2	2	2	3	2	4	4	4	2	3	4
LxE3	4	3	3	3	1	4	4	4	4	3	4
Medway: Md	2	1	1	1	3	3	3	3	1	1	3
Mermill: Me, Mf, Mg	4	3	3	1	1	1	1	2	3	1	1
Millgrove: Mh, Mk	4	3	3	1	1	1	1	3	3	2	1
Nappanee:											
NaA, NtA	2	2	2	1	3	3	2	3	2	2	3
NaB, NtB, NtB2	2	2	2	1	3	3	4	4	2	2	4
Oakville: OaC	3	3	3	4	1	4	4	4	3	3	4
Oshtemo: OsB	2	1	1	2	3	4	4	4	1	2	4
Ottokee OtB	2	2	2	2	3	4	3	4	2	3	4
Paulding: Pa	3	3	3	1	1	3	2	2	3	1	2
Rawson: RaB, RdB, ReB	2	1	1	1	3	3	3	3	1	1	3
Rimer: RfA, RmA	2	2	1	1	3	2	2	3	1	2	2
Roselms: RoA	2	2	2	1	3	3	2	2	2	2	2
Ross: Rs	1	1	1	1	3	4	4	4	1	1	4
St. Clair:											
SbB2	2	2	2	2	3	4	4	4	2	3	4
SbC2	2	2	2	2	3	4	4	4	2	3	4
ScC3	2	2	2	3	2	4	4	4	2	3	4
ScD3, ScE3, ScF3	4	3	3	3	1	4	4	4	4	3	4
Seward:											
SdB, SeB	2	1	1	1	3	3	3	3	1	1	3
SdC, SeC	2	1	1	1	3	4	4	4	1	1	4
SdD	3	1	1	1	3	4	4	4	1	1	4

See footnotes at end of table.

Table 3.—*Suitability of the soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Soil series and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Legumes and grasses	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Ponds	Openland	Woodland	Wetland
Shinrock, sandy subsoil variant: SfA	1	1	1	1	3	3	3	3	1	1	3
Shoals: Sh	2	2	2	1	3	2	2	2	2	2	2
Sloan: So	4	3	3	1	1	1	2	4	3	1	2
Spinks:											
SpB, SpC	3	3	3	4	1	4	4	4	3	4	4
SpD	4	3	3	4	1	4	4	4	4	4	4
Tedrow: TdA	2	2	1	1	3	2	2	4	1	2	2
Tedrow, silty subsoil variant:											
TeA	2	2	1	1	3	2	2	4	1	2	2
Toledo: To, Tt	4	3	3	1	1	3	1	2	3	1	2
Tuscola:											
TuB2	1	1	1	1	3	4	4	4	1	1	4
TuC2	2	1	1	1	3	4	4	4	1	1	4
Urban land: Ur. Properties too variable to be rated.											
Vaughnsville: VaA	1	1	1	1	3	4	4	4	1	1	4
Wabasha: Wa	4	3	3	1	1	1	2	4	3	1	2
Warners: Wc	4	3	4	4	4	1	1	1	4	4	1
Wauseon: Wf, Wg	4	3	3	1	1	1	1	2	3	1	1

[1] Some areas have a relatively stable water table; other areas have a fluctuating water table.

Wild herbaceous upland plants.—Foxtail, ragweed, smartweed, panicgrass, wild oats, native lespedeza, and herbs.

Hardwood woody plants.—Sumac, wild grape, dogwood, viburnum, hawthorn, wild cherry, and such trees as oak, hickory, American beech, and walnut. The soils are rated on the basis of producing good growth and large growth and large crops of fruit or seeds.

Coniferous shrubs and trees.—Eastern redcedar, arborvitae, Virginia pine, Scotch pine, and Austrian pine. The soils are rated on the basis of delayed growth and canopy closure. Soil characteristics that cause plants to grow slowly provide good conditions for this habitat element.

Wetland food and cover.—Cattails, bullrushes, sedges, barnyardgrass, duckweed, and willows.

Shallow water developments.—These are areas that have been made by impounding water, digging excavations, or by using devices to control water. The soils are rated on their suitability for water developments that are less than 5 feet deep.

Excavated ponds.—These include excavations where the water areas have a depth of 8 feet in at least one-fourth of the area, and where the ponds have water of suitable quality for the production of fish.

Table 3 also rates the soils for suitability for the following kinds of wildlife.

Openland wildlife.—Quail, pheasant, openland songbirds, cottontail rabbit, red fox, and woodchuck.

Woodland wildlife.—Ruffed grouse, gray squirrel, raccoon, woodcock, and woodland songbirds.

Wetland wildlife.—Duck, geese, rail, heron, other waterfowl, and muskrat.

The soils have been rated according to the natural drainage of each soil series. Areas of wet soils that are artificially drained have different ratings than those given in table 3. Artificially drained soils are not rated separately, as they are seldom used for wildlife habitat. Additional information concerning management of soils for wildlife purposes can be obtained from the Henry County Soil and Water Conservation District Office, the County Agricultural Extension Agent, or the Division of Wildlife, Ohio Department of Natural Resources.

Engineering Uses of the Soils [2]

This subsection names soil properties important to engineering, tells how the survey can be used in planning engineering works, and describes two engineering classification systems. It also lists engineering properties and interpretations and discusses engineering hazards.

During a soil survey, considerable detailed information is cataloged about the properties of soils in the survey area and their relation to the landscape. When properly interpreted, much of this information is useful to soils and civil engineers and to others whose work involves the use of soil mechanics or soil engineering data. This section has been prepared for the purpose of interpreting the characteristics of the soils of the county for soil engineering uses. Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building

[2] RUSSEL K. ROWE, civil engineer, Soil Conservation Service, Defiance, Ohio, helped to prepare and review this subsection.

foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties important to the engineer are permeability to water, compaction characteristics, soil drainage, shrink-swell characteristics, grain-size distribution, plasticity, and pH. Depth to water table, depth to bedrock, and topography are also important.

Information in this survey can be used as a guide to help—

a. Make soil and land use studies that will aid in selecting and developing small industrial, business, residential, and recreational sites.
b. Make preliminary estimates of the engineering properties of soils in the planning of drainage systems, farm ponds, irrigation systems, and diversion terraces.
c. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway, airport, pipeline, and cable locations and in planning detailed investigations at the selected locations.
d. Locate probable sources of gravel and other construction materials.
e. Correlate performance of engineering structures with soil mapping units to develop information for overall planning that can be useful in designing and maintaining certain engineering practices and structures.
f. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
g. Supplement the information obtained from other published maps and reports and aerial photographs to make maps and reports that can be used readily by engineers.
h. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification of soil areas, the engineering interpretations reported in tables 4, 5, and 6 can be useful for many purposes. It should be emphasized, however, that these interpretations do not eliminate the need for sampling and testing at the site of specific engineering works, particularly where heavy loads are to be supported and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by soil scientists may not be familiar to the engineer, and some terms may have a special meaning in soil science. These terms are defined in the Glossary at the back of this survey. It should also be noted that some of the soils mapped have inclusions of dissimilar soils. These are given in the mapping unit descriptions of the soils.

Engineering classification systems

Two engineering classification systems are used in this survey. One is the system adopted by the American Association of State Highway Officials (AASHO) (*2*). In this system soil materials are classified into seven groups based on load capacity and service. The best soil materials for road subgrades are classified as A–1. The poorest soil materials are classified as A–7. A within-group index ranging from 0 to 20 is a part of the system. The best subgrades within a group are indicated by 0, the poorest by an index of 20. The indexes are shown in table 4 only. They are not shown in table 5.

Some engineers prefer to use the Unified Soil Classification System (*19*). In this system soil materials are classified on the basis of particle-size distribution and their Atterburg limits—plasticity index and liquid index. Soil materials are classified into one of 15 classes, eight classes representing coarse-grained materials; six classes representing fine-grained material; and one class representing highly organic soils. In this system an approximate classification of soils can be made in the field.

Table 4 shows laboratory data for soils tested in the county. Tables 5 and 6 show estimated engineering properties and interpretations for all of the soils in the county.

Soil test data

Samples of five soils in Henry County were tested according to standard procedures to help evaluate the soils for engineering purposes. The results of these tests are shown in table 4. The following paragraphs discuss the columns listed in table 4.

Moisture-density data were obtained by testing. If a soil material is compacted at successively higher moisture content, assuming that the compaction effort remains constant, then density of the compacted material will increase until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. Moisture-density data are important in earthwork, for as a rule, material is most stable if it is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The mechanical analyses were made by combined sieve and hydrometer methods. Percentages of clay obtained by the hydrometer method are not suitable in naming textural classes of soils.

Tests for liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture is further increased, the material changes from a plastic state to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition. Some silty and sandy soils are nonplastic; that is they will not become plastic at any moisture content.

Two engineering classifications are shown in table 4—AASHO and Unified. The modified AASHO classification used by the Ohio Department of Highways Testing Laboratory is also shown. The AASHO and Unified systems are briefly defined under the heading "Engineering Classification Systems."

TABLE 4 —*Engineering*

[Tests performed by Ohio Department of Highways in accordance with standard procedures

Soil name and location	Parent material	Ohio report No.	Depth from surface	Moisture density [1]	
				Maximum dry density	Optimum moisture
			Inches	*Lb. per cu. ft.*	*Percent*
Colwood loam:					
SW¼SW¼SW¼ sec. 29, Liberty Township (BPR–1)	Lacsutrine sand and silt.	9024	0–10	97. 4	22. 7
		9025	22–31	107. 1	18. 1
		9026	43–49	109. 6	16. 9
Lenawee silty clay loam:					
NW¼NE¼SW¼SW¼ sec. 6, Liberty Township (HN–83)	Lacustrine silty clay loam and clay loam.	9036	0–9	89. 9	27. 4
		9037	17–24	102. 4	20. 3
		9038	42–56	107. 1	18. 1
Spinks fine sand:					
NE¼SE¼NW¼NE¼ sec. 13, Harrison Township (HN–86).	Lacustrine fine sand.	9042	0–6	92. 1	25. 8
		9043	34–42	109. 6	16. 9
		9044	100–114	104. 7	19. 2
Toledo silty clay:					
SW¼NW¼SE¼NE¼ sec. 14, Damascus Township (HN–74).	Lacustrine clay and silt.	9027	0–7	89. 9	27. 4
		9028	24–39	99. 9	21. 5
		9029	48–53	99. 9	21. 5
Toledo silty clay loam:					
SE¼SE¼NE¼NW¼ sec. 7, Liberty Township (HN–82)	Lacustrine clay and silt.	9033	0–7	94. 6	24. 4
		9034	17–27	102. 4	20. 3
		9035	57–67	102. 4	20. 3

[1] Based on AASHO Designation T 99(*2*).
[2] Mechanical analyses according to the AASHO Designation T 88(*2*). Results by this procedure frequently may differ somewhat from results that would have been 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 analyses used in this table are not suitable for use in naming textural classes for soil.
[3] Based on AASHO Designation M 145-49 (*2*).

TABLE 5.—*Engineering*

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

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Percentage passing sieve—			
			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Inches*				
Adrian: Ad	0	0–22	----------	----------	----------	----------
		22–36	100	100	90–100	5–35
Arkport: ArB, ArC	6	0–24	100	95–100	90–100	5–35
		[3] 24–58	100	90–100	85–100	30–45
		58–75	100	90–100	90–100	5–35
Clay pits: Ca. Properties too variable to be estimated.						

See footnotes at end of table.

test data

of the American Association of State Highway Officials (AASHO). The symbol < means less than]

Mechanical analysis [2]				Liquid limit	Plasticity index	Classification		
Percentage passing sieve—			Percentage smaller than—			AASHO [3]	Unified [4]	Ohio [5]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.005 mm.					
100	98	95	36	37	9	A-4(8)	ML	A-4b
100	99	95	39	33	11	A-6(9)	ML-CL	A-6a
100	100	99	32	31	8	A-4(8)	ML-CL	A-4b
100	100	95	43	46	14	A-7-5(12)	ML	A-7-5
100	100	96	46	41	18	A-7-6(11)	CL	A-7-6
100	100	98	46	34	12	A-6(9)	CL-ML	A-6a
100	96	14	5	NP	NP	A-2-4(0)	SM	A-3a
100	90	5	<5	NP	NP	A-3(0)	SP-SM	A-3
100	97	6	<6	NP	NP	A-3(0)	SP-SM	A-3
100	92	89	65	54	22	A-7-5(16)	MH	A-7-5
100	100	97	70	48	24	A-7-6(15)	CL	A-7-6
100	99	96	72	54	28	A-7-6(18)	CH	A-7-6
100	99	93	55	45	17	A-7-6(12)	ML-CL	A-7-6
100	99	92	63	50	28	A-7-6(17)	CH	A-7-6
100	99	94	70	54	31	A-7-6(19)	CH	A-7-6

[4] Based on the Unified Soil Classification System (*19*).
[5] Based on "Classification of Soils," Ohio State Highway Testing Laboratory, Feb. 1, 1955.
[6] Nonplastic.

properties of the soils

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions table. The symbol < means less than; the symbol > means more than]

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH value*			
Muck	Pt	----------	2. 0–6. 3	0. 22–0. 26	6. 1–7. 3	Variable	High	Low.
Fine sand	SP-SM, SM	A-2, A-3	6. 3–12. 0	0. 02–0. 04	[1] 7. 4–8. 4	Low	High	Low.
Fine sand	SM, SP-SM	A-2	6. 3–12. 0	0. 02–0. 05	5. 6–6. 5	Low	Low	Moderate.
Fine sandy loam	SM	A-2, A-4	2. 0–6. 3	0. 10–0. 16	5. 6–6. 5	Low	Low	Moderate.
Fine sand	SP-SM, SM	A-2, A-3	6. 3–12. 0+	0. 02–0. 05	[1] 7. 4–7. 8	Low	Low	Low.

TABLE 5.—*Engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Percentage passing sieve—			
			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
Cohoctah: Ch	0–½	0–44	100	100	80–100	20–40
		44–62	100	100	80–100	20–35
		62–71	100	100	80–100	5–15
Colwood: Cn, Co	0–½	0–11	100	95–100	90–100	65–95
		11–48	100	100	90–100	65–95
		48–65	100	100	85–100	80–100
Cut and fill land: Cu. Properties too variable to be estimated.						
Del Rey: DeA, DfA	½–1½	0–9	100	95–100	85–100	65–90
		9–34	100	90–100	80–95	80–95
		34–52	100	95–100	85–100	65–95
Digby: DuA, DyA	½–1½	0–9	85–100	80–100	75–90	30–50
		9–37	85–100	80–100	75–90	30–55
		37–50	65–85	45–75	20–50	5–35
Fulton: FsA, FsB, FuA, FuB	½–1½	0–9	100	100	90–100	80–95
		9–32	100	100	90–100	90–100
		32–60	100	100	90–100	80–100
Fulton, sandy subsoil variant: FvA	½–1½	0–9	100	100	90–100	80–95
		9–33	100	100	90–100	90–100
		33–57	90–100	45–95	40–70	5–65
		57–64	95–100	90–100	85–100	80–95
Galen: GaA, GaB	2–3	0–28	100	90–100	90–100	10–25
		[2] 28–79	95–100	90–100	85–95	30–50
		79–92	95–100	90–100	90–100	5–20
Genesee: Gm	[3] >3	0–20	95–100	90–100	80–95	60–75
		20–52	95–100	90–100	80–95	65–95
Gilford: Go	0–½	0–32	100	95–100	65–90	25–50
		32–60	100	95–100	85–100	5–35
Granby: Gr	0	0–20	100	90–100	75–95	20–50
		20–63	100	90–100	85–100	5–35
Gravel pits: Gv. Properties too variable to be estimated.						

See footnotes at end of table.

properties of the soils—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
Fine sandy loam	SM	A–2, A–4	2. 0–6. 3	0. 07–0. 10	6. 6–7. 8	Low	High	Low.
Loamy sand	SM	A–1, A–2	2. 0–6. 3	0. 04–0. 08	7. 3–7. 8	Low	High	Low.
Sand	SM, SP–SM	A–1, A–2, A–3	6. 3–12. 0+	0. 02–0. 05	7. 3–7. 8	Low	High	Low.
Loam	ML, ML–CL	A–4	0. 63–2. 0	0. 16–0. 22	6. 6–7. 3	Low	High	Low.
Loam	ML, ML–CL	A–4, A–6	0. 63–2. 0	0. 14–0. 18	6. 6–7. 3	Low	High	Low.
Stratified silt loam and very fine sand.	ML–CL, ML	A–4	0. 63–2. 0	0. 15–0. 20	[1] 7. 4–8. 4	Low	High	Low.
Silt loam	ML, ML–CL	A–4	0. 63–2. 0	0. 15–0. 20	5. 6–6. 5	Low	High	Moderate.
Silty clay loam	CL, ML–CL	A–6, A–7	0. 06–0. 2	0. 16–0. 19	5. 1–7. 8	Moderate	High	Moderate to low.
Stratified silty clay loam, clay loam, and silt loam.	CL, ML–CL	A–6, A–7	0. 06–0. 2	0. 15–0. 19	[1] 7. 4–8. 4	Moderate	High	Low.
Fine sandy loam	SM	A–2, A–4	0. 63–6. 3	0. 10–0. 16	6. 1–6. 5	Low	Moderate	Low.
Sandy clay loam	SC, CL	A–2, A–4, A–6	0. 63–2. 0	0. 14–0. 18	5. 1–7. 8	Low to moderate.	High	Moderate to low.
Sand and gravel	SP–SM, SM	A–1, A–3	6. 3–12. 0	0. 02–0. 04	[1] 7. 4–7. 8	Low	Moderate	Low.
Silty clay loam	CL, ML–CL	A–7, A–6	0. 20–0. 63	0. 16–0. 19	5. 6–7. 3	Moderate	High	Moderate to low.
Silty clay	CL, CH	A–7	0. 06–0. 2	0. 13–0. 16	5. 6–7. 3	High	High	Moderate to low.
Stratified silty clay and silt.	CL, ML–CL, CH	A–6, A–7	0. 06–0. 2	0. 06–0. 10	[1] 7. 4–8. 4	Moderate to high.	High	Low.
Silty clay loam	CL, ML–CL	A–7, A–6	0. 2–0. 63	0. 16–0. 19	5. 6–7. 3	Moderate	High	Moderate to low.
Silty clay	CL, CH	A–7	0. 06–0. 2	0. 13–0. 16	5. 6–7. 3	High	High	Moderate to low.
Stratified sandy loam, silt loam, and coarse sand.	ML, ML–CL, SP–SM, SM	A–1, A–2, A–4, A–6	0. 63–6. 3	0. 12–0. 18	[1] 7. 4–8. 4	Low	High	Low.
Silty clay and silty clay loam.	CL, CH	A–6, A–7	0. 06–0. 2	0. 06–0. 10	7. 4–8. 4	Moderate to high.	High	Low.
Fine sand	SM	A–2	6. 3–12. 0	0. 06–0. 12	5. 1–6. 5	Low	Low	Moderate.
Fine sandy loam or loamy fine sand.	SM	A–2, A–4	2. 0–6. 3	0. 10–0. 16	6. 1–7. 8	Low	Low	Low.
Fine sand	SP–SM, SM	A–2, A–3	6. 3–12+	0. 02–0. 05	6. 6–7. 8	Low	Low	Low.
Loam	ML, ML–CL	A–4	0. 63–2. 0	0. 18–0. 22	6. 6–7. 8	Low to moderate.	Low	Low.
Silt loam	ML, ML–CL	A–4	0. 63–2. 0	0. 17–0. 19	[1] 7. 4–8. 4	Low to moderate.	Low	Low.
Fine sandy loam	SM	A–2, A–4	2. 0–6. 3	0. 10–0. 15	6. 6–7. 3	Low	High	Low.
Loamy fine sand to fine sand.	SM, SP–SM	A–2, A–3	2. 0–6. 3+	0. 02–0. 05	[1] 7. 4–8. 4	Low	High	Low.
Loamy fine sand	SM	A–2, A–4	6. 3–12. 0	0. 08–0. 12	5. 6–7. 3	Low	High	Low.
Fine sand	SP–SM, SM	A–2, A–3	6. 3–12. 0	0. 02–0. 05	[1] 7. 4–8. 4	Low	High	Low.

TABLE 5.—*Engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Percentage passing sieve—			
			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
*Haney: HaA, HaB, HdA, HdB, HeC	1½–2	0–12	100	90–100	75–90	40–75
For properties of Rawson part of HeC, refer to Rawson series. HaA and HaB have a fine sandy loam surface layer.		12–28	95–100	90–100	80–100	25–50
		28–42	90–100	85–100	75–95	40–75
		42–80	100	75–100	75–100	20–35
Haskins: HkA, HlA	½–1	0–7	95–100	90–100	85–95	60–75
HkA has a fine sandy loam surface layer.		7–24	95–100	90–100	50–85	40–75
		24–60	100	95–100	90–100	80–95
HnA	½–1	40–49	100	90–100	50–80	35–55
This mapping unit is similar to HkA and HlA, except that it has a stratified substratum below a depth of 40 inches.		49–55	100	95–100	90–100	80–95
		55–62	100	100	65–90	30–40
		62–64	100	95–100	90–100	80–95
Hoytville: Ho, Hv	0	0–7	100	90–100	90–100	85–100
		7–37	100	90–100	90–100	85–100
		37–60	95–100	90–100	90–100	85–95
Hoytville, thin solum variant: Hw	0	0–13	100	90–100	90–100	85–95
		13–44	100	90–100	90–100	85–95
Kibbie: KfA, KlA	½–1	0–15	100	100	70–90	55–85
KlA has a loam surface layer.		15–38	100	100	70–90	50–75
		38–72	100	100	80–100	65–90
Latty: La	0	0–8	100	100	95–100	90–100
		8–41	100	100	95–100	85–100
		41–71	95–100	90–100	90–100	85–95
Lenawee: Le, Lf	0	0–8	100	100	90–100	90–100
		8–43	100	100	90–100	90–100
		43–61	100	100	90–100	90–100
Lucas: LwB2, LwC2, LxC3, LxE3	2–3	0–5	100	100	90–100	85–100
		5–25	100	100	90–100	90–100
		25–60	100	100	90–100	90–100
Medway: Md	[3] 2–3	0–18	95–100	90–100	80–90	75–85
		18–60	95–100	90–100	80–90	70–90
Mermill:						
Me, Mf	0	0–9	100	90–100	80–100	55–85
Mf has a clay loam surface layer.		9–40	100	90–100	80–100	40–60
		40–60	100	90–100	80–100	80–95
Mg	0	40–66	100	100	65–90	5–15
This mapping unit is similar to Me and Mf, except that it has a substratum of stratified sand and clay below a depth of 40 inches.			100	100	90–100	85–100

See footnotes at end of table.

properties of the soils—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
Loam	ML, ML-CL, SM	A-4	0.63-2.0	0.14-0.18	5.6-6.5	Low	Low	Low.
Fine sandy loam	SM	A-2, A-4	0.63-2.0	0.10-0.15	5.1-7.3	Low	Moderate	Moderate to low.
Sandy clay loam or clay loam.	SC, CL	A-4, A-6	0.63-2.0	0.14-0.18	6.6-7.3	Low to moderate.	Moderate	Low.
Loamy sand	SM	A-2	6.3-12.0+	0.04-0.08	[1] 7.4-8.4	Low	Moderate	Low.
Loam	ML, ML-CL	A-4	0.63-2.0	0.14-0.18	6.1-6.5	Low	High	Low.
Clay loam and sandy clay loam.	SC, CL	A-4, A-6	0.63-2.0	0.14-0.18	6.1-6.5	Low	High	Low.
Silty clay	ML-CL, CH	A-6, A-7	<0.06	0.06-0.08	[1] 7.4-8.4	High	High	Low.
Sandy clay loam	SC, CL	A-2, A-6	0.63-2.0	0.14-0.18	[1] 7.4-8.4	Moderate	High	Low.
Clay	ML-CL, CH	A-6, A-7	<0.2	0.06-0.08	[1] 7.4-8.4	High	High	Low.
Sandy loam	SM	A-2, A-4	0.63-2.0	0.12-0.15	[1] 7.4-8.4	Low	High	Low.
Clay	ML-CL, CH	A-6, A-7	<0.2	0.06-0.08	[1] 7.4-8.4	High	High	Low.
Clay	ML-CL, CH, MH	A-7	0.63-2.0	0.14-0.18	6.1-7.3	High	High	Low.
Clay	ML-CL, MH, CH	A-7	0.2-0.63	0.12-0.17	6.6-7.3	High	High	Low.
Clay	MH-CH, CH	A-7	0.06-0.2	0.06-0.10	[1] 7.4-8.4	High	High	Low.
Clay	ML-CL, CH-MH	A-7	0.2-0.63	0.12-0.17	6.1-7.3	High	High	Low.
Clay	CH, MH	A-7	0.06-0.02	0.06-0.10	[1] 7.4-8.4	High	High	Low.
Fine sandy loam	ML	A-4	0.63-2.0	0.14-0.18	6.1-6.5	Low	High	Low.
Loam and very fine sandy loam.	ML-CL	A-4	0.63-2.0	0.14-0.18	6.1-7.8	Low	High	Low.
Stratified silt, silt loam, and fine sand.	ML, ML-CL	A-4	0.63-2.0	0.10-0.16	[1] 7.4-8.4	Low	High	Low.
Clay	ML-CL, MH CH	A-7	0.2-0.63	0.14-0.17	6.1-6.5	High	High	Low.
Clay	ML-CL, MH, CH	A-7	0.06-0.2	0.12-0.15	6.6-7.8	High	High	Low.
Clay	ML-CL, MH, CH	A-7	<0.06	0.04-0.08	[1] 7.4-8.4	High	High	Low.
Silty clay loam	ML, ML-CL	A-6, A-7	0.2-0.63	0.17-0.19	6.6-7.3	Moderate	High	Low.
Silty clay loam	CL, ML-CL	A-6, A-7	0.2-0.63	0.15-0.18	6.6-7.8	High	High	Low.
Stratified silt, silt loam, and silty clay.	ML-CL, CH	A-6, A-7	0.2-0.63	0.06-0.10	[1] 7.4-7.8	Moderate to high.	High	Low.
Silty clay	CL, ML-CL	A-6, A-7	0.2-0.63	0.16-0.18	5.1-6.0	Moderate	High	Moderate.
Silty clay	ML-CL, CH	A-6, A-7	0.06-0.2	0.12-0.15	6.1-7.3	High	High	Low.
Silty clay	ML-CL, CH	A-6, A-7	<0.2	0.06-0.10	[1] 7.4-8.4	High	High	Low.
Silt loam	ML, ML-CL	A-4	0.63-2.0	0.17-0.19	6.6-7.3	Low	Moderate	Low.
Clay loam and silty clay loam.	CL, ML-CL	A-6	0.63-2.0	0.16-0.18	6.6-7.8	Low to moderate.	Moderate	Low.
Loam	ML	A-4	0.63-2.0	0.16-0.22	6.1-6.5	Low	High	Low.
Sandy clay loam	CL, SC	A-4, A-6	0.63-2.0	0.14-0.18	6.6-7.3	Moderate	High	Low.
Clay	CH, ML-CL	A-7, A-6	<0.06	0.06-0.08	[1] 7.4-8.4	High	High	Low.
Sand	SP-SM, SM	A-2	0.63-12.0	0.02-0.04	[1] 7.4-8.4	Low	High	Low.
Clay	CH	A-6, A-7	<0.06	0.06-0.08	[1] 7.4-8.4	High	High	Low.

TABLE 5.—*Engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
Millgrove: Mh, Mk	0	0–12	95–100	90–100	70–90	40–75
Mk has a clay loam surface layer.		12–42	95–100	90–100	70–85	40–75
		42–72	85–100	80–100	70–85	5–15
Nappanee: NaA, NaB, NtA, NtB, NtB2	½–1	0–12	100	100	90–100	80–90
NaA and NaB have a loam surface layer.		12–24	95–100	90–100	90–100	80–95
		24–60	95–100	90–100	90–100	75–90
Oakville: OaC	>6	0–9	100	100	70–85	5–30
		9–100	100	100	70–85	5–30
Oshtemo: OsB	>4	0–29	90–100	85–100	60–70	25–45
		29–44	75–90	60–80	50–65	20–45
		44–70	75–90	60–80	50–70	40–65
Ottokee: OtB	2½–3	0–47	100	95–100	65–80	12–25
		47–49	100	90–100	55–75	20–40
		49–81	100	95–100	65–80	12–25
Paulding: Pa	0	0–8	100	100	90–100	90–100
		8–50	100	100	90–100	90–100
		50–60	100	100	90–100	90–100
Rawson: RaB, RdB	2–3	0–12	95–100	90–100	70–90	40–60
		12–26	90–100	90–100	60–85	30–55
		26–60	100	90–100	90–100	85–95
ReB. This mapping unit is similar to RaB and RdB, except that it has a fine sandy loam surface layer and a substratum of stratified clay and sandy loam below a depth of 35 inches.	2–3	35–60	100	100	90–100	80–95
			100	100	65–90	30–50
Rimer: RfA	0–½	0–24	95–100	90–100	70–90	20–45
		24–70	95–100	90–100	85–100	80–95
RmA. This mapping unit is similar to RfA, except that it has a substratum of stratified loam, clay, and sand below a depth of 29 inches.	0–½	29–64	100	90–100	80–90	65–90
			100	100	90–100	80–95
			100	100	70–95	5–30
Roselms: RoA	0–½	0–6	95–100	90–100	85–100	80–95
		6–25	100	95–100	90–100	75–95
		25–60	100	95–100	90–100	80–100
Ross: Rs	[3] >3	0–21	90–100	80–95	80–90	50–75
		21–61	90–100	85–100	80–90	65–85
St. Clair: SbB2, SbC2, ScC3, ScD3, ScE3, ScF3	1½–2	0–5	100	90–100	90–100	80–90
		5–23	100	90–100	85–100	80–95
		23–60	100	90–100	85–100	80–95

See footnotes at end of table.

properties of the soils—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
Loam	SM, ML	A-4	0. 63–2. 0	0. 14–0. 20	6. 1–6. 5	Low	High	Low.
Clay loam or sandy clay loam.	SC, CL	A-6	0. 63–2. 0	0. 14–0. 18	5. 6–7. 3	Moderate	High	Moderate to low.
Sand and thin clay strata.	SP-SM, SM	A-2, A-3	6. 3–12. 0	0. 02–0. 04	[1] 7. 4–8. 4	Low	High	Low.
Silty clay loam	CL, ML-CL	A-4, A-6	0. 2–0. 63	0. 16–0. 19	5. 6–6. 5	Moderate	High	Moderate to low.
Clay	CH, ML-CL	A-7	0. 06–0. 2	0. 14–0. 17	5. 1–7. 3	Moderate to high.	High	Moderate to low.
Clay loam	CL	A-6	<0. 06	0. 06–0. 08	[1] 7. 4–8. 4	Moderate	High	Low.
Fine sand	SM, SP-SM	A-2, A-3	6. 3–12. 0	0. 02–0. 04	5. 1–6. 0	Low	Low	Moderate.
Fine sand	SM, SP-SM	A-2, A-3	6. 3–12. 0	0. 02–0. 04	5. 6–7. 3	Low	Low	Moderate to low.
Sandy loam	SM	A-2, A-4	2. 0–6. 3	0. 10–0. 14	5. 1–6. 0	Low	Low	Moderate.
Gravelly sandy loam.	SM	A-2, A-4	2. 0–6. 3	0. 08–0. 12	5. 1–7. 3	Low	Low	Moderate to low.
Gravelly loam	SM, ML	A-4	2. 0–6. 3	0. 10–0. 14	[1] 7. 4–8. 4	Low	Low	Low.
Fine sand	SM	A-2, A-3	6. 3–12. 0	0. 02–0. 04	5. 0–6. 5	Low	Low	Moderate.
Loamy fine sand	SM	A-2, A-4	2. 0–6. 3	0. 06–0. 08	5. 6–7. 3	Low	Low	Moderate.
Fine sand	SM	A-2, A-3	6. 3–12. 0	0. 02–0. 04	6. 6–7. 8	Low	Moderate	Moderate.
Clay	CH	A-7	0. 6–0. 2	0. 14–0. 17	5. 1–6. 5	High	High	Moderate.
Clay	CH	A-7	<0. 06	0. 12–0. 15	6. 6–7. 8	High	High	Low.
Clay	CH	A-7	<0. 06	0. 06–0. 08	[1] 7. 4–8. 4	High	High	Low.
Sandy loam	SM, ML	A-4	0. 63–2. 0	0. 12–0. 15	5–6–7. 3	Low	High	Moderate to low.
Sandy clay loam	SC, CL	A-2, A-6	0. 63–2. 0	0. 14–0. 18	5. 1–7. 3	Moderate	High	Moderate to low
Silty clay, clay	CH, ML-CL	A-7, A-6	<0. 06	0. 06–0. 08	[1] 7–4–8. 4	High	High	Low.
Clay	ML-CL, CH	A-6, A-7	<0. 06	0. 06–0. 08	[1] 7. 4–8. 4	High	High	Low.
Sandy clay	SM	A-4, A-2	>6. 3	0. 08–0. 15	[1] 7. 4–8. 4	Low	High	Low.
Loamy fine sand	SM	A-2, A-4	6. 3–12. 0	0. 06–0. 10	5. 1–7. 3	Low	Moderate	Low.
Silty clay, clay	ML-CL, CH	A-6, A-7	<0. 06	0. 06–0. 08	[1] 7. 4–8. 4	High	High	Low.
Loam	ML, ML-CL	A-4	0. 2–0. 63	0. 14–0. 18	[1] 7. 4–8. 4	Low	High	Low.
Clay	ML-CL, CH	A-6, A-7	<0. 06	0. 06–0. 08	[1] 7. 4–8. 4	High	High	Low.
Sand	SP-SM, SM	A-2, A-3	2. 0–6. 3	0. 02–0. 04	[1] 7. 4–8. 4	Low	Moderate	Low.
Silty clay loam	ML-CL, CH	A-6, A-7	0. 2–0. 63	0. 15–0. 18	5. 1–6. 0	High	High	Moderate.
Clay	ML-CL, CH	A-7	0. 06–0. 2	0. 12–0. 15	5. 1–7. 3	High	High	Moderate to low.
Clay	ML-CL, CH	A-7	<0. 06	0. 06–0. 10	[1] 7. 4–8. 4	High	High	Low.
Loam	ML, ML-CL	A-4	0. 63–2. 0	0. 16–0. 22	6. 6–7. 3	Low	Low	Low.
Silt loam	ML, ML-CL	A-4	0. 63–2. 0	0. 18–0. 20	[1] 6. 6–7. 8	Low	Low	Low.
Silty clay loam	CL, ML-CL	A-6	0. 63–2. 0	0. 16–0. 20	5. 6–6. 5	Moderate	High	Moderate.
Clay	ML-CL, CH	A-6, A-7	0. 06–0. 2	0. 14–0. 17	6. 1–7. 3	Moderate to high.	High	Low.
Clay	ML-CL, CH	A-6, A-7	<0. 06	0. 06–0. 08	[1] 7. 4–8. 4	Moderate to high.	High	Low.

TABLE 5.—*Engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Inches*				
Seward:						
SdB, SdC, SdD	>3	0–26	100	90–100	50–75	15–40
		26–34	100	90–100	60–70	30–40
		34–60	100	95–100	90–100	80–95
SeB, SeC	3	27–94	100	90–100	90–100	70–80
These mapping units are similar to SdB, SdC, and SdD, except that they have a substratum of stratified clay loam, clay, and sand below a depth of 27 inches.			100	100	90–100	85–100
			100	100	50–70	5–50
Shinrock, sandy subsoil variant: SfA	1½–2	0–9	100	80–100	75–90	50–75
		9–28	100	90–100	90–100	80–95
		28–37	100	90–100	80–90	35–55
		37–82	100	100	50–70	5–15
Shoals: Sh	[3] ½–1	0–13	95–100	85–100	80–100	65–90
		13–31	95–100	85–100	85–95	55–75
		31–60	90–100	85–100	70–90	55–90
Sloan: So	[3] 0	0–12	100	90–100	90–100	80–95
		12–43	100	90–100	90–100	80–95
		43–72	100	90–100	90–100	65–85
Spinks: SpB, SpC, SpD	>6	0–23	100	100	90–100	5–35
		23–100	100	100	70–95	5–30
		100–153	100	100	80–100	5–35
Tedrow: TdA	½–1	0–8	100	95–100	60–80	20–45
		8–31	100	95–100	60–80	20–45
		31–60	100	100	70–90	5–35
Tedrow, silty subsoil variant: TeA. Similar to normal Tedrow soil to a depth of 35 inches.	½–1	35–50	100	100	65–100	25–75
Toledo: To, Tt	0	0–7	100	100	90–100	85–100
		7–24	100	100	90–100	90–100
		24–68	100	100	90–100	90–100
Tuscola: TuB2, TuC2	2–3	0–7	100	100	80–90	60–80
		7–27	100	100	80–100	65–90
		27–68	100	100	65–95	55–90
Urban land: Ur. Properties too variable to be estimated.						
Vaughnsville: VaA	2–3	0–9	90–100	85–100	65–85	55–75
		9–30	90–100	60–90	45–70	20–55
		30–60	95–100	90–100	85–100	75–95
Wabasha: Wa	[3] 0	0–16	95–100	90–100	85–100	80–100
		16–48	100	90–100	85–100	85–95
		48–70	100	100	90–100	85–100

See footnotes at end of table.

properties of the soils—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
			Inches per hour	*Inches per inch of soil*				
Loamy fine sand	SM	A-2, A-4	6. 3-12. 0	0. 06-0. 10	5. 6-7. 3	Low	Low	Moderate.
Sandy loam	SM	A-2, A-4	6. 3-12. 0	0. 06-0. 10	6. 1-7. 3	Low	Moderate	Low.
Clay	ML-CL, CH	A-6, A-7	0. 06-0. 2	0. 04-0. 08	[1] 7. 4-7. 8	Moderate to high.	High	Low.
Clay loam	CL, ML-CL	A-6, A-7	0. 2-0. 63	0. 12-0. 16	[1] 7. 4-7. 8	Moderate	High	Low.
Clay	ML-CL, CH	A-6, A-7	<0. 2	0. 06-0. 08	[1] 7. 4-7. 8	High	High	Low.
Sand	SP-SM, SM	A-2, A-3, A-4	2. 0-6. 3+	0. 02-0. 04	[1] 7. 4-7. 8	Low	High	Low.
Silt loam	ML, ML-CL	A-4	0. 63-2. 0	0. 15-0. 20	5. 1-6. 5	Low	Moderate	Moderate.
Silt loam to silty clay loam.	CL, ML-CL	A-6, A-7	0. 2-0. 63	0. 14-0. 18	5. 1-6. 0	Moderate	Moderate	Moderate.
Sandy clay loam	SC, CL	A-2, A-6	0. 2-2. 0	0. 14-0. 16	5. 1-6. 0	Moderate	Moderate	Moderate.
Coarse sand	SP-SM, SM	A-1, A-3	6. 3-12. 0	0. 02-0. 04	6. 1-7. 3	Low	Moderate	Low.
Silt loam	ML, ML-CL	A-4	0. 63-2. 0	0. 18-0. 22	6. 6-7. 8	Low	High	Low.
Loam	ML, ML-CL	A-4	0. 63-2. 0	0. 14-0. 18	6. 6-7. 8	Low	High	Low.
Loam	ML, CL	A-4, A-6	0. 63-2. 0	0. 14-0. 18	[1] 7. 4-7. 8	Low	High	Low.
Silty clay loam	ML, ML-CL	A-6, A-7	0. 63-2. 0	0. 17-0. 20	6. 6-7. 8	Moderate	High	Low.
Silty clay loam	CL, ML-CL	A-6, A-7	0. 63-2. 0	0. 16-0. 18	6. 6-7. 8	Moderate	High	Low.
Silt loam	ML, ML-CL	A-4	0. 63-2. 0	0. 16-0. 19	[1] 7. 4-7. 8	Low	High	Low.
Fine sand	SP-SM, SM	A-2, A-3	6. 3-12. 0	0. 04-0. 07	5. 6-6. 5	Low	Low	Moderate.
Fine sand and bands of loamy sand.	SM, SP-SM	A-2, A-3	2. 0-6. 3	0. 02-0. 06	6. 1-6. 5	Low	Low	Moderate.
Fine sand	SP-SM, SM	A-2, A-3	6. 3-12. 0	0. 02-0. 04	[1] 7. 4-8. 4	Low	Low	Low.
Loamy fine sand	SM	A-2, A-4	6. 3-12. 0	0. 06-0. 09	6. 1-7. 3	Low	Low	Low.
Loamy fine sand	SM	A-2, A-4	6. 3-12. 0	0. 06-0. 09	6. 6-7. 3	Low	Low	Low.
Fine sand	SP-SM, SM	A-2, A-3	6. 3-12. 0	0. 02-0. 04	[1] 7. 4-8. 4	Low	Low	Low.
Stratified silt and fine sand.	ML, ML-CL, SM	A-4, A-2	0. 2-2. 0	0. 14-0. 18	[1] 7. 4-8. 4	Low	High	Low.
Silty clay	ML-CL, MH	A-7	0. 2-0. 63	0. 14-0. 18	6. 6-7. 3	Moderate to high.	High	Low.
Silty clay	CL, CH	A-7	0. 2-0. 63	0. 12-0. 15	6. 6-7. 8	High	High	Low.
Silty clay	ML-CL, CH	A-7	0. 06-0. 2	0. 06-0. 08	[1] 7. 4-8. 4	High	High	Low.
Loam	ML, ML-CL	A-4	0. 63-2. 0	0. 14-0. 18	5. 6-6. 5	Low	Moderate	Low to moderate.
Silt loam	ML, ML-CL	A-4	0. 63-2. 0	0. 17-0. 20	5. 6-6. 5	Low	Moderate	Low to moderate.
Stratified silt loam and fine sand.	ML, ML-CL	A-4	0. 63-2. 0	0. 10-0. 12	[1] 7. 4-7. 8	Low	Moderate	Low.
Loam	ML, ML-CL	A-4	0. 63-2. 0	0. 14-0. 18	6. 6-7. 3	Low	Moderate	Low.
Sandy clay loam and sandy loam.	SC, CL	A-2, A-6	0. 63-2. 0	0. 10-0. 15	6. 6-7. 3	Low	Moderate	Low.
Clay loam to clay	CL, CH	A-6, A-7	0. 06-0. 2	0. 08-0. 12	[1] 7. 4-8. 4	High	High	Low.
Silty clay	ML, CL	A-6, A-7	0. 2-0. 63	0. 18-0. 22	7. 4-7. 8	Moderate	High	Low.
Silty clay	ML-CL, CH	A-6, A-7	0. 06-0. 2	0. 15-0. 18	[1] 7. 4-7. 8	Moderate to high.	High	Low.
Clay	ML-CL, CH	A-7, A-6	0. 06-0. 2	0. 08-0. 10	[1] 7. 4-8. 4	Moderate to high.	High	Low.

TABLE 5.—*Engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Inches*				
Warners: Wc	0	0–8	------	------	------	------
		8–12	100	100	80–90	35–55
		12–31	100	100	85–100	65–90
		31–50	100	100	75–95	5–30
Wauseon:						
Wf	0	0–27	95–100	90–100	70–85	25–55
		27–40	95–100	90–100	65–95	20–40
		40–60	95–100	90–100	90–100	80–95
			100	100	90–100	85–100
Wg	0	22–50	100	100	55–75	5–30
This mapping unit is similar to Wf, except that it has a loamy fine sand surface layer and a substratum of stratified clay, sand, and clay loam below a depth of 22 inches.			100	90–100	90–100	70–80

[1] Calcareous.
[2] Banded fine sand and fine sandy loam or loamy fine sand. Estimated particle size for fine sand strata only.

TABLE 6.—*Engineering*

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

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features affecting— Highway location [1]
Adrian: Ad	Poor: high water table; organic material; very poorly drained.	High	Poor: organic soil; fair to good if mixed with mineral soil.	Not suitable for gravel; fair source of sand below a depth of 16 to 50 inches: high water table.	Upper 16 to 50 inches not suitable: unstable organic soil material; substratum fair: fine sand.	Nearly level; high water table; subject to ponding; organic material in upper 16 to 50 inches.
Arkport: ArB, ArC	Good	Low	Poor: sandy material; low fertility.	Good source of fine sand; unsuitable for gravel.	Fair to good: slight compressibility; unprotected slopes are highly erodible.	Loose sand hinders hauling; well drained.
Clay pits: Ca. No interpretations; properties too variable.						
Cohoctah: Ch	Poor to fair: seasonally wet; very poorly drained.	High	Good	Not suitable	Poor: fair stability and compaction; high water table; subject to flooding.	Subject to flooding; high water table; very poorly drained.

See footnotes at end of table.

properties of the soils—Continued

Classification			Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential	
USDA texture	Unified	AASHO					Steel	Concrete
			Inches per hour	*Inches per inch of soil*				
Muck	OL, Pt		2.0–6.3	0.22–0.26	6.6–7.3	Variable	High	Low.
Sandy clay loam	SC, CL	A–6	0.63–2.0	0.18–0.22	[1] 7.4–8.4	Low	High	Low.
Marl	ML	A–4	0.06–0.2	0.16–0.20	[1] 7.4–8.4	Low	High	Low.
Fine sand	SM, SP–SM	A–2, A–3	2.0–12.0	0.02–0.06	[1] 7.4–8.4	Low	High	Low.
Fine sandy loam	SM, ML	A–2, A–4	2.0–6.3	0.13–0.17	6.1–7.3	Low	High	Low.
Loamy fine sandy and fine sand.	SM	A–2, A–4	6.3–12.0	0.06–0.08	6.6–7.8	Low	High	Low.
Clay	ML–CL, CH	A–6, A–7	0.06–0.2	0.06–0.08	[1] 7.4–8.4	High	High	Low.
Clay	ML–CL, CH	A–6, A–7	<0.2	0.06–0.08	[1] 7.4–8.4	High	High	Low.
Sand	SP–SM, SM	A–2, A–3	2.0–6.3+	0.02–0.04	[1] 7.4–8.4	Low	High	Low.
Clay loam	CL, ML–CL	A–6, A–7	0.2–0.63	0.12–0.16	[1] 7.4–8.4	Moderate	High	Low.

[3] Subject to flooding.

interpretations of the soils

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

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds: Reservoir area	Farm ponds: Embankment [3]	Agricultural drainage	Irrigation	Terraces or diversions	Waterways
Organic material 16 to 50 inches thick over fine sand; high water table; very poorly drained.	High water table; high seepage rate; organic material in upper 16 to 50 inches.	Upper 16 to 50 inches not suitable; sandy substratum has fair stability and fair to good compaction; subject to piping.	High water table; subject to ponding; organic material in upper 16 to 50 inches; subject to subsidence; outlet problems in some areas.	Medium to high available moisture capacity; rapid intake rate; high water table.	Nearly level; very poorly drained; organic soil.	Nearly level; high water table; very poorly drained.
Well drained; loose sand.	Excessive seepage loss.	Subject to piping; rapid permeability; fair stability; fair to good compaction.	Well-drained sandy material.	Low available moisture capacity; rapid intake rate; susceptible to soil blowing.	Sandy material; erodible and difficult to vegetate.	Well-drained; sandy material; erodible and difficult to vegetate.
Subject to flooding; high water table.	High water table; medium seepage rate; subject to flooding.	Fair stability; fair compaction; medium compressibility; subject to piping.	High water table; subject to flooding; moderately rapid permeability; nearly level.	High available moisture capacity; medium intake rate; high water table; subject to flooding.	Nearly level; subject to flooding; very poorly drained.	Very poorly drained; nearly level; subject to flooding; high water table.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location [1]
Colwood: Cn, Co	Poor: seasonal high water table; very poorly drained.	High	Good to a depth of 20 inches; fair below a depth of 20 inches.	Not suitable	Fair: medium compressibility; erodible on fills.	Seasonal high water table; soft when wet; very poorly drained.
Cut and fill land: Cu. No interpretations; properties too variable.						
Del Rey: DeA, DfA	Poor: seasonal high water table; sticky material when wet; somewhat poorly drained.	High	Surface layer is good to a depth of 10 inches; fair below a depth of 10 inches: moderately fine material.	Not suitable	Fair: fair stability; seasonal high water table.	Seasonal high water table; nearly level; somewhat poorly drained.
Digby: DuA, DyA	Poor: seasonal high water table; somewhat poorly drained.	Moderate to high.	Fair to a depth of 18 inches; poor below a depth of 18 inches.	Fair to good below a depth of 40 inches: strata of sand interbedded with thin layers of gravel.	Fair: somewhat poorly drained; fair compaction and stability; seasonal high water table; substratum good.	Seasonal high water table; nearly level; somewhat poorly drained.
Fulton: FsA, FsB, FuA, FuB.	Poor: seasonal high water table; clayey subsoil; somewhat poorly drained.	Moderate to high.	Surface layer is fair: limited suitable material.	Not suitable	Poor: plastic clay; fair stability; seasonal high water table; medium to high compressibility.	Seasonal high water table; clayey subsoil; somewhat poorly drained.
Fulton, sandy subsoil variant: FvA.	Poor: seasonal high water table; clayey subsoil; somewhat poorly drained.	Moderate to high.	Surface layer is fair; limited suitable material.	Not suitable	Poor: fair stability; seasonal high water table; substratum is fair if mixed.	Seasonal high water table; clayey subsoil layer; somewhat poorly drained.
Galen: GaA, GaB	Good	Low	Poor: sandy material; low fertility.	Good: poorly graded fine sand.	Fair to good: moderately well drained; fair stability; unprotected slopes are erodible.	Loose sand hinders hauling operations; moderately well drained.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Seasonal high water table; soft when wet; trench walls are unstable.	Seasonal high water table; excessive seepage loss.	Poor stability; fair to poor compaction; subject to piping; medium compressibility.	Seasonal high water table; moderate permeability; nearly level.	Medium intake rate; high available moisture capacity; seasonal high water table.	Nearly level; very poorly drained.	Very poorly drained; seasonal high water table.
Seasonal high water table.	Seasonal high water table; low seepage loss.	Fair stability; fair to good compaction; low permeability; medium compressibility.	Seasonal high water table; slow permeability.	Medium intake rate; high available mositure capacity; seasonal high water table.	Nearly level; somewhat poorly drained.	Seasonally wet; somewhat poorly drained; nearly level.
Sandy and gravelly below a depth of 40 inches; seasonal high water table.	Seasonal high water table; excessive seepage loss.	Fair stability; fair to good compaction; substratum has high permeability if compacted.	Seasonal high water table; moderate permeability; nearly level.	Medium intake rate; medium available moisture capacity; seasonal high water table.	Nearly level; somewhat poorly drained.	Nearly level; seasonally wet; somewhat poorly drained.
Somewhat poorly drained; clayey subsoil and substratum.	Seasonal high water table; low seepage rate; clayey subsoil and substratum.	Fair compaction; fair stability; slow permeability; moderate to high shrink-swell potential; medium to high compressibility; good resistance to piping.	Seasonal high water table; slow permeability.	Medium available moisture capacity; slow to medium intake rate; seasonal high water table.	Dense clayey subsoil; difficult to vegetate; uniform short slopes.	Dense clayey subsoil; difficult to vegetate; seasonally wet; somewhat poorly drained.
Somewhat poorly drained; clayey subsoil layer; lower part of subsoil is sandy.	Seasonal high water table; sandy strata; excessive seepage; nearly level.	Fair stability and compaction; poor resistance to piping in substratum.	Seasonal high water table; sandy material within a depth of 28 to 44 inches.	Medium available moisture capacity; medium intake rate; seasonal high water table.	Nearly level; somewhat poorly drained.	Nearly level; somewhat poorly drained; difficult to vegetate.
Moderately well drained; loose sand.	Excessive seepage loss.	Subject to piping; fair stability; fair to good compaction; rapid permeability.	Moderately well drained.	Low available moisture capacity; rapid intake rate.	Sandy material; erodible; difficult to vegetate.	Sandy material; erodible; difficult to vegetate.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location [1]
Genesee: Gm	Fair to poor: commonly wet in winter; subject to flooding.	Low to moderate.	Good to a depth of 28 inches.	Not suitable	Fair: fair stability and compaction.	Subject to flooding; nearly level; well drained.
Gilford: Go	Poor: high water table; very poorly drained.	Moderate	Good to a depth of about 18 inches.	Fair source of fine sand below a depth of 26 to 40 inches.	Poor: high water table; fair stability and compaction.	Seasonal high water table; nearly level; very poorly drained.
Granby: Gr	Poor: high water table; very poorly drained.	Moderate to high.	Fair to a depth of about 20 inches; poor below a depth of 20 inches: sandy.	Fair to good source of fine sand below a depth of 20 inches.	Fair to good: high water table; fair stability and compaction.	Seasonal high water table; nearly level; very poorly drained.
Gravel pits: Gv. No interpretations; properties too variable.						
*Haney: HaA, HaB, HdA, HdB, HeC. For interpretations of Rawson part of HeC, see the Rawson series.	Fair: seasonally wet; moderately well drained.	Moderate to low.	Good to a depth of 12 inches; fair at a depth of 12 to 28 inches.	In places fair to good for fine sand and gravel below a depth of 25 to 48 inches.	Fair to good: fair stability and compaction.	Moderately well drained.
Haskins: HkA, HlA, HnA.	Poor: seasonal high water table; somewhat poorly drained.	High	Fair to a depth of about 15 inches; limited suitable material.	Not suitable	Fair to a depth of 24 to 40 inches: seasonal high water table; substratum poor: plastic clay.	Seasonal high water table; clayey material below a depth of 24 to 40 inches; somewhat poorly drained.
Hoytville: Ho, Hv	Poor: seasonally wet; clayey; very poorly drained.	High	Poor: sticky; clayey material.	Not suitable	Poor: seasonal high water table; plastic clay.	Seasonal high water table; plastic material; very poorly drained.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm pond		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Subject to flooding; well drained; loamy.	Well drained; medium seepage rate; subject to flooding.	Fair stability and compaction; medium compressibility; low seepage rate in embankment; moderate seepage in substratum.	Well drained; subject to flooding.	High available moisture capacity; medium intake rate; well drained; subject to flooding.	Nearly level; subject to flooding; well drained.	Nearly level; well drained.
Very poorly drained; fine sand; flows when wet.	Very poorly drained; high water table; excessive seepage loss.	Fair stability and compaction; poor resistance to piping; moderate permeability.	High water table; moderately rapid permeability; nearly level; fine sand flows when saturated.	Medium available moisture capacity; rapid intake rate; high water table.	Not needed; nearly level; very poorly drained.	Nearly level; seasonally wet; very poorly drained.
Very poorly drained; loose sand below a depth of 20 inches.	High water table; excessive seepage loss; very poorly drained.	Fair stability and compaction; poor resistance to piping; moderate to high permeability.	High water table; rapid permeability; sandy material; fine sand flows when saturated.	Low available moisture capacity; rapid intake rate; high water table.	Nearly level; very poorly drained.	Nearly level; seasonally wet; very poorly drained.
Moderately well drained; loamy material over sand and gravel.	Moderately well drained; high seepage rate in substratum.	Fair stability; material below a depth of 26 to 48 inches has moderately rapid permeability if compacted.	Moderate permeability; moderately well drained.	Medium available moisture capacity; medium intake rate.	Generally has short slopes; moderately well drained.	Moderately susceptible to erosion; moderately well drained.
Somewhat poorly drained; clayey material between depths of 24 and 40 inches.	Seasonal high water table; medium seepage rate between depths of 24 and 40 inches; low seepage rate in substratum; high seepage rate in substratum of HnA.	Fair stability; slow permeability; high shrink-swell potential below a depth of 24 to 40 inches.	Seasonal high water table; moderate permeability in upper 20 to 40 inches; slow permeability in substratum; somewhat poorly drained.	Medium available moisture capacity; medium intake rate; slow permeability below a depth of 24 to 40 inches.	Nearly level; somewhat poorly drained.	Nearly level; somewhat poorly drained.
Seasonal high water table; very poorly drained; clayey material.	Seasonal high water table; slow seepage rate; nearly level.	Fair stability; high shrink-swell potential; cracks as it dries; slow permeability if compacted.	Seasonal high water table; slow permeability; nearly level.	High available moisture capacity; slow intake rate; seasonal high water table.	Nearly level; very poorly drained; clayey material.	Seasonally wet; clayey channels; very poorly drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location [1]
Hoytville, thin solum variant: Hw.	Poor: seasonally wet; clayey; very poorly drained.	High	Poor: sticky; clayey material.	Not suitable	Poor: seasonal high water table; plastic clay.	Seasonal high water table; plastic material; very poorly drained.
Kibbie: KfA, KlA	Poor: seasonally wet; somewhat poorly drained.	High	Good to a depth of 15 inches; fair between depths of 15 and 30 inches.	Not suitable	Poor: poor stability; high erodibility in fills; seasonal high water table; poor compaction.	Seasonal high water table; nearly level; somewhat poorly drained.
Latty: La	Poor: high content of clay; very poorly drained.	High	Poor: high content of clay.	Not suitable	Poor: seasonal high water table; plastic clay.	Seasonal high water table; plastic clayey material; very poorly drained; nearly level.
Lenawee: Le, Lf	Poor: seasonally wet; very poorly drained.	High	Fair: sticky surface layer.	Not suitable	Poor to fair: seasonal high water table; fair compaction and stability.	Seasonal high water table; nearly level; very poorly drained.
Lucas: LwB2, LwC2, LxC3, LxE3.	Poor: wet in winter; slow to dry; clayey subsoil.	Moderate	Poor: clayey material.	Not suitable	Poor: plastic clayey material.	Plastic material; steep slopes in some places; moderately well drained.
Medway: Md	Poor: generally wet in winter; subject to flooding; moderately well drained.	Moderate	Good to a depth of 24 inches.	Not suitable	Fair: fair stability and compaction; medium compressibility.	Subject to flooding; seasonal high water table; nearly level; moderately well drained.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Seasonal high water table; very poorly drained; clayey material.	Seasonal high water table; slow seepage rate; nearly level.	Fair stability; high shrink-swell potential; cracks as it dries; slow permeability if compacted.	Seasonal high water table; slow permeability; nearly level.	High available moisture capacity; slow intake rate; high water table.	Nearly level; very poorly drained; clayey material.	Seasonally wet; clayey channels; very poorly drained.
Somewhat poorly drained; seasonally wet; unstable trench walls.	Seasonal high water table; high seepage rate; sandy seams in substratum.	Poor stability and compaction; poor resistance to piping.	Seasonal high water table; moderate permeability; nearly level.	High available moisture capacity; medium intake rate; seasonal high water table.	Nearly level; somewhat poorly drained.	Nearly level; seasonally wet; somewhat poorly drained.
Seasonal high water table; very poorly drained; clayey material.	Seasonal high water table; low seepage rate; nearly level.	Fair to poor stability; poor compaction; high shrink-swell potential; cracks as it dries; slow permeability.	Seasonal high water table; very slow permeability; nearly level; very poorly drained.	Medium available moisture capacity; slow intake rate; seasonal high water table.	Nearly level; very poorly drained.	Seasonally wet; clayey material; very poorly drained; difficult to vegetate.
Seasonal high water table; very poorly drained.	Seasonal high water table; low seepage rate; silt lenses that have a medium seepage rate in some places; nearly level.	Fair stability; fair compaction; medium to high compressibility; moderate shrink-swell potential; slow permeability.	Seasonal high water table; moderately slow permeability; very poorly drained; nearly level.	High available moisture capacity; medium intake rate; seasonal high water table.	Nearly level; very poorly drained.	Seasonally wet; very poorly drained; nearly level.
Moderately well drained; clayey material.	Moderately well drained; low seepage rate; sand or silt lenses that have a high seepage rate in some places; steep slopes in some places.	Fair stability; fair to poor compaction; high compressibility; high shrink-swell potential; cracks as it dries.	Moderately well drained; seasonal high water table; very slow permeability.	Medium available moisture capacity; slow intake rate.	Clay subsoil at a shallow depth; difficult to vegetate; seasonally wet; moderately well drained.	Clayey material in channels; seasonally wet.
Subject to flooding; nearly level.	Moderately well drained; moderate seepage rate; subject to flooding.	Fair stability and compaction; moderate permeability; medium compressibility.	Moderately well drained; subject to flooding; moderate permeability; nearly level.	High available moisture capacity; medium intake rate; subject to flooding.	Nearly level; subject to flooding; moderately well drained.	Nearly level; subject to flooding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location [1]
Mermill: Me, Mf, Mg	Poor: very poorly drained; seasonally wet.	High	Me and Mg are good to a depth of about 12 inches; Mf is fair: moderately fine textured material.	Not suitable	Fair to poor: seasonal high water table; loamy material; substratum poor: clayey material	Seasonal high water table; plastic clay at a depth of 24 to 40 inches; very poorly drained.
Millgrove: Mh, Mk	Poor: very poorly drained; seasonally wet.	High	Good	Fair to good below a depth of 24 to 42 inches: strata of fine sand interbedded with gravel; high water table.	Fair: fair stability and compaction to a depth of 24 to 42 inches; good stability in substratum.	High water table; nearly level; very poorly drained.
Nappanee: NaA, NaB, NtA, NtB, NtB2.	Poor: seasonally wet; clayey subsoil.	High	Surface layer is fair: limited suitable material.	Not suitable	Poor: plastic subsoil; high compressibility; seasonal high water table.	Seasonal high water table; clayey subsoil; somewhat poorly drained.
Oakville: OaC	Good	Low	Poor: sandy material; low fertility.	Good for fine sand; not suitable for gravel.	Fair to good: fair to good stability and compaction; slight compressibility.	Loose sand; well drained; cut slopes are droughty and erodible.
Oshtemo: OsB	Good	Low	Good to a depth of 1½ feet; fair below a depth of 1½ feet.	Not suitable to a depth of 42 inches; good source of sand below a depth of 42 inches; content of gravel generally is low.	Excellent to good: good compaction and stability.	Well drained
Ottokee: OtB	Good	Low	Poor: sandy material; low fertility.	Good: poorly graded fine sand; not suitable for gravel.	Fair to good: fair stability and fair to good compaction.	Loose sand; cut slopes are erodible and droughty.
Paulding: Pa	Poor: very poorly drained; clayey.	Moderate to high.	Poor: high content of clay.	Not suitable	Poor: seasonal high water table; plastic clay.	Seasonal high water table; plastic, clayey material; nearly level; very poorly drained.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Very poorly drained; nearly level; seasonal high water table; clay at a depth of 24 to 40 inches.	Seasonal high water table; medium seepage rate in upper 24 to 40 inches; low seepage rate below, except in Mg where seepage rate is high in some places.	Fair stability and compaction; high compressibility below a depth of 24 to 40 inches.	Seasonal high water table; very slow permeability; clayey material below a depth of 24 to 40 inches.	Medium available moisture capacity; medium intake rate; seasonal high water table.	Nearly level; very poorly drained.	Seasonal high water table; nearly level; very poorly drained.
Very poorly drained; sandy and gravelly substratum; nearly level.	High water table; excessive seepage loss in substratum.	Fair stability; fair to good compaction; poor resistance to piping.	High water table; moderate permeability; sandy material below a depth of 24 to 42 inches.	High available moisture capacity; medium intake rate; high water table.	Nearly level; very poorly drained.	High water table; nearly level; very poorly drained.
Somewhat poorly drained; clayey subsoil.	Seasonal high water table; low seepage rate.	Fair stability; poor compaction; high compressibility; subject to cracking.	Seasonal high water table; very slow permeability.	Medium available moisture capacity; slow intake rate; seasonal high water table.	Clayey subsoil; difficult to vegetate; short, uniform slopes; somewhat poorly drained.	Clayey subsoil; erodible slopes seasonally wet; somewhat poorly drained.
Well drained; loose fine sand.	Sandy material; high seepage rate.	Rapid permeability; poor resistance to piping; fair to good stability and compaction.	Well drained; sandy.	Very rapid intake rate; very low available moisture capacity.	Well drained; sandy; terrace channels are subject to filling by blowing sand.	Well drained; sandy material; highly erodible; difficult to vegetate.
Well drained; trench walls are subject to caving.	Sandy material; high seepage rate.	Good stability; fair to good compaction; poor resistance to piping.	Well drained; sandy.	Rapid intake rate; low available moisture capacity.	Well drained; gently sloping; erodible channels.	Well drained; erodible channels.
Loose sand; trench walls are subject to caving.	Sandy material; high seepage rate.	Fair stability; fair to good compaction; rapid permeability; subject to piping.	Moderately well drained.	Low available moisture capacity; very rapid intake rate.	Sandy material; irregular slopes; moderately well drained.	Sandy material; highly erodible; difficult to vegetate; moderately well drained.
Nearly level; plastic, clayey soil; very poorly drained.	Seasonal high water table; low seepage rate; nearly level.	Fair to poor stability and compaction; high shrink-swell potential; cracks as it dries.	Seasonal high water table; very slow permeability.	Medium available moisture capacity; slow intake rate; seasonal high water table.	Nearly level; very poorly drained; clayey material.	Seasonal high water table; clayey material; very poorly drained.

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	Soil features affecting— Highway location [1]
Rawson: RaB, RdB, ReB.	Fair to poor: seasonally wet; slow to dry; moderately well drained.	Moderate	Surface layer is fair to good in upper 12 inches.	Not suitable	Upper 26 to 40 inches fair: fair stability and compaction; poor below a depth of 26 to 40 inches: plastic clay.	Moderately well drained; clayey below a depth of 26 to 40 inches; seasonally wet.
Rimer: RfA, RmA	Poor: seasonal high water table; slow to dry; somewhat poorly drained.	Moderate to high.	Fair: sandy material; low fertility.	Not suitable for gravel; poor for sand in upper 24 to 40 inches; high content of fines; not suitable below a depth of 40 inches.	Fair in upper 24 to 40 inches; poor below a depth of 24 to 40 inches: clayey material.	Somewhat poorly drained; seasonal high water table; clayey material below a depth of 24 to 40 inches.
Roselms: RoA	Poor: seasonal high water table; somewhat poorly drained; clayey.	Moderate to high.	Poor: shallow to clay.	Not suitable	Poor: plastic clay; seasonal high water table.	Seasonal high water table; clayey material; nearly level; somewhat poorly drained.
Ross: Rs	Fair: subject to flooding; well drained.	Low to moderate.	Good to a depth of 32 inches or more.	Not suitable	Fair: fair to poor stability and compaction.	Well drained; subject to flooding; nearly level.
St. Clair: SbB2, SbC2, ScC3, ScD3, ScE3, ScF3	Poor: seasonally wet; slow to dry; clayey material; moderately well drained.	Moderate	Poor: shallow to clay subsoil.	Not suitable	Poor: fair to poor stability; high compressibility; plastic clay subsoil.	Moderately well drained; plastic soil material; steep slopes in some places.
Seward: SdB, SdC, SdD, SeB, SeC.	Fair to good: moderately well drained; sandy soil over clay; wet for short periods.	Moderate to low.	Poor: sandy material; low fertility.	Not suitable for gravel; poor source of sand in upper 20 to 40 inches: high content of fines; clayey substratum within a depth of 40 inches.	Good to fair in upper 20 to 40 inches; poor below a depth of 20 to 40 inches: clayey material.	Moderately well drained; clayey material below a depth of 20 to 40 inches.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Moderately well drained; clayey below a depth of 26 to 42 inches; seasonally wet.	Moderately well drained; moderate seepage rate in upper 26 to 42 inches, low seepage rate below.	Fair stability; fair compaction; high shrink-swell potential below a depth of 26 to 42 inches.	Seasonal high water table; moderate permeability to a depth of 26 to 42 inches; clayey material below a depth of 26 to 40 inches.	Medium available moisture capacity; medium to rapid intake rate; seasonal high water table.	Moderately well drained; gentle slopes.	Moderately well drained; seasonally wet.
Seasonal high water table; somewhat poorly drained; clay at a depth of of 24 to 40 inches.	Seasonal high water table; high seepage rate in upper 2 to 3 feet; low seepage rate below a depth of 2 to 3 feet in RfA; high seepage possible in RmA substratum.	Rapid permeability to a depth of 24 to 40 inches; high shrink-swell potential below a depth of 24 to 40 inches; cracks as it dries.	Seasonal high water table; rapid permeability in upper 24 to 40 inches, slow permeability below.	Low to medium available moisture capacity; rapid intake rate; seasonal high water table.	Nearly level; somewhat poorly drained; seasonally wet.	Nearly level; seasonally wet; somewhat poorly drained.
Nearly level; plastic clay; somewhat poorly drained.	Seasonal high water table; low seepage rate; nearly level.	Fair to poor stability and compaction; high compressibility; high shrink-swell potential; cracks as it dries.	Seasonal high water table; very slow permeability.	Medium available moisture capacity; slow intake rate; seasonal high water table.	Nearly level; somewhat poorly drained; high content of clay.	Somewhat poorly drained; clayey material; difficult to vegetate and construct.
Well drained; subject to flooding.	Well drained; medium seepage rate; subject to flooding.	Fair to poor stability and compaction; medium compressibility; moderate to low permeability.	Well drained-----	High available moisture capacity; medium intake rate; well drained; subject to flooding.	Nearly level; subject to flooding; well drained.	Nearly level; subject to flooding; well drained.
Steep slopes in some places; seasonally wet; sticky clay material.	Moderately well drained; low seepage rate; steep slopes in some places.	Fair to poor stability and compaction; high compressibility; high shrink-swell potential; cracks as it dries.	Moderately well drained; seasonal high water table; very slow permeability.	Medium available moisture capacity; slow intake rate; seasonal high water table.	Dense, clayey subsoil; short slopes; moderately well drained.	Dense, clayey subsoil; difficult to vegetate cut channels; moderately well drained.
Moderately well drained; clayey material within a depth of 40 inches; seasonally wet for short periods.	Moderately well drained; high seepage rate in upper 20 to 40 inches, low seepage rate below a depth of 40 inches; high seepage rate in substratum of SeB and SeC in places.	Moderately rapid permeability to a depth of 20 to 40 inches; high shrink-swell potential below a depth of 20 to 40 inches.	Seasonal high water table; clayey material below a depth of 20 to 40 inches; slow permeability below a depth of 20 to 40 inches.	Low to medium available moisture capacity; rapid intake rate; seasonal high water table for short periods.	Short slopes; erodible material; moderately well drained.	Erodible; difficult to vegetate; moderately well drained.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location [1]
Shinrock, sandy subsoil variant: SfA.	Poor: seasonally wet; slow to dry; moderately well drained.	Moderate	Good in upper 12 inches; fair between depths of 12 and 28 inches: moderately fine texture.	Good for course sand below a depth of 3 to 4 feet; fair for gravel.	Poor to fair in upper 3 to 4 feet: moderate shrink-swell potential; good below a depth of 3 to 4 feet: coarse sand and gravel.	Nearly level; sand and gravel below a depth of 32 to 48 inches; moderately well drained; nearly level.
Shoals: Sh	Poor: seasonal high water table; subject to flooding.	High	Good to a depth of 36 inches.	Not suitable	Poor: poor stability and compaction; medium compressibility.	Subject to flooding; seasonal high water table; nearly level; somewhat poorly drained.
Sloan: So	Poor: subject to flooding; seasonally wet; very poorly drained.	High	Fair: moderately fine texture.	Not suitable	Poor: fair stability and compaction; seasonal high water table; medium to high compressibility.	Nearly level; subject to flooding; seasonal high water table; very poorly drained.
Spinks: SpB, SpC, SpD.	Good	Low	Poor: sandy material; low fertility.	Good source of fine sand; not suitable for gravel.	Fair: fair stability and compaction; slight compressibility.	Loose sand; well drained; cut slopes are droughty.
Tedrow: TdA	Poor: seasonal high water table; slow to dry; somewhat poorly drained.	Moderate	Poor: sandy material; low fertility.	Fair to poor source of fine sand: high content of fines.	Fair: fair stability and compaction; seasonally wet.	Seasonal high water table; nearly level; somewhat poorly drained.
Tedrow, silty subsoil variant: TeA.	Poor: seasonal high water table; slow to dry; somewhat poorly drained.	Moderate	Poor: sandy material; low fertility.	Poor to not suitable: high content of fines.	Fair: fair stability and compaction; seasonally wet.	Seasonal high water table; nearly level; somewhat poorly drained.
Toledo: To, Tt	Poor: seasonally wet; clayey subsoil; very poorly drained.	High	Poor: surface layer is moderately fine to fine textured.	Not suitable	Poor: seasonal high water table; plastic clay subsoil.	Seasonal high water table; clay subsoil; very poorly drained.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Moderately well drained; sand and gravel below a depth of 3 to 4 feet; seasonally wet for short periods; nearly level.	Moderately well drained; sandy and gravelly material has rapid seepage.	Fair stability and compaction; poor resistance to piping below a depth of 32 to 48 inches.	Sand and gravel below a depth of 3 to 4 feet; seasonally high water table for short periods.	Medium available moisture capacity; slow intake rate; seasonal high water table for short periods.	Nearly level; moderately well drained.	Moderately well drained; nearly level.
Somewhat poorly drained; subject to flooding; deep, loamy material.	Seasonal high water table; medium seepage rate; subject to flooding.	Poor stability and compaction medium compressibility; subject to piping.	Seasonal high water table; moderate permeability; subject to flooding.	High available moisture capacity; medium intake rate; seasonal high water table; subject to flooding.	Nearly level; subject to flooding; somewhat poorly drained.	Nearly level; subject to flooding; somewhat poorly drained.
Nearly level; subject to flooding; seasonal high water table; very poorly drained.	Seasonal high water table; medium seepage rate; subject to flooding.	Fair stability and compaction; medium compressibility; subject to piping.	Seasonal high water table; subject to flooding; moderate permeability; nearly level.	High available moisture capacity; medium intake rate; seasonal high water table; subject to flooding.	Nearly level; very poorly drained; seasonally wet; subject to flooding.	Nearly level; subject to flooding; seasonally wet; very poorly drained.
Loose, well-drained sand.	Rapid seepage rate.	Susceptible to piping; moderately rapid permeability; fair stability and compaction.	Well drained; sandy material.	Very low available moisture capacity; very rapid intake rate.	Sandy material; highly erodible; difficult to vegetate; well drained.	Sandy material; highly erodible; difficult to vegetate; well drained.
Somewhat poorly drained; sandy material; seasonal high water table.	Sandy material; high seepage rate.	Rapid permeability; susceptible to piping; fair compaction and stability.	Seasonal high water table; rapid permeability; nearly level.	Low available moisture capacity; rapid intake rate; seasonal high water table.	Nearly level; somewhat poorly drained; seasonally wet.	Sandy material; difficult to vegetate; seasonally wet; somewhat poorly drained.
Somewhat poorly drained; sandy material; seasonal high water table.	Sandy material; high seepage rate.	Rapid permeability; susceptible to piping; fair compaction and stability.	Seasonal high water table; slow permeability below a depth of 36 inches.	Low available moisture capacity; rapid intake rate; seasonal high water table.	Nearly level; somewhat poorly drained; seasonally wet.	Sandy material; difficult to vegetate; seasonally wet; somewhat poorly drained.
Very poorly drained; clayey subsoil; seasonal high water table.	High water table; low seepage rate; sand and silt lenses that have high seepage rate in some places.	Poor compaction and stability; high shrink-swell potential; cracks as it dries.	High water table; slow permeability; nearly level.	Medium available moisture capacity; slow intake rate; seasonal high water table.	Nearly level; very poorly drained; seasonally wet.	Seasonal high water table; very poorly drained; nearly level.

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	Soil features affecting— Highway location [1]
Tuscola: TuB2, TuC2	Fair: moderately well drained; seasonally wet for short periods.	High	Good in upper 12 inches; fair between depths of 12 and 30 inches: low organic-matter content.	Not suitable	Fair to poor: silty material; slopes erodible and unstable; medium compressibility.	Moderately well drained; cut slopes are very erodible; seasonal high water table for short periods.
Urban land: Ur No interpretations; properties too variable.						
Vaughnsville: VaA	Poor: generally wet and seepy in winter; moderately well drained and somewhat poorly drained.	Moderate	Good in upper 12 inches.	Not suitable	Good in upper 24 to 38 inches; poor below a depth of 24 to 38 inches: plastic clay.	Seepage in cuts in places; clayey material below a depth of 24 to 38 inches; seasonal high water table.
Wabasha: Wa	Poor: seasonally wet; subject to flooding; very poorly drained; clayey.	Moderate to high.	Poor: clayey material.	Not suitable	Poor: poor stability; plastic clay; seasonal high water table; subject to flooding.	Seasonal high water table; subject to flooding; clayey material.
Warners: Wc	Poor: high water table; muck over marl; very poorly drained.	High to moderate.	Poor; fair to good if mixed with mineral soil.	Not suitable	Poor: muck over marl.	Muck over marl; high water table; subject to ponding; nearly level.
Wauseon: Wf, Wg	Poor: seasonally wet; very poorly drained.	High	Good to fair in upper 24 inches.	Not suitable	Fair: seasonal high water table; plastic clay within a depth of 40 inches.	Seasonal high water table; clayey material within a depth of 40 inches; very poorly drained.

[1] See also the column "Susceptibility to frost action" in this table and the column "Shrink-swell potential" in table 5.
[2] Corrosion potential is rated in table 5.

interpretations of the soils—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance [2]	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment [3]				
Moderately well drained; unstable trench walls; seasonal high water table for short periods.	Moderately well drained; high seepage rate in sandy seams in places.	Poor compaction and stability; susceptible to piping; medium compressibility; erodible.	Seasonal high water table; moderate permeability; moderately well drained.	High available moisture capacity; medium intake rate; seasonal high water table.	Highly erodible; slopes generally short and irregular; moderately well drained.	Highly erodible; moderately well drained.
Moderately well drained to somewhat poorly drained; seasonal high water table; clayey below a depth of 24 to 38 inches.	Moderately well drained to somewhat poorly drained; medium seepage rate to a depth of 24 to 38 inches; low seepage in underlying clayey material.	Fair stability; slow permeability; high shrink-swell potential below a depth of 24 to 38 inches.	Seasonal high water table; moderate permeability in upper 24 to 38 inches; slow permeability below a depth of 24 to 38 inches.	Medium available moisture capacity; medium intake rate; seasonal high water table.	Seasonally wet and seepy; moderately well drained to somewhat poorly drained.	Moderately erodible; seasonally wet and seepy; moderately well drained to somewhat poorly drained.
Subject to flooding; clayey material; seasonal high water table.	Seasonal high water table; low seepage rate; subject to flooding.	Fair compaction and stability; high shrink-swell potential; cracks as it dries; slow permeability.	Seasonal high water table; slow permeability; subject to flooding; nearly level.	Medium available moisture capacity; slow intake rate; seasonal high water table; subject to flooding.	Nearly level; subject to flooding; very poorly drained.	Seasonal high water table; subject to flooding; nearly level.
Very poorly drained; muck over marl; high water table.	High water table; high seepage rate; muck in upper 15 inches.	Organic material unstable; material below susceptible to piping.	Nearly level; high water table.	Medium available moisture capacity; medium intake rate; high water table.	Nearly level; very poorly drained.	Nearly level; very poorly drained.
Very poorly drained; seasonally wet; clayey material within a depth of 40 inches.	Seasonal high water table; high seepage rate in sandy layers; slow seepage in underlying clay.	Fair stability; fair to good compaction; susceptible to piping in sandy layers; good resistance to piping in clayey material.	Seasonal high water table; rapid permeability in sandy layers; slow permeability in clayey material within a depth of 40 inches.	Medium available moisture capacity; rapid intake rate; seasonal high water table.	Nearly level; very poorly drained.	Nearly level; very poorly drained.

[3] Interpretations for embankment also apply to low dikes and levees.

Engineering properties of soils

Table 5 lists soil series and map symbols of the soils in Henry County. It shows the estimated soil properties that are important in engineering, and it gives the AASHO and Unified classification of the soils. The textural terms used to describe the main horizons are those used by the USDA. The data in table 5 are based on the results of soil tests shown in table 4 and on experience with the same kinds of soil in this and other counties. Additional information about the soils is given in the section headed "Descriptions of the Soils." Some reference to geology is given in the section "Formation and Classification of the Soils" and the section "Additional Facts About the County." The following paragraphs briefly describe the columns shown in table 5.

Depth to a seasonal high water table is the shallowest depth at which saturated soil occurs during winter and spring because of a perched or other ground water table. Soil conditions immediately after heavy rains are not considered. In all soils, particularly in those on sloping uplands, the depth to the water table generally is greater late in spring, summer, and fall than is indicated in this column.

The depth given in the "Depth from surface" column corresponds to significant changes in texture in the representative profile for each soil described. It should be pointed out that the estimated data given are for the representative soil in each series. Soils in the same series that are different from the representative soil may differ slightly in some properties from those shown.

The columns "Percentage passing sieve" show estimated particle-size distribution according to standard size sieves.

The USDA texture indicated corresponds to the textures given in the technical description of each soil.

The engineering classifications are based on actual test data from this county and other survey areas. See the subsection "Engineering Classification Systems" for explanation of these headings.

Permeability values are estimates of the range in rates of downward water movement in the major soil horizons when they are saturated, but allowed to drain freely (saturated above a true water table). They are estimates based on soil texture, soil structure, porosity, permeability, and infiltration tests. On any given soil, infiltration (or percolation) through the surface layer varies considerably according to land use and management as well as initial moisture conditions.

The available moisture capacity, estimated in inches per inch of soil, is the approximate amount of capillary water in the soil when it is wet to field capacity. When the soil is air dry, this amount of water will wet the soil material to a depth of one inch without deeper percolation. Available moisture capacity is a measure of the maximum amount of moisture a particular soil can store for use by plants. The estimated values listed are based on difference in percentage of moisture retained at 1/3 and 15 atmospheres of tension for medium-textured and fine-textured soils. For sandy soils estimated values are based on the difference between 1/10 and 15 atmospheres of tension. The available moisture capacity in compact glacial till is rated at a lower figure than normal for the given texture. This is a result of increased bulk densities in these layers, which greatly reduces the penetration of plant roots. Thus, some of the water stored is not available to plant roots.

The reaction given in a pH range represents a summary of the many field pH determinations taken during the survey on each of the soils in the county. The definition for reaction is given in the Glossary.

The estimated shrink-swell potential is an indication of the volume change to be expected in the soil material with changes in moisture content. The soil materials rated high have serious limitations for such engineering uses as building foundation, backfill, highway location, and others.

The corrosion potential indicated for uncoated steel is based on soil texture, soil drainage, and total acidity. Electrical resistivity is not considered in this rating. The corrosion potential for concrete is based on soil texture and pH values. The rating given is for average concrete. The ratings do not apply to concrete mixed specifically for corrosion resistance.

Engineering interpretations of soils

Table 6 shows the engineering interpretations of the soils in Henry County. Interpretations for other selected uses involving engineering procedures are shown on table 7.

Table 6 lists all of the soils series in the county and describes and rates selected characteristics of the soils that might affect their use in engineering. The interpretations shown in table 6 are based on actual and estimated soil test data in tables 4 and 5 and on field experience. Explanations of the column headings in table 6 follow.

Because of wetness, plasticity, or susceptibility to frost action, many of the soils are not suited to grading during part of the winter. Such soils are rated poor.

Silty and fine sandy soils that are wet most of the winter and have a readily available source of water are the ones that are most susceptible to frost action. Such soils, as well as others, are rated high.

The thickness, texture, and inherent fertility of the surface layer of a soil determine its suitability for use as a topdressing for roadbanks and embankment to promote the growth of vegetation. Only the surface layer of the soil is considered in this rating, except as noted otherwise.

The sand and gravel column gives information about the soils as a possible source of sand and gravel for construction purposes. It should not be assumed that if a soil is rated good that all areas of that soil can be used for commercial development for sand or gravel. A soil rated good has better possibilities for sand or gravel than soils rated poor or fair.

Road fill is soil material used to build fills and embankments for roads. The properties that affect the use of soils for road fill include stability, compaction, texture, and compressibility. The presence or absence of a high water table influences the use of the material. In some soils the substratum has a different rating than the soil material above it. These differences are noted in table 6.

Soil features that affect highway locations are natural drainage, presence or absence of a high water table, slope, and the hazard of flooding.

Among the soil features that affect the construction and maintenance of pipelines are high water table, soil texture, drainage, hazard of flooding, and slopes.

In the column "Reservoir area," consideration is given primarily to the sealing potential of the reservoir, but shallowness to bedrock and the susceptibility to overflow in flood plains also are noted. In the column "Embankment," the soils are rated according to the stability and permeability of the materials when used in the construction of pond embankments. The permeability noted in this column is for the soil material when compacted at optimum moisture. The information in this column also applies to low dikes and levees.

In the column "Agricultural drainage," the soil features are described relative to their natural drainage, their in-place permeability, and the presence of a seasonal high water table.

In the column "Irrigation," the relative ease with which water normally infiltrates into, percolates through, and drains from each of the soils, and the moisture-holding capacity of the soils is noted as well as other features.

The slope of the land and the relative erodibility of the soil materials are the main considerations in the use of soils for terraces and diversions. Another soil feature considered is the presence of a seasonal high water table. Nearly level soils do not need terracing, and steep soils are not well suited to terracing. Highly erodible soils require special care in the construction of diversions.

Slope and the erodibility of the soil are the main considerations in the use of soils for waterways. A high water table is noted where applicable.

Construction hazards

Soils that cause difficulty during construction are of special concern to engineers and contractors. Some of the adverse features are given in table 6, and others are described in this section.

Soil slumping during construction causes serious difficulties. The fine and very fine sands common in soil association 4 are susceptible to slumping if excavated. Steep slopes or vertical cuts slump until they form a stable grade.

Areas at the bases of sand knolls or ridges commonly are saturated with water. During construction activities these areas commonly are like quicksand. The installation of tile is difficult, and the use of heavy equipment may be limited in these areas. Most of these areas occur near the boundary between Ottokee soils and Tedrow or Granby soils.

Organic soils are unstable and have a high water table. The organic, or muck, soils in Henry County occur mainly in the northwestern part of soil association 4. These bogs, or muck pockets, are generally shallow, ranging from 1½ to 3 feet deep. Outlets for drainage tile are difficult to provide in most of these pockets. Organic soils that are covered with fill generally settle unevenly. Because of wetness, roads and buildings constructed on filled muck soils are likely to settle.

Colwood, Kibbie, and Tuscola soils and soils of the Tedrow series, silty subsoil variant, have a high content of silt. These soils are highly erodible if used where fills are sloping or where the protective cover is removed. Newly made cuts in these soils frequently slump. The silty materials are unstable when wet, and mud flows occur in places.

The Fulton and Shinrock sandy subsoil variants have silty clay or silty clay loam overlying sandy material. Where excavations are made, the coarser material may wash out from under the finer textured material, causing the soils to cave or slump.

Soils that vary in texture in different layers commonly yield unexpected amounts of water when excavations are dug. Sandy or sandy and gravelly material in the substratum of some of the soils acts as an aquifer, and excavations often fill with water.

Several soils in Henry County have a stratified substratum. These soils have strata of clayey material interlayered with loamy or sandy material. Because the thickness of these strata is variable from place to place, rating these soils is difficult. In table 5 the substratum of these soils is classified by the strata that are found most extensively.

Planning for Town and Country Use

Table 7 rates the soils in the county for specified land uses and names limiting features of soils that have moderate or severe limitations. These ratings and the limitations are helpful in town and country planning.

In Henry County, the land is dominantly used for farming, but the county lies southwest of the large metropolitan area of Toledo, Ohio, and suburban areas are expanding. At present several miles of farmland in Lucas County separate encroaching residential areas from Henry County. The principal road between Toledo, Ohio and Fort Wayne, Indiana, crosses the county, and a belt of town and country land use is gradually developing along this road. This changing land use may increase after road improvements now underway or programmed for the next few years are completed (fig. 7). A gradual enlargement of the towns in the county and the city of Napoleon is producing a mixture of town and country uses near these population centers. These uses include residential, industrial, transportation, and recreational facilities.

***Figure 7.*—Highway construction replacing farming on Hoytville soils. These soils are in capability class II.**

TABLE 7.—*Estimated degree and kind*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Adrian: Ad	Severe: high water table.	Severe: [2] very poorly drained; organic soil material; high water table.	Severe: [2] organic soil material.	Severe: very poorly drained; organic soil material; high water table; unstable material.	Severe: very poorly drained; organic soil material; high water table.
Arkport:					
ArB	Slight	Slight [2]	Severe: [2] moderately rapid permeability.	Slight	Severe: low available moisture capacity; sandy texture.
ArC	Moderate: slope; hazard of soil blowing.	Moderate: [2] slope.	Severe: [2] moderately rapid permeability; slope.	Moderate: slope	Severe: low available moisture capacity; sandy texture.
Clay pits: Ca. Limitations too variable to be estimated.					
Cohoctah: Ch	Moderate: subject to flooding.	Severe: [2] subject to flooding.	Severe: [2] subject to flooding.	Severe: [2] subject to flooding; very poorly drained; high susceptibility to frost action.	Severe: subject to flooding; very poorly drained.
Colwood: Cn, Co	Slight	Severe: very poorly drained.	Moderate: moderate permeability.	Severe: very poorly drained.	Severe: very poorly drained.
Cut and fill land: Cu. Limitations too variable to be estimated.					
Del Rey: DeA, DfA	Slight	Severe: slow permeability.	Slight	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Digby: DuA, DyA	Slight	Moderate: [2] somewhat poorly drained.	Severe: [2] rapid permeability in the substratum.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.

See footnotes at end of table.

of limitations for specified land uses

Streets and parking lots	Recreation: Athletic fields and other areas of intensive play	Recreation: Parks and extensive play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills	Cemeteries
Severe: very poorly drained; organic soil material; high water table; soft, unstable material; high susceptibility to frost action.	Severe: very poorly drained; organic soil material; high water table.	Severe: very poorly drained; organic soil material; high water table.	Severe: very poorly drained; organic soil material; high water table; material is soft when wet.	Severe: very poorly drained; organic soil material; high water table; material is soft when wet.	Severe:[2] very poorly drained; organic soil material; high water table.	Severe: very poorly drained; organic soil material; high water table.
Moderate: slope.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe:[2] rapid permeability; sandy texture.	Severe: sandy texture.
Severe: slope	Severe: sandy texture; slope.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture; slope.	Severe:[2] sandy texture.	Severe: sandy texture.
Severe: subject to flooding; very poorly drained; high susceptibility to frost action.	Severe: subject to flooding; very poorly drained.	Severe: subject to flooding; very poorly drained.	Severe: subject to flooding; very poorly drained.	Severe: subject to flooding; very poorly drained.	Severe:[2] subject to flooding; very poorly drained.	Severe: subject to flooding; very poorly drained.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Moderate: somewhat poorly drained; high susceptibility to frost action.	Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Moderate: somewhat poorly drained; moderately fine texture.	Severe: somewhat poorly drained.
Moderate: somewhat poorly drained; moderate to high susceptibility to frost action.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; seasonal high water table.	Severe: somewhat poorly drained.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Fulton:					
FsA, FuA	Moderate: seasonal wetness.	Severe: slow permeability.	Slight	Moderate: somewhat poorly drained.	Severe: slow permeability; clayey subsoil.
FsB, FuB	Moderate: seasonal wetness; hazard of erosion.	Severe: slow permeability.	Moderate: slope	Moderate: somewhat poorly drained.	Severe: slow permeability; clayey subsoil.
Fulton, sandy subsoil variant: FvA.	Moderate: seasonal wetness.	Severe: [2] slow permeability in upper 2 to 3 feet.	Severe: [2] moderately rapid permeability in lower layers.	Moderate; somewhat poorly drained.	Severe: slow permeability; clayey subsoil.
Galen:					
GaA	Slight	Slight [2]	Severe:[2] moderately rapid permeability.	Slight	Severe: low available moisture capacity; sandy texture.
GaB	Slight	Slight [2]	Severe:[2] moderately rapid permeability.	Slight	Severe: low available moisture capacity; sandy texture.
Genesee: Gm	Slight	Severe:[2] subject to flooding.	Severe:[2] subject to flooding.	Severe: subject to flooding.	([3])
Gilford: Go	Slight	Severe: very poorly drained.	Severe: moderately rapid permeability.	Severe: very poorly drained.	Severe: very poorly drained.
Granby: Gr	Slight	Severe:[2] very poorly drained.	Severe:[2] rapid permeability.	Severe: very poorly drained.	Severe: very poorly drained.
Gravel pits: Gv. Limitations too variable to be estimated.					

See footnotes at end of table.

limitations for specified land uses—Continued

Streets and parking lots	Recreation				Sanitary land fills	Cemeteries
	Athletic fields and other areas of intensive play	Parks and extensive play areas	Campsites			
			Tents	Trailers		
Moderate: somewhat poorly drained; moderate to high susceptibility to frost action.	Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability	Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; slow permeability.
Moderate: somewhat poorly drained; moderate to high susceptibility to frost action.	Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; slow permeability.
Moderate: somewhat poorly drained; moderate to high susceptibility to frost action.	Severe: slow permeability in upper 2 to 3 feet.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Severe:[2] moderate to rapid permeability in substratum.	Severe: slow permeability; seasonal high water table.
Slight	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe:[2] moderately rapid permeability; sandy texture.	Severe: sandy texture.
Moderate: slope.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe:[2] moderately rapid permeability; sandy texture.	Severe: sandy texture.
Severe: subject to flooding; low to moderate susceptibility to frost action.	(3)	(3)	Severe: subject to flooding.	Severe: subject to flooding.	Severe:[2] subject to flooding.	Severe: subject to flooding.
Severe: very poorly drained; moderate susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe:[2] very poorly drained; moderately rapid permeability.	Severe: very poorly drained.
Severe: very poorly drained; moderate to high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained; sandy texture.	Severe: very poorly drained; sandy texture.	Severe:[2] very poorly drained.	Severe: very poorly drained.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Haney:					
HaA, HdA	Slight	Slight [2]	Severe: [2] rapid permeability in lower layers.	Slight	Slight
HaB, HdB	Slight	Slight [2]	Severe: [2] rapid permeability in lower layers.	Slight	Slight
HeC For both Haney and Rawson soils, except as noted.	Moderate: slope; hazard of erosion.	Moderate: [2] slope; Rawson part is severe; very slow permeability.	Severe: [2] rapid permeability in lower layers of Haney part; slope.	Moderate: slope	Moderate: slope
Haskins: HkA, HlA, HnA	Slight	Severe: slow permeability.	Moderate: moderate permeability in upper 20 to 40 inches.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Hoytville: Ho, Hv	Slight	Severe: very poorly drained; slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.
Hoytville, thin solum variant: Hw.	Slight	Severe: very poorly drained; slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.
Kibbie: KfA, KlA	Slight	Moderate: somewhat poorly drained; moderate permeability.	Moderate: moderate permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Latty: La	Moderate: seasonal wetness.	Severe: very poorly drained; very slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained; clay surface layer.
Lenawee: Le, Lf	Slight	Severe: very poorly drained; moderately slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.

See footnotes at end of table.

limitations for specified land uses—Continued

Streets and parking lots	Recreation				Sanitary land fills	Cemeteries
	Athletic fields and other areas of intensive play	Parks and extensive play areas	Campsites			
			Tents	Trailers		
Slight: moderate to low susceptibility to frost action.	Slight: very poorly drained.	Slight	Slight	Slight	Moderate: [2] seasonal high water table.	Moderate: seasonal high water table.
Moderate: slope; moderate to low susceptibility to frost action.	Moderate: slope.	Slight	Slight	Moderate: slope.	Moderate: [2] seasonal high water table.	Moderate: seasonal high water table.
Severe: slope; moderate to low susceptibility to frost action.	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: [2] slope; seasonal high water table.	Moderate: slope; seasonal high water table.
Moderate: somewhat poorly drained; high susceptibility to frost action.	Severe: slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; slow permeability.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained; slow permeability; Hv has clay surface layer.	Severe: very poorly drained; Hv has clay surface layer.	Severe: very poorly drained; slow permeability; Hv has clay surface layer.	Severe: very poorly drained; slow permeability; Hv has clay surface layer.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; slow permeability; clay texture.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained; slow permeability; clay surface layer.	Severe: very poorly drained; clay surface layer.	Severe: very poorly drained; slow permeability; clay texture.	Severe: very poorly drained; slow permeability; clay texture.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; slow permeability; clay texture.
Moderate: somewhat poorly drained; high susceptibility to frost action.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained; clay surface layer; very slow permeability.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; very slow permeability; clay texture.	Severe: very poorly drained; clay texture; very slow permeability.	Severe: very poorly drained; clay texture; very slow permeability.	Severe: very poorly drained; clay texture; very slow permeability.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Lucas:					
LwB2	Moderate: slope; hazard of erosion.	Severe: very slow permeability.	Moderate: slope.	Slight	Severe: very slow permeability; clayey subsoil.
LwC2	Severe: slope; hazard of erosion.	Severe: very slow permeability.	Severe: slope	Moderate: slope	Severe: very slow permeability; clayey subsoil.
LxC3	Severe: slope; hazard of erosion.	Severe: very slow permeability.	Severe: slope	Moderate: slope	Severe: very slow permeability; severely eroded.
LxE3	Severe: slope; hazard of erosion.	Severe: very slow permeability; slope.	Severe: slope	Severe: slope	Severe: very slow permeability; slope; severely eroded.
Medway: Md	Slight	Severe: [2] subject to flooding.	Severe: [2] subject to flooding.	Severe: subject to flooding.	([3])
Mermill: Me, Mf, Mg	Slight	Severe: very poorly drained; very slow permeability.	Moderate: moderate permeability in upper 20 to 40 inches; possible seepage in substratum of Mg.	Severe: very poorly drained.	Severe: very poorly drained.
Millgrove: Mh, Mk	Slight	Severe: [2] very poorly drained.	Severe: [2] rapid permeability in substratum.	Severe: very poorly drained.	Severe: very poorly drained.
Nappanee:					
NaA, NtA	Moderate: seasonal wetness.	Severe: very slow permeability.	Slight	Moderate: somewhat poorly drained.	Severe: very slow permeability; clayey subsoil.
NaB, NtB, NtB2	Moderate: seasonal wetness; hazard of erosion.	Severe: very slow permeability.	Moderate: slope.	Moderate: somewhat poorly drained.	Severe: very slow permeability; clayey subsoil.
Oakville: OaC	Severe: very low available moisture capacity; hazard of soil blowing.	Slight [2]	Severe: [2] rapid permeability.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent.	Severe: sandy material; very low available moisture capacity.

See footnotes at end of table.

limitations for specified land uses—Continued

Streets and parking lots	Recreation				Sanitary land fills	Cemeteries
	Athletic fields and other areas of intensive play	Parks and extensive play areas	Campsites			
			Tents	Trailers		
Moderate: slope; moderate susceptibility to frost action.	Severe: very slow permeability.	Slight.	Severe: very slow permeability.	Severe: very slow permeability.	Severe: clayey texture.	Severe: very slow permeability.
Severe: slope; moderate susceptibility to frost action.	Severe: very slow permeability; slope.	Moderate: slope.	Severe: very slow permeability.	Severe: very slow permeability; slope.	Severe: clayey texture.	Severe: very slow permeability.
Severe: slope; moderate susceptibility to frost action.	Severe: very slow permeability; slope.	Severe: slope; clayey texture.	Severe: very slow permeability; clayey texture.	Severe: very slow permeability; clayey texture; slope.	Severe: clayey texture.	Severe: very slow permeability; clayey surface layer.
Severe: slope; moderate susceptibility to frost action.	Severe: slope; very slow permeability.	Severe: slope; clayey texture.	Severe: very slow permeability; clayey texture; slope.	Severe: very slow permeability; clayey texture; slope.	Severe: clayey texture; slope.	Severe: slow permeability; clayey surface layer; slope.
Severe: subject to flooding; moderate susceptibility to frost action.	([3])	([3])	Severe: subject to flooding.	Severe: subject to flooding.	Severe:[2] subject to flooding.	Severe: subject to flooding.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe:[2] very poorly drained; rapid permeability in substratum.	Severe: very poorly drained.
Moderate: somewhat poorly drained; high susceptibility to frost action.	Severe: very slow permeability.	Moderate: somewhat poorly drained.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; very slow permeability.
Moderate: somewhat poorly drained; slope; high susceptibility to frost action.	Severe: very slow permeability.	Moderate: somewhat poorly drained.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; very slow permeability.
Moderate where slopes are 2 to 6 percent; severe where slopes are 6 to 12 percent.	Severe where slopes are 6 to 12 percent; sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture; slope.	Severe:[2] rapid permeability.	Severe: sandy texture.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Oshtemo: OsB	Moderate: low available moisture capacity.	Slight [2]	Severe: [2] moderately rapid permeability.	Slight	Moderate: low available moisture capacity.
Ottokee: OtB	Moderate: low available moisture capacity; hazard of soil blowing.	Slight: [2] rapid permeability.	Severe: [2] rapid permeability.	Slight	Severe: low available moisture capacity.
Paulding: Pa	Moderate: seasonal wetness; high content of clay.	Severe: very poorly drained; very slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.
Rawson: RaB, RdB, ReB	Slight	Severe: very slow permeability in substratum.	Moderate: slope; moderate permeability in upper 20 to 40 inches.	Slight	Slight
Rimer: RfA, RmA	Slight	Severe: very slow permeability.	Severe: upper 20 to 40 inches of sandy material has rapid permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Roselms: RoA	Moderate: seasonal wetness.	Severe: very slow permeability.	Slight	Moderate: somewhat poorly drained.	Severe: very slow permeability.
Ross: Rs	Slight	Severe: [2] subject to flooding.	Severe: [2] subject to flooding.	Severe: subject to flooding.	(3)

See footnotes at end of table.

limitations for specified land uses—Continued

Streets and parking lots	Recreation: Athletic fields and other areas of intensive play	Recreation: Parks and extensive play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills	Cemeteries
Moderate: slope.	Moderate: slope.	Slight	Slight	Moderate: slope.	Severe:[2] moderately rapid permeability.	Slight.
Moderate: slope.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe:[2] rapid permeability.	Severe: sandy texture.
Severe: very poorly drained; moderate to high susceptibility to frost action.	Severe: very poorly drained; very slow permeability; clay texture.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; clay texture.	Severe: very poorly drained; very slow permeability; clay texture.
Moderate: slope; moderate susceptibility to frost action.	Moderate to severe: very slow permeability below a depth of 20 to 40 inches.	Slight	Moderate to severe: very slow permeability below a depth of 20 to 40 inches.	Moderate to severe: very slow permeability below a depth of 20 to 40 inches.	Moderate: moderate permeability in upper 20 to 40 inches.	Moderate to severe: very slow permeability below a depth of 20 to 40 inches.
Moderate: somewhat poorly drained; moderate to high susceptibility to frost action.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; very slow permeaability.
Moderate: somewhat poorly drained; moderate to high susceptibility to frost action.	Severe: very slow permeability.	Moderate: somewhat poorly drained.	Severe: very slow permeability.	Severe: very slow permeability.	Severe: clay texture.	Severe: somewhat poorly drained; very slow permeability.
Severe: subject to flooding; low to moderate susceptibility to frost action.	(3)	(3)	Severe: subject to flooding.	Severe: subject to flooding.	Severe:[2] subject to flooding.	Severe: subject to flooding.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
St. Clair:					
SbB2	Moderate: slope; hazard of erosion.	Severe: very slow permeability.	Moderate: slope.	Slight	Severe: very slow permeability.
SbC2	Severe: slope; hazard of erosion.	Severe: very slow permeability.	Severe: slope	Moderate: slope.	Severe: very slow permeability.
ScC3	Severe: slope; hazard of erosion.	Severe: very slow permeability.	Severe: slope	Moderate: slope.	Severe: very slow permeability; slope; hazard of erosion.
ScD3, ScE3, ScF3	Severe: slope; hazard of erosion.	Severe: very slow permeability; slope.	Severe: slope	Severe: slope	Severe: very slow permeability; slope; severe hazard of erosion.
Seward:					
SdB, SeB	Slight	Severe:[2] slow permeability within a depth of 20 to 40 inches.	Severe:[2] rapid permeability in the upper 20 to 40 inches.	Slight	Moderate: sandy surface layer.
SdC, SeC	Moderate: slope; hazard of erosion.	Severe:[2] slow permeability within a depth of 20 to 40 inches.	Severe: slope; rapid permeability in the upper 20 to 40 inches.	Moderate: slope.	Moderate: sandy surface layer.
SdD	Severe: slope; hazard of erosion.	Severe:[2] slope; slow permeability within a depth of 20 to 40 inches.	Sévere: slope; rapid permeability in the upper 20 to 40 inches.	Severe: slope	Severe: slope
Shinrock, sandy subsoil variant: SfA.	Slight	Slight [2]	Severe:[2] rapid permeability in the substratum.	Slight	Slight
Shoals: Sh	Slight	Severe:[2] subject to flooding.	Severe:[2] subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Sloan: So	Moderate: subject to flooding; seasonal wetness.	Severe:[2] subject to flooding.	Severe:[2] subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.

See footnotes at end of table.

limitations for specified land uses—Continued

Streets and parking lots	Recreation: Athletic fields and other areas of intensive play	Recreation: Parks and extensive play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills	Cemeteries
Moderate: slope; moderate susceptibility to frost action.	Severe: very slow permeability.	Slight.	Severe: very slow permeability.	Severe: very slow permeability.	Severe: clay texture.	Severe: very slow permeability.
Severe: slope; moderate susceptibility to frost action.	Severe: slope; very slow permeability.	Moderate: slope.	Severe: very slow permeability.	Severe: very slow permeability; slope.	Severe: clay texture.	Severe: very slow permeability.
Severe: slope; moderate susceptibility to frost action.	Severe: very slow permeability; slope; clayey texture.	Severe: slope; clayey texture.	Severe: very slow permeability; clayey texture.	Severe: very slow permeability; clayey texture; slope.	Severe: clay texture.	Severe: very slow permeability; clayey texture.
Severe: slope; moderate susceptibility to frost action.	Severe: slope; clayey texture.	Severe: slope; clayey texture.	Severe: very slow permeability; clayey texture; slope.	Severe: very slow permeability; clayey texture; slope.	Severe: slope; clayey texture.	Severe: slope; very slow permeability.
Moderate: slope; moderate to low susceptibility to frost action.	Moderate to severe: slow permeability below a depth of 20 to 40 inches.	Slight.	Moderate to severe: slow permeability within a depth of 20 to 40 inches.	Moderate to severe: slope; slow permeability within a depth of 20 to 40 inches.	Severe:[2] rapid permeability in the upper 20 to 40 inches.	Severe: slow permeability in the substratum.
Severe: slope; moderate susceptibility to frost action.	Severe: slope; slow permeability within a depth of 20 to 40 inches.	Moderate: slope.	Moderate to severe: slow permeability within a depth of 20 to 40 inches.	Severe: slope.	Severe:[2] rapid permeability in the upper 20 to 40 inches.	Severe: slow permeability in the substratum.
Severe: slope; moderate susceptibility to frost action.	Severe: slope; slow permeability below a depth of 20 to 40 inches.	Severe: slope.	Severe: slope.	Severe: slope.	Severe:[2] rapid permeability in the upper 20 to 40 inches.	Severe: slow permeability in the substratum; slope.
Slight: moderate susceptibility to frost action.	Slight to moderately slow permeability in subsoil.	Slight.	Slight.	Slight.	Severe:[2] rapid permeability in substratum.	Slight.
Severe: subject to flooding; high susceptibility to frost action.	Severe:[3] subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: very poorly drained; subject to flooding; high susceptibility to frost action.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Spinks:					
SpB	Moderate: very low available mositure capacity; hazard of soil blowing.	Slight [2]	Severe [2]: moderately rapid permeability.	Slight	Severe: very low available moisture capacity; sandy texture.
SpC	Moderate: very low available mositure capacity; hazard of soil blowing; slope.	Moderate: [2] slope.	Severe: [2] moderately rapid permeability.	Moderate: slope	Severe: very low available moisture capacity; sandy texture.
SpD	Severe: very low available moisture capacity; hazard of soil blowing; slope.	Severe: [2] slope	Severe: slope; moderately rapid permeability.	Severe: slope	Severe: very low available moisture capacity; slope; sandy texture.
Tedrow: TdA	Slight	Moderate: [2] somewhat poorly drained.	Severe: [2] rapid permeability.	Moderate: somewhat poorly drained.	Severe: low available moisture capacity.
Tedrow, silty subsoil variant: TeA.	Slight	Severe: moderately slow permeability within a depth of 40 inches.	Severe: [2] rapid permeability and lateral seepage in upper 30 inches.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; low available moisture capacity.
Toledo: To, Tt	Moderate: seasonal wetness.	Severe: very poorly drained; slow permeability.	Slight	Severe: very poorly drained; clayey surface layer.	Severe: very poorly drained.
Tuscola:					
TuB2	Slight	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Slight	Slight
TuC2	Moderate: slope; hazard of erosion.	Moderate: moderate permeability; slope.	Severe: slope	Moderate: slope	Moderate: slope.
Urban land: Ur. Limitations too variable to be estimated.					

See footnotes at end of table.

limitations for specified land uses—Continued

Streets and parking lots	Recreation: Athletic fields and other areas of intensive play	Recreation: Parks and extensive play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills	Cemeteries
Moderate: slope.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe:[2] moderately rapid permeability; sandy texture.	Severe: sandy texture.
Severe: slope	Severe: slope; sandy texture.	Severe: sandy texture.	Severe: sandy texture.	Severe: sandy texture; slope.	Severe:[2] slope; moderately rapid permeability; sandy texture.	Severe: sandy texture.
Severe: slope	Severe: sandy texture; slope.	Severe: sandy texture; slope.	Severe: sandy texture; slope.	Severe: sandy texture; slope.	Severe:[2] slope; sandy texture; moderately rapid permeability.	Severe: sandy texture; slope.
Moderate: somewhat poorly drained; moderate susceptibility to frost action.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained; sandy surface layer.	Severe:[2] rapid permeability.	Severe: some what poorly drained.
Moderate: somewhat poorly drained, moderate susceptibility to frost action.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained; sandy surface layer.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained.
Severe: very poorly drained; slow permeability; clayey surface layer; high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained; slow permeability; clayey surface layer.	Severe: very poorly drained; slow permeability; clayey surface layer.	Severe: very poorly drained; slow permeability; clayey surface layer.	Severe: very poorly drained; clayey texture.	Severe: very poorly drained; slow permeability; clayey surface layer.
Moderate: slope; high susceptibility to frost action.	Moderate: slope.	Slight	Slight	Moderate: slope.	Slight	Slight.
Severe: slope; high susceptibility to frost action.	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Cultivated crops	Disposal of sewage effluent from septic tanks	Sewage lagoons	Homesite location for homes of three stories or less [1]	Lawns, landscaping, and golf fairways
Vaughnsville: VaA	Slight	Severe: [2] slow permeability.	Moderate: [2] moderate permeability in upper 24 to 30 inches.	Slight to moderate: moderately well drained to somewhat poorly drained.	Moderate: moderately well drained to somewhat poorly drained.
Wabasha: Wa	Moderate: seasonal wetness; subject to flooding.	Severe: very poorly drained; slow permeability; subject to flooding.	Severe: subject to flooding.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; slow permeability; subject to flooding.
Warners: Wc	Severe: seasonal wetness.	Severe: [2] very poorly drained; organic and mineral soil material; high water table.	Severe: [2] permeable substratum.	Severe: very poorly drained; soft material when wet.	Severe: very poorly drained.
Wauseon: Wf, Wg	Slight	Severe: [2] very poorly drained.	Severe: [2] rapid permeability in upper 20 to 40 inches.	Severe: very poorly drained.	Severe: very poorly drained.

[1] The rating in this column also applies to small industrial, institutional, and commercial locations where the planned buildings are three stories or less.

[2] Pollution is a hazard if the soil is used for this purpose. Some of the soils are porous, including the substratum. If the alluvial soils and other soils subject to flooding are used for this purpose, extensive surface water pollution can be expected.

limitations for specified land uses—Continued

Streets and parking lots	Recreation				Sanitary land fills	Cemeteries
	Athletic fields and other areas of intensive play	Parks and extensive play areas	Campsites			
			Tents	Trailers		
Moderate: moderately well drained to somewhat poorly drained; moderate susceptibility to frost action.	Moderate: moderately well drained to somewhat poorly drained.	Slight	Moderate: moderately well drained to somewhat poorly drained.	Moderate: moderately well drained to somewhat poorly drained.	Moderate:[3] moderate permeability in upper 24 to 30 inches.	Moderate to severe: moderately well drained to somewhat poorly drained.
Severe: very poorly drained; subject to flooding; moderate to high susceptibility to frost action.	Severe: very poorly drained; subject to flooding; slow permeability.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding; slow permeability.	Severe: very poorly drained; subject to flooding. slow permeability.	Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding; slow permeability.
Severe: very poorly drained; soft material when wet; high to moderate susceptibility to frost action.	Severe: very poorly drained; muck surface layer.	Severe: very poorly drained; soft material when wet; muck surface layer.	Severe: very poorly drained; soft material when wet; muck surface layer.	Severe: very poorly drained; muck surface layer; soft material when wet.	Severe:[2] very poorly drained; high organic-matter content.	Severe: very poorly drained.
Severe: very poorly drained; high susceptibility to frost action.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe:[2] very poorly drained.	Severe: very poorly drained.

[3] Rating depends on frequency and duration of flooding.

The expansion of town and country uses of land in the county can, in a short period, remove many acres from farm use. Freeways can displace as much as 50 acres per mile. Shopping centers can easily replace 25 to 50 acres of farmland. These uses permanently remove land from farming.

Community planners and industrial users of land commonly look for nearly level soils that have other soil properties favorable to development. In Henry County most of the nearly level soils have other properties that are limitations to development. These soils have limitations to their use for farming that are easily overcome, and they are important to farming in the county and in the State. Hoytville, Mermill, Millgrove, and Toledo soils are of this kind.

Comparisons can be made among the soils in the county for any particular planning problem. Planning individuals and groups can find other useful information on the soil maps and in other parts of this survey. From the estimated degree and kinds of limitations of soils for selected land uses in table 7, knowledgeable alternatives can be chosen as a basis for long-range planning and zoning. Because extensive manipulation of the soil alters some of its natural properties, the ratings for some uses may not apply in areas where there has been extensive cutting and filling.

Any one soil property may impose a degree of limitation for a specified land use. This same soil property can be more, or less, limiting for some other specified land use. To provide a comparative scale, the estimated degree of limitation for each soil and specified land use is rated as slight, moderate, and severe. A rating of *slight* indicates that the soil presents no important limitation to the specified use. *Moderate* shows that the soil has some limitations to the specified use. The limitations need to be recognized, but they can be overcome or corrected. *Severe* indicates that the soil has serious limitations for the specific use. These limitations are difficult and costly to overcome. A rating of severe does not mean that the soil cannot be used for the specific use, but it suggests that an alternative site or sites that have slight or moderate limitations should be selected. Choice of a site rated severe for a particular use commonly results in expensive continuing maintenance and upkeep. Following are explanations of the uses rated in table 7.

Most of the land in Henry County is used for farming. Most changes in land use involve the conversion of farmland to town and country uses. Such changes in land use tend to be irreversible. In table 7, the soils have been rated for use for cultivated crops. The rating is based on such limitations as slope, erosion, wetness, and droughtiness. The use of the soils for cultivated crops is rated in this table to aid land-use planners who are considering farming as a sound land use. Table 7 shows that many of the soils rated have a slight limitation to their use for cultivated crops, but that they have a severe limitation for many other uses.

The suitability of soils for disposal of effluent from septic tanks depends on permeability, slope, natural drainage, depth to the water table, and the hazard of flooding. The permeability of each soil in the county is shown in table 5.

If filter fields for septic tanks are located on slopes of more than 12 percent, erosion and seepage downslope can be a hazard or the soil may be unstable when saturated. A severe limitation is imposed by a restrictive layer, such as solid bedrock, a layer of dense, compact material, or a layer of clay that interferes with adequate filtration and the removal of the effluent from the soil.

Some soils in the county have a gravelly and sandy substratum through which effluent that is inadequately filtered can contaminate ground water or nearby springs, lakes, or streams. Before a septic tank system is installed, an onsite investigation should be made at the proposed site to evaluate related site factors other than the soil properties discussed in this section.

Sewage lagoons are shallow ponds that are built to dispose of sewage through oxidation. They may be needed in an area if septic tanks or a central sewage system is not feasible or practical. Among the features that control the degree of limitation are the hazard of flooding, percent of slope, and permeability of the soil.

Ratings for homesite location for homes of three stories or less that have a basement also apply to sites for small industrial, commercial, and institutional buildings.

Most of the acreage being converted from farming to town and country uses is in new residential developments. These areas generally surround present urban areas. Individual houses or small groups of houses also are being built throughout the county.

Ratings are based on soil properties and related site characteristics, such as slope, natural drainage, and hazard of flooding.

The method of sewage disposal is not considered in the homesite location column.

Homes on such naturally wet soils as Hoytville, Nappanee, Toledo, Fulton, Granby, and Lenawee are likely to have wet basements if adequate drainage is not provided. In many areas in the county, well-developed systems of tile and open-ditch drains have been installed for cropland drainage. Excavations in these areas for structures, such as homesites, can disrupt the established drainage system and change it back to its natural condition of wetness.

On soils that are subject to flooding, there is a special hazard to life and property if the soils are used for building sites (fig. 8). Buildings on flood plains tend to restrict the flow of floodwater and can result in higher flood crests upstream.

Some of the soils, such as Colwood, Kibbie, and Tuscola soils, have a high content of silt. Such soils are not so favorable for supporting structural foundations as soils that are coarser textured, such as Oshtemo or Haney soils. Soils having a high shrink-swell potential are likely to heave and crack foundations unless special precautions are observed. A high shrink-swell potential also affects the alignment of sidewalks, patios, and rock walls. To minimize this effect, a subgrade or layers of sandy or gravelly material directly below the structure is desirable.

On soils that have slopes of more than 12 percent, erosion is a hazard and excavating and leveling are difficult.

Some soils in the county are suitable sources of topsoil for lawns, landscaping, and golf fairways. The suitability of the soils for topsoil is indicated in table 6. During construction the upper foot of natural surface soil can be scalped and pushed aside into a stockpile. It can then be distributed back over the area after grading has been

Figure 8.—**Flooding along the Maumee River. Flooding is a severe limitation for houses and cottages on soils subject to flooding.**

Figure 9.—**This lake, used for recreation, was constructed in Shoals silty clay loam on a narrow flood plain.**

completed. In most areas this provides a better root zone for lawns, flowers, shrubs, and trees than subsoil material exposed during construction. The natural surface soil in areas being developed for streets can be scalped in a like manner and used to improve adjacent areas where it is most needed.

The features that determine whether a good lawn or golf fairway can be established are natural soil drainage, degree of slope, texture of the surface soil, and hazard of flooding.

The ratings given for the use of soils for streets and parking lots apply to streets and parking lots that are in subdivisions and are not subject to continual heavy traffic. Features that affect this use are natural drainage, slope, and hazard of flooding. Tables 5 and 6 give other information about the soils that are important for streets and parking lots. The degree of slope that should be designed for the sides of cuts and fills depends on the erodibility of the soil and its capacity to support close-growing vegetation.

Recreation is becoming increasingly important in Henry County. Potentially, all the soils of the county are suitable for one or more kinds of recreational development. Some soils on flood plains are well suited to some kinds of recreation because they generally occur in long, winding areas along streams and are adjacent to scenic hills (fig. 9). Use of these soils for homes, highways, and other nonfarm uses is severely limited by flooding, and construction in these areas may hold back the natural flow of floodwater. Among the kinds of recreational facilities that can be developed in some areas on flood plains are extensive play areas. Also suitable are such intensive play areas as ball diamonds, picnic areas, and tennis courts that are not used during the normal period of flooding and are not subject to costly damage by floodwater. Flooding can cause costly damage to recreational facilities. A determination of flooding frequency and duration in a local area is needed to properly evaluate the limitations for recreational uses.

Athletic fields and other intensive play areas are fairly small tracts used for baseball, football, tennis, volleyball, badminton, and other sports. Because the areas must be nearly level, considerable shaping may be needed. Consequently, slopes of more than 2 percent are a limitation. The texture of the surface layer, permeability, natural drainage, and hazard of flooding are also important.

Parks and extensive play areas can be located on many kinds of soil. Areas consisting of different kinds of soil provide a variety of wildlife and natural vegetation. Considered in rating the soils for picknicking, related hiking, nature study, and similar uses are degree of slope, texture of the surface soil, natural drainage, and hazard of flooding. Paths in picnic and play areas should be constructed and maintained in a way that helps to control erosion.

Campsites for tents and trailers should be located in areas where the landscape is attractive, the trafficability is good, and the productivity of grasses and trees is medium or high. Soils in which the natural drainage is good or moderately good have less severe limitations than wetter soils. Level areas are better suited than sloping areas. Soils that are firm when moist and nonsticky when wet are most desirable. Among the soils most suitable for campsites are those having a surface layer of loam, silt loam, very fine sandy loam, fine sandy loam, and sandy loam.

Deep, well-drained, loamy soils that are nearly level and slowly permeable have the fewest limitations for use for sanitary land fills. Few soils, however, have this combination of properties. Limitations that affect the use of soils for sanitary land fills are slope, somewhat poor to very poor natural drainage; clayey or sandy texture, rapid permeability, and hazard of flooding. Sanitary land fills present a hazard to underground water supplies and nearby springs and streams unless they are developed in soils that minimize this hazard.

For use as cemeteries, soils that have the fewest limitations are deep, are well drained or moderately well drained, and have slopes of less than 12 percent. Soils that are somewhat poorly drained to very poorly drained have a seasonally high water table that limits use for cemeteries. Flooding also is a limitation to cemetery use. If the water table is permanently lowered, limitations are only slight or moderate on some soils. A clayey or sandy surface layer is a limitation to the development of a good grass cover.

The installation and maintenance of utility lines is affected by soil properties but is not rated in table 7. Natural drainage, water table characteristics, and corrosion potential are among the outstanding properties affecting utility lines. Corrosion potential of all the soils in the county has been rated in table 5. The soil descriptions and table 5 point out other properties important to installation and maintenance problems. During the planning stages, routing of utility lines can be facilitated by the soil survey. The establishment of and the control and maintenance of vegetation on utility right-of-ways are also related to soil properties.

Descriptions of the Soils

This section describes the soil series and mapping units in Henry County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

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

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

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page on which each soil is described and the page for the description of each capability unit can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 8. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*17*).

Adrian Series

In the Adrian series are dark-colored, organic soils that are very poorly drained. These soils consist of layers of muck that are underlain by calcareous sandy material. They occupy low depressional areas on the lake plain in the northeastern part of Liberty Township and the northwestern part of Washington Township. The native vegetation on these soils was mixed hardwoods, and reeds, sedges, and grasses common to bogs or marshy areas.

In a representative profile of an Adrian soil that is cultivated, the surface layer is black muck to a depth of 22 inches. Below the muck is calcareous sand.

Adrian soils have moderately rapid permeability in the muck layers and rapid permeability in the sandy layers. They are seasonally saturated for long periods unless they have been adequately drained. They have medium to high available moisture capacity. The root zone is deep in summer when the water table is low and in artificially drained areas.

Adrian soils are used for cultivated crops in a few places, but most areas are undrained and swampy. Cultivated areas have been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Adrain muck, in a cultivated field in Washington Township (W½NW¼SW¼NW¼ sec. 20, T. 6 N., R. 8 E.):

Oa1—0 to 8 inches, black (10YR 2/1) muck (sapric material); moderate, medium, granular structure; very friable; many roots; neutral; abrupt, smooth boundary.

Oa2—8 to 15 inches, black (10YR 2/1) muck (sapric material); weak, fine and medium, subangular blocky structure; very friable; many roots; neutral; clear, smooth boundary.

Oa3—15 to 22 inches, black (N 2/0) muck (sapric material); moderate, coarse, angular blocky structure; friable; many roots; neutral; abrupt, smooth boundary.

IIC—22 to 50 inches, gray (10YR 5/1 to 6/1) fine sand; common, medium, distinct, brown (10YR 5/3) and yellowish-brown (10YR 5/4) mottles; single grain; loose; moderately alkaline; calcareous.

The thickness of the muck ranges from 16 to 50 inches. The thickness of the muck and the depth to carbonates generally are the same, but the Oa3 horizon can be mildly alkaline. The muck layers range from strongly acid to mildly alkaline. The dark-colored layers are black (10YR 2/1 to N 2/0), very dark brown (10YR 2/2), or very dark gray (10YR 3/1). The IIC horizon is commonly gray (10YR 5/1 to 6/1) or pale brown (10YR 6/3) and commonly is mottled with brown (10YR 5/3) and yellowish brown (10YR 5/4 to 5/6). This horizon generally is fine sand but ranges to loamy fine sand or loamy sand.

Adrian soils differ from very poorly drained Warners soils by having a IIC horizon that is sandy rather than marly. They also have thicker upper layers that are higher in content of organic matter than those in Warners soils. They are organic soils in contrast to Granby and other very poorly drained soils in the county, which are mineral soils.

Adrian muck (Ad).—This nearly level soil is in swampy, depressional areas that range from about 1½ to 10 acres in size.

Included with this soil in mapping are areas of Granby loamy fine sand that are 1 to 5 acres in size. These areas occur as a circular belt around the outside edge of the muck pockets. Also included are areas of lighter colored Tedrow soils, a few areas of Warners muck, and drained areas where the muck is as thin as 13 inches.

Wetness is the major limitation. Many of the muck pockets are difficult to drain for lack of suitable outlets (fig. 10). Drained areas are subject to subsidence because of oxidation of the muck. When the surface of the muck

TABLE 8.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Adrian muck	144	0.1	Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded	281	.1
Arkport fine sand, 2 to 6 percent slopes	208	.1	Oakville fine sand, 2 to 12 percent slopes	746	.3
Arkport fine sand, 6 to 12 percent slopes	107	(1)	Oshtemo sandy loam, 2 to 6 percent slopes	349	.1
Clay pits	124	.1	Ottokee fine sand, 1 to 5 percent slopes	5,557	2.0
Cohoctah fine sandy loam	100	(1)	Paulding clay	642	.2
Colwood loam	2,391	.9	Rawson sandy loam, 2 to 6 percent slopes	106	(1)
Colwood silt loam	501	.2	Rawson loam, 2 to 6 percent slopes	129	.1
Cut and fill land	581	.2	Rawson fine sandy loam, stratified substratum, 2 to 6 percent slopes	85	(1)
Del Rey loam, 0 to 2 percent slopes	521	.2	Rimer loamy fine sand, 0 to 2 percent slopes	2,564	.9
Del Rey silt loam, 0 to 2 percent slopes	701	.3	Rimer loamy fine sand, stratified substratum, 0 to 2 percent slopes	1,792	.6
Digby fine sandy loam, 0 to 2 percent slopes	1,004	.4	Roselms silty clay loam, 0 to 2 percent slopes	96	(1)
Digby loam, 0 to 2 percent slopes	1,463	.6	Ross loam	547	.2
Fulton loam, 0 to 2 percent slopes	2,088	.8	St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded	152	.1
Fulton loam, 2 to 6 percent slopes	291	.1	St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded	258	.1
Fulton silty clay loam, 0 to 2 percent slopes	2,741	1.0	St. Clair silty clay, 6 to 12 percent slopes, severely eroded	272	.1
Fulton silty clay loam, 2 to 6 percent slopes	481	.2	St. Clair silty clay, 12 to 18 percent slopes, severely eroded	438	.2
Fulton loam, sandy subsoil variant, 0 to 2 percent slopes	226	.1	St. Clair silty clay, 18 to 25 percent slopes, severely eroded	113	(1)
Galen fine sand, 0 to 2 percent slopes	129	.1	St. Clair silty clay, 25 to 45 percent slopes, severely eroded	484	.2
Galen fine sand, 2 to 6 percent slopes	1,073	.4	Seward loamy fine sand, 2 to 6 percent slopes	785	.3
Genesee loam	372	.1	Seward loamy fine sand, 6 to 12 percent slopes	108	(1)
Gilford fine sandy loam	2,547	1.0	Seward loamy fine sand, 12 to 18 percent slopes	55	(1)
Granby loamy fine sand	6,281	2.4	Seward loamy fine sand, stratified substratum, 2 to 6 percent slopes	451	.2
Gravel pits	17	(1)	Seward loamy fine sand, stratified substratum, 6 to 12 percent slopes	118	(1)
Haney fine sandy loam, 0 to 2 percent slopes	150	.1	Shinrock silt loam, sandy subsoil variant, 0 to 2 percent slopes	162	.1
Haney fine sandy loam, 2 to 6 percent slopes	160	.1	Shoals silt loam	1,575	.6
Haney loam, 0 to 2 percent slopes	394	.2	Sloan silty clay loam	1,975	.7
Haney loam, 2 to 6 percent slopes	233	.1	Spinks fine sand, 2 to 6 percent slopes	156	.1
Haney and Rawson loams, 6 to 12 percent slopes	92	(1)	Spinks fine sand, 6 to 12 percent slopes	218	.1
Haskins fine sandy loam, 0 to 2 percent slopes	2,403	.9	Spinks fine sand, 12 to 18 percent slopes	66	(1)
Haskins loam, 0 to 2 percent slopes	5,148	1.9	Tedrow loamy fine sand, 0 to 2 percent slopes	3,029	1.1
Haskins fine sandy loam, stratified substratum, 0 to 2 percent slopes	2,221	.8	Tedrow loamy fine sand, silty subsoil variant, 0 to 2 percent slopes	294	.1
Hoytville clay loam	803	.3	Toledo silty clay loam	3,984	1.5
Hoytville clay	142,654	53.6	Toledo silty clay	3,263	1.2
Hoytville clay, thin solum variant	166	(1)	Tuscola loam, 2 to 6 percent slopes, moderately eroded	153	.1
Kibbie fine sandy loam, 0 to 2 percent slopes	758	.3	Tuscola loam, 6 to 12 percent slopes, moderately eroded	183	.1
Kibbie loam, 0 to 2 percent slopes	442	.2	Urban land	285	.1
Latty clay	3,137	1.2	Vaughnsville loam, 0 to 2 percent slopes	65	(1)
Lenawee loam	353	.1	Wabasha silty clay	563	.2
Lenawee silty clay loam	3,130	1.2	Warners muck	67	(1)
Lucas silty clay loam, 2 to 6 percent slopes, moderately eroded	133	.1	Wauseon fine sandy loam	140	.1
Lucas silty clay loam, 6 to 12 percent slopes, moderately eroded	173	.1	Wauseon loamy fine sand, stratified subsratum	78	(1)
Lucas silty clay, 6 to 12 percent slopes, severely eroded	373	.1	Water and ponds	398	.2
Lucas silty clay, 12 to 45 percent slopes, severely eroded	481	.2	Total	266,240	100.0
Medway silt loam	296	.1			
Mermill loam	8,813	3.4			
Mermill clay loam	4,287	1.6			
Mermill loam, stratified substratum	3,216	1.2			
Millgrove loam	13,707	5.1			
Millgrove clay loam	853	.3			
Nappanee loam, 0 to 2 percent slopes	2,778	1.0			
Nappanee loam, 2 to 6 percent slopes	240	.1			
Nappanee silty clay loam, 0 to 2 percent slopes	11,183	4.2			
Nappanee silty clay loam, 2 to 6 percent slopes	590	.2			

[1] Less than 0.1 percent.

Figure 10.—**Undrained pocket of Adrian muck in Washington Township.**

is dry, it is subject to soil blowing and fire. Capability unit IVw-1.

Arkport Series

The Arkport series consists of deep, gently sloping to sloping, sandy soils that are well drained. These soils formed in thick sandy material on the crests and slopes of dunes and ridges on the lake plain in Liberty and Washington Townships.

In a representative profile of an Arkport soil that is cultivated, the plow layer is dark grayish-brown fine sand about 8 inches thick. The subsurface layer, to a depth of 24 inches, is light yellowish-brown fine sand. The subsoil layers are in thick bands, or lamellae, between depths of 24 and 58 inches. They are strong brown in contrast to layers above and below and are slightly more clayey than the surface layer. The underlying material, between depths of 58 to 75 inches, is calcareous fine sand.

Arkport soils have moderately rapid permeability. They have low available moisture capacity and a deep root zone. They are subject to severe soil blowing during windy periods if they are bare. Arkport soils can be medium acid within the upper 2 feet.

Arkport soils are used mainly for cultivated crops and woodland.

Representative profile of Arkport fine sand, 2 to 6 percent slopes, along a roadcut in Washington Township (SE¼SE¼SE¼NW¼ sec. 19, T. 6 N., R. 8 E.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2, 4/2 rubbed) fine sand; weak, fine, granular structure; loose; many roots; some mixing with A2 horizon in lowermost inch; medium acid; abrupt, smooth boundary.

A21—8 to 24 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; many roots; few, fine, yellowish-brown (10YR 5/6) spots of iron oxide; slightly acid; abrupt, wavy boundary.

B21t—24 to 29 inches, strong-brown (7.5YR 5/6) fine sandy loam; moderate, medium, subangular blocky structure; friable; common roots; thin, patchy, dark-brown (7.5YR 4/4) clay films on vertical ped faces; medium acid; abrupt, wavy boundary.

A22—29 to 34 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; few roots; common, fine, strong-brown (7.5YR 5/6) spots of iron oxide; some nodules of dark-brown (7.5YR 4/4) fine sandy loam scattered within horizon; slightly acid; abrupt, wavy boundary.

B22t—34 to 51 inches, strong-brown (7.5YR 5/6) fine sandy loam; moderate, medium, subangular blocky structure; firm; few roots; thin, patchy, dark-brown clay films, primarily on vertical ped faces, very patchy on horizontal ped faces; horizon contains pockets of light yellowish-brown (10YR 6/4) fine sand about 11 inches thick and 8 to 15 inches wide; sand in the pockets is single grain and loose; slightly acid; gradual, smooth boundary.

B23t—51 to 58 inches, strong-brown (7.5YR 5/6) fine sandy loam; moderate, medium, subangular blocky structure; friable; few roots; thin, patchy, dark-brown (7.5YR 4/4) clay films on vertical ped faces, very patchy on horizontal faces; neutral; abrupt, wavy boundary.

C—58 to 75 inches, olive-yellow (2.5Y 6/6) fine sand; common, medium, brownish-yellow (10YR 6/6) and light-gray (10YR 7/2) mottles; single grain; loose; mildly alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from about 44 to 65 inches, but in some places the depth to carbonates is 1 foot to 2 feet below the solum.

The Ap horizon is 3 to 8 inches thick, depending on soil loss through soil blowing. The Ap horizon generally is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The A2 horizon is light yellowish brown (10YR 6/4), brownish yellow (10YR 6/6), or yellowish brown (10YR 5/6). The texture of the A2 horizon is commonly fine sand, but it ranges to loamy fine sand.

The B2t horizon generally is strong brown (7.5YR 5/6 and 7.5YR 5/8), but in some places it ranges to dark brown (7.5YR 4/4). The dominant texture is fine sandy loam, but in some places there are layers of loamy fine sand or light sandy clay loam. The B2t horizon occurs either as a continuous layer ranging from about 10 to 34 inches in thickness or as a horizon that has common pockets of sand, or in some places it occurs as several bands or lamella 4 to 10 inches in thickness.

The C horizon is commonly light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/4), or pale brown (10YR 6/3), but it ranges to olive yellow (2.5Y 6/6) or light olive brown (2.5Y 5/4). This horizon generally is fine sand, but layers of loamy fine sand, loamy sand, and medium sand occur in some places.

Arkport soils are the well drained members of a drainage sequence that includes the moderately well drained Galen soils. They are adjacent to these soils in many places. They are commonly adjacent to somewhat poorly drained Tedrow soils and very poorly drained Granby soils. In some places they are adjacent to Spinks, Oakville, and Ottokee soils. Arkport soils are similar to those soils in some properties, but they have thicker Bt layers.

Arkport fine sand, 2 to 6 percent slopes (ArB).—This soil occupies sand ridges or dunes. A profile of this soil is described as representative for the series. This soil is slightly less droughty than the more sloping Arkport soil. Partly because of soil losses through soil blowing, the content of organic matter is low.

Included with this soil in mapping are some areas of slightly wetter, less sloping Ottokee and Galen soils and small areas of the more droughty Oakville soils.

A moderate hazard of erosion is the major limitation to farming, but droughtiness is almost as severe a limitation. Soil blowing is a hazard during periods of high winds. Droughtiness and moderately rapid permeability are limitations for some nonfarm uses. Capability unit IIe-2.

Arkport fine sand, 6 to 12 percent slopes (ArC).—This sloping soil is on sand ridges or dunes. It generally is more droughty than Arkport fine sand, 2 to 6 percent slopes. Partly because of soil losses through soil blowing, the content of organic matter is low.

Included with this soil in mapping are small areas of Oakville soils, small areas of gently sloping Arkport soils, and a few areas of soils that have slopes of more than 12 percent.

A severe hazard of erosion is the major limitation to farming, but droughtiness is almost as severe a limitation. Soil blowing is severe during periods of high winds if the soil is not protected by a thick plant cover. Slope, moderately rapid permeability, and droughtiness are limitations for some nonfarm uses. Capability unit IIIe–3.

Clay Pits

Clay pits (Ca) is a miscellaneous land type made up of excavated areas from which the soil material has been removed to manufacture clay tile. The surface layer and subsoil of the original soils have been removed. Some of the pits are no longer used, but others are being enlarged as clay is removed. Capability unit not assigned.

Cohoctah Series

The Cohoctah series consists of nearly level, dark-colored soils that are very poorly drained. These soils formed in alluvium on the flood plain along Dry Creek in the northern part of Liberty Township. They are flooded during periods of high water. Flooding occurs mainly during winter, but it also occurs at other times of the year.

In a representative profile of a Cohoctah soil that is cultivated, the plow layer is very dark gray fine sandy loam about 11 inches thick. The subsoil, between depths of 11 and 44 inches, is gray or dark-gray fine sandy loam. Grayish-brown and gray mottles indicate that the soil is seasonally saturated. The underlying material, below a depth of 44 inches, consists of strata of loamy sand and sand.

Cohoctah soils have moderately rapid permeability. They are saturated during winter and spring. They have a deep root zone in summer when the water table is low and in drained areas. Cohoctah soils have medium available moisture capacity and are mostly neutral to mildly alkaline in the root zone.

Most of the acreage of Cohoctah soils is used for such cultivated crops as corn and soybeans. The remaining acreage is either wooded or in pasture.

Representative profile of Cohoctah fine sandy loam, in a cultivated field in Liberty Township (SE¼SE¼SW¼NE¼ sec. 23, T. 6 N., R. 7 E.):

Ap—0 to 11 inches, very dark gray (10YR 3/1) and very dark grayish-brown (10YR 3/2 rubbed) fine sandy loam; weak, medium, subangular blocky structure parting to weak, fine granular structure; friable; common roots; neutral; abrupt, smooth boundary.

B21g—11 to 16 inches, gray (10YR 5/1) fine sandy loam; common, medium, distinct, brown (7.5YR 4/2) mottles; weak, thick, platy structure parting to weak, fine, subangular blocky structure; friable; common roots; ped surfaces are dark gray (10YR 4/1) and have common, medium, distinct, grayish-brown (10YR 3/2) fillings in root channels; neutral; gradual, wavy boundary.

B22g—16 to 27 inches, dark-gray (10YR 4/1) fine sandy loam; common, fine, faint, gray (5Y 5/1) and brown (7.5YR 4/2) mottles; weak, coarse, subangular blocky structure parting to weak, fine, subangular blocky structure; friable; few roots; thin strata of pale-brown (10YR 6/3) loamy sand at a depth of 23 to 24 inches; neutral; gradual, wavy boundary.

B23g—27 to 37 inches, gray (10YR 5/1) fine sandy loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; few roots; ped surfaces are dark gray (10YR 4/1) and have common, fine, distinct, light-gray (10YR 6/1) and dark-brown (7.5YR 3/2) mottles; mildly alkaline; gradual, wavy boundary.

B24g—37 to 44 inches, gray (10YR 5/1) fine sandy loam; common, medium, distinct, grayish-brown (2.5Y 5/2) and dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few roots; ped surfaces are dark gray (10YR 4/1) and have common, medium, distinct, gray (N 5/0) mottles and dark-brown (7.5YR 3/2) oxide stains; mildly alkaline; abrupt, wavy boundary.

C1g—44 to 62 inches, gray (N 5/0) loam sand; common, fine, faint, light olive-brown (2.5Y 5/4) mottles and few, medium, distinct, yellowish-brown (10YR 5/6) mottles; single grain; very friable; mildly alkaline; clear, smooth boundary.

C2g—62 to 71 inches, gray (10YR 5/1) sand; common, medium, distinct, grayish-brown (2.5 Y 5/2) mottles; single grain; loose; mildly alkaline.

The thickness of the solum ranges from 34 to 56 inches, but it most commonly is 36 to 48 inches. The upper 1 or 2 feet of the C horizon generally is noncalcareous but in some places is slightly calcareous.

The dark-colored Ap horizon is more than 10 inches thick and generally ranges from 10 to 12 inches in thickness. This horizon is commonly very dark gray (10YR 3/1), but it is very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) in places. The Ap horizon is fine sandy loam or loam. It contains a significant content of very fine sand.

The B horizon is gray (10YR 5/1) and dark gray (10YR 4/1) mottled with brown (10YR 4/3 or 7.5YR 4/2), light brownish gray (10YR 6/2 or 2.5Y 6/2), and grayish brown (2.5Y 5/2). The B horizon is fine sandy loam that has some lenses of slightly finer texture.

Colors in the C horizon have a hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The C horizon is loamy sand to sand. Layers or lenses of loamy fine sand and light fine sandy loam occur in some places.

Cohoctah soils are similar to Gilford soils, but they formed in areas subject to flooding. They are coarser textured throughout than Sloan and Wabasha soils.

Cohoctah fine sandy loam (Ch).—This nearly level soil is in fairly wide, elongated strips on the flood plain of Dry Creek. The soil is easy to till. The surface layer dries readily when the water table recedes late in spring or early in summer.

Included with this soil in mapping are small areas of more sandy soils that are commonly very droughty in summer. This Cohoctah soil is bounded by areas of soils that have slopes of 2 to 12 percent, which are on the valley walls, and it commonly receives runoff from these sloping soils.

A hazard of flooding and very poor natural drainage are the major limitations that affect both farming and nonfarm uses. Spring tillage and planting are commonly delayed because of seasonal wetness, but summer crops can be grown safely in most years. Capability unit IIIw–1.

Colwood Series

The Colwood series consists of deep, nearly level, dark-colored soils that are very poorly drained. These soils formed in loamy material that has a high content of silt and very fine sand. They are underlain by stratified silt and fine sand. Colwood soils are in broad upland areas, mainly in Liberty Township.

In a representative profile of a Colwood soil that is cultivated, the plow layer is very dark grayish-brown loam about 11 inches thick. The subsoil, between depths of 11 and 42 inches, is gray and contains many yellowish-brown mottles. It is loam and light clay loam and has about the same content of clay as the surface layer. The underlying material, between depths of 42 inches and 65 inches or more, is calcareous, stratified silt and fine sand.

Colwood soils have moderate permeability in both the subsoil and the underlying stratified material. They are saturated for long periods in winter and early in spring. They have high available moisture capacity, and the root zone is deep where the soil is artificially drained or when the water table is low in summer.

Most of the acreage of Colwood soils has been artificially drained to improve plant growth and to make fieldwork easier, and it is used for cultivated crops.

Representative profile of Colwood loam, in a cultivated field in Liberty Township (SW¼SW¼SW¼SW¼ sec. 29, T. 6 N., R. 7 E.):

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, subangular blocky structure parting to moderate, medium, granular structure; friable; many roots; neutral; gradual, smooth boundary.

B21g—11 to 15 inches, gray (5Y 6/1) heavy loam; many, fine, distinct, light yellowish-brown (10YR 6/4) and strong-brown (7.5YR 5/6) mottles; weak, medium, angular blocky structure parting to moderate, fine, angular blocky structure; friable; many roots; many, medium, grayish-brown (10YR 5/2) mottles on ped surfaces; neutral; clear, smooth boundary.

B22g—15 to 22 inches, gray (5Y 6/1) loam; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; common roots; friable; many, medium, grayish-brown (2.5Y 5/2) mottles on ped surfaces; 2-inch grayish-brown (10YR 5/2) krotovinas extending into the next lower horizon; neutral; clear, smooth boundary.

B23g—22 to 31 inches, gray (5Y 6/1) light clay loam; many, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium and coarse, angular blocky structure; firm; few roots; many, medium, grayish-brown (10YR 5/2) krotovinas extending into next lower horizon; common to many earthworm casts; neutral; gradual, smooth boundary.

B3g—31 to 42 inches, gray (5Y 6/1) loam; many, fine and medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure parting to weak, medium and coarse, subangular blocky structure; friable; few roots; many, medium, grayish-brown (2.5Y 5/2) mottles on ped surfaces; mildly alkaline and a few calcareous zones; gradual, wavy boundary.

C1g—42 to 48 inches, gray (5Y 6/1) loam; many, coarse, distinct, light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/6) mottles; massive but has some vertical cleavages; friable; common, medium, grayish-brown (2.5Y 5/2) mottles on vertical cleavages; moderately alkaline; calcareous; gradual, clear boundary.

C2—48 to 65 inches, yellowish-brown (10YR 5/4), stratified silt and very fine sand; many, coarse, gray (5Y 6/1) and light olive-brown (2.5Y 5/4) mottles; weak, medium and thick, platy structure; friable; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 38 to 50 inches. In some places several inches of the upper part of the C horizon are mildly alkaline and noncalcareous.

The dark-colored Ap horizon is more than 10 inches thick and generally ranges from 10 to 12 inches in thickness. It is commonly very dark grayish brown (10YR 3/2) but ranges to very dark gray (10YR 3/1) and in some places to very dark brown (10YR 2/2). The texture is loam, fine sandy loam, or silt loam, but only loam and silt loam were mapped in this county.

The B horizon generally is commonly gray (10YR 5/1 or 5Y 5/1 or 5Y 6/1) but ranges to grayish brown (10YR 5/2) and light brownish gray (10YR 6/2). Mottling is distinct, yellowish brown (10YR 5/4 and 10YR 5/6), grayish brown (2.5Y 5/2), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), and strong-brown (7.5YR 5/6). The B horizon is commonly loam, but it is heavy fine sandy loam, light silty clay loam, or heavy silt loam in some places.

The C horizon is commonly gray (10YR 6/1) or grayish brown (10YR 5/2), but it ranges to yellowish brown (10YR 5/4 and 10YR 5/6), light yellowish brown (10YR 6/4), or gray (5Y 6/1) in some places. The C horizon is silt, silt loam, and fine or very fine sand.

Colwood soils are the very poorly drained members of a drainage sequence that includes the moderately well drained Tuscola soils and the somewhat poorly drained Kibbie soils. They are adjacent to those soils in some areas. They are commonly adjacent to Lenawee soils, but they are less clayey in the B horizon than those soils. In contrast to the very poorly drained Mermill soils, the Colwood soils lack a B horizon of clay accumulation. They lack the medium and coarse sand content that is characteristic in Gilford and Granby soils. Colwood soils contain more silt and fine sand and lack a Bt horizon in contrast to Millgrove soils.

Colwood loam (Cn).—This nearly level soil is in broad areas on uplands. A profile of this soil is described as representative for the series. This soil is easier to till than Colwood silt loam and is less likely to be cloddy if plowed when wet.

Included with this soil in mapping are areas of a Colwood soil that has a fine sandy loam surface layer and some areas of Colwood loam that has a thinner dark-colored surface layer than is typical. Also included are small areas, ½ acre to 2 acres in size, of lighter colored, somewhat poorly drained Kibbie soils. These included Kibbie soils are on low rises most commonly near drainageways. Small areas of somewhat poorly drained, lighter colored Rimer soils also are included, but they are less common than the inclusions of Kibbie soils. These lighter colored Rimer soils are readily seen in plowed areas.

A seasonally high water table is the major limitation that affects most uses of this Colwood soil. It delays planting in spring unless the soil is drained. Very poor natural drainage is a limitation to most nonfarm uses. Capability unit IIw-3.

Colwood silt loam (Co).—This nearly level soil is in broad areas on uplands. It is adjacent to Lenawee soils in many places. This soil generally has more clay in the subsoil than Colwood loam, and it has a greater tendency to crust than that more sandy soil.

Included with this soil in mapping are small areas, ½ acre to 2 acres in size, of lighter colored, somewhat poorly drained Kibbie soils. These inclusions are on low rises that are common near drainageways. Also included are small areas of somewhat poorly drained, lighter colored Del Rey soils on low rises. These inclusions of lighter colored soils are easy to see in plowed fields. In addition, there are included areas of Colwood silt loam that has a thinner dark-colored surface layer than is typical.

A seasonally high water table and very poor natural drainage are the major limitations that affect farming and nonfarm uses. Capability unit IIw-3.

Cut and Fill Land

Cut and fill land (Cu) is a miscellaneous land type that consists of areas where the soil material has been leveled, moved, or removed; or areas where earth, trash, or both have been dumped. The soil material in many of these areas is a mixture of parent material and the original surface layer and subsoil. Some leveled and graded areas are used for cultivated crops. This land type varies greatly in its potential for farming. Capability unit not assigned.

Del Rey Series

The Del Rey series consists of nearly level, deep, somewhat poorly drained soils. These soils formed in medium-textured and moderately fine textured lacustrine sediment. They are on uplands, mainly in the southern part of Liberty Township and the northern part of Flatrock and Harrison Townships.

In a representative profile of a Del Rey soil that is cultivated, the plow layer is dark grayish-brown silt loam about 9 inches thick. The subsoil, between depths of 9 and 34 inches, is yellowish-brown, dark yellowish-brown, light brownish-gray, and gray silty clay loam. It is more firm and has a higher content of clay than the surface layer. The underlying material, between depths of 34 and 60 inches, consists of layers of silty clay loam, silt loam, and clay loam.

Del Rey soils have slow permeability in the subsoil and in the underlying stratified material. They are saturated for significant periods in winter and spring. Artificial drainage helps to lower the water table, and this allows the soils to dry out and warm up earlier in spring. Del Rey soils have high available moisture capacity and a root zone that is deep where the soil is drained or when the water table is low in summer. They are medium acid or strongly acid within the upper 24 inches.

Most of the acreage of Del Rey soils have been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Del Rey silt loam, 0 to 2 percent slopes in a cultivated field in Liberty Township (NE¼NE¼NE¼SW¼ sec. 7, T. 5 N., R. 7 E.):

Ap1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, coarse, subangular blocky structure parting to moderate, medium, granular structure; friable; common roots; slightly acid; abrupt, smooth boundary.

Ap2—6 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, thick, platy structure parting to weak, thin, platy structure; friable; common roots; few, fine, distinct, dark-brown (7.5YR 4/4) iron stains on horizontal surfaces of plates; slightly acid; abrupt, smooth boundary.

B1tg—9 to 13 inches, yellowish-brown (10YR 5/6) silty clay loam; common, fine, faint, light brownish-gray (2.5Y 6/2) and light olive-gray (5Y 6/2) mottles; moderate, thick, platy structure in upper 2 inches, moderate, fine, angular blocky structure below; firm; common roots; few, fine, distinct, dark-brown (7.5YR 4/4) iron stains on horizontal surfaces of plates; thin, patchy, brown (10YR 5/3) silt coatings and thin, patchy clay films on peds; medium acid; clear, smooth boundary.

B2tg—13 to 25 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) heavy silty clay loam; common, fine, distinct, light olive-gray (5Y 6/2) and light brownish-gray (2.5Y 6/2) mottles; moderate, coarse, subangular blocky structure parting to moderate, medium, angular blocky structure; firm; common roots; thin, continuous, grayish-brown (2.5Y 5/2) clay films on vertical ped surfaces, patchy on horizontal faces; common, fine, black (5YR 2/1) oxide concretions; neutral; clear, wavy boundary.

B3tg—25 to 34 inches, light brownish-gray (2.5Y 6/2) and gray (5Y 6/1) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few roots; thin, very patchy, grayish-brown (2.5Y 5/2) clay films on vertical ped surfaces; common, light brownish-gray (10YR 6/2) ped coatings; mildly alkaline; abrupt, smooth boundary.

C1g—34 to 42 inches, light brownish-gray (2.5Y 6/2) and gray (5Y 6/1) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; firm; few grayish-brown (2.5Y 5/2) clay films in old root channels; moderately alkaline; calcareous; gradual, wavy boundary.

C2—42 to 60 inches, brown (10YR 5/3), stratified silty clay loam, clay loam, and silt loam; weak, medium and thick, platy structure; firm; thin horizontal layers, 2 to 5 millimeters thick, highly mottled with pinkish gray (5YR 7/2), light gray (10YR 7/2), and light greenish gray (5GY 7/1), occur every 3 to 5 inches; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 28 to 44 inches. In some places the solum extends several inches into the calcareous horizon.

The Ap horizon is commonly 8 inches thick, but its thickness ranges from 6 to 10 inches. The colors generally are dark grayish brown (10YR 4/2), but they are grayish brown (10YR 5/2) or dark gray (10YR 4/1) in places. The A horizon is silt loam or loam. An A2 horizon occurs in undisturbed soils.

The B horizon generally is dark yellowish brown (10YR 4/4), brown (10YR 4/3), and grayish brown (10YR 5/2), but it ranges to yellowish brown (10YR 5/4, 5/6) and gray (10YR 6/1). Hues of 2.5Y and 5Y, a value of 6, and a chroma of 1 or 2 are not uncommon in the lower part of the B horizon. Mottling is distinct, light brownish gray (2.5Y 6/2), light olive gray (5Y 6/2), and yellowish brown (10YR 5/4, 5/6). Ped coatings generally are darker; they are grayish brown or dark grayish brown. The B horizon generally is silty clay loam or silty clay, but thin layers of fine sand occur in some places.

The C horizon commonly is light brownish gray (2.5Y 6/2), gray (5Y 6/1), grayish brown (10YR 5/2), or brown (10YR 5/3), but it ranges to dark grayish brown (10YR 4/2) or brown (10YR 4/3). The texture is silty clay loam and clay loam. Thin layers of silt loam and fine sand occur in some places.

Del Rey soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Lenawee soils. They are adjacent to those darker colored soils in many places. The Del Rey soils have a higher content of clay in the B and C horizons than the Kibbie soils. They are similar to Fulton and Nappanee soils, but they have a higher content of sand in the B horizon than Fulton soils and a lower content of clay in the B horizon than Nappanee soils.

Del Rey loam, 0 to 2 percent slopes (DeA).—This soil is in elongated strips that commonly parallel drainageways on uplands and on some breaks along the Maumee River. The surface layer is less susceptible to crusting than that of Del Rey silt loam.

Included with this soil in mapping are small areas, ½ acre to 2 acres in size, of Fulton soils and small areas of gently sloping Del Rey loam.

Seasonal wetness is the major limitation to farming. A hazard of erosion and wetness are limitations in the included areas of gently sloping soils. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIw-6.

Del Rey silt loam, 0 to 2 percent slopes (DfA).—This soil is in somewhat elongated strips that parallel drainageways on uplands. A profile of this soil is described as representative for the series. The surface layer of this soil has a tendency to crust after heavy rains, and this tends to have an adverse affect on stands of seedlings.

Included with this soil in mapping are a few areas of soils that have a silty clay loam surface layer and areas of gently sloping Del Rey soils. Also included are some small areas, ½ acre to 3 acres in size, of somewhat poorly drained Fulton soils.

Seasonal wetness is the major limitation to the use of this soil for farming. A hazard of erosion and wetness are limitations in a few included areas of gently sloping soils. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIw-6.

Digby Series

The Digby series consists of deep, nearly level, somewhat poorly drained soils in areas on uplands, mainly in the northern part of the county. These soils formed in loamy material on beach ridges, outwash plains, and stream terraces.

In a representative profile of a Digby soil that is cultivated, the plow layer is dark grayish-brown fine sandy loam about 9 inches thick. The upper part of the subsoil, between depths of 9 and 32 inches, is dark yellowish-brown sandy clay loam. It has a higher content of clay than the surface layer. The lower part of the subsoil, between depths of 32 and 37 inches, is dark-brown sandy clay loam. The underlying material, between depths of 37 and 50 inches, is calcareous sand and gravel.

Digby soils have moderate permeability in the subsoil and rapid permeability in the underlying sand and gravel. They have a seasonally high water table and medium available moisture capacity. The root zone is deep in summer when the water table is low, and it is slightly acid to strongly acid.

Most areas of Digby soils are used for cultivated crops. Most of the acreage of these soils have been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Digby fine sandy loam, 0 to 2 percent slopes, in a cultivated field in Napoleon Township (sec. 24, T. 5 N., R 6E.) :

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, subangular blocky structure parting to moderate, fine granular structure; friable; many roots; common fine pebbles; slightly acid; clear, smooth boundary.

B1—9 to 18 inches, dark yellowish-brown (10YR 4/4) light sandy clay loam; common, faint, yellowish-brown (10YR 5/6), light olive-brown (2.5YR 5/4), and dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure parting to weak, fine, subangular blocky structure; friable; many roots; common fine pebbles; dark grayish-brown (10YR 4/2) coatings on root channels and earthworm channels: many, medium, grayish-brown (10YR 5/2) mottles on ped faces; slightly acid; abrupt, smooth boundary.

B21t—18 to 23 inches, dark yellowish-brown (10YR 4/4) heavy sandy clay loam; common, fine, distinct, light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/6) mottles; moderate, coarse, angular blocky structure parting to moderate, medium and fine, subangular blocky structure; firm; few roots; thin, continuous, grayish-brown (10YR 5/2) clay films on peds; common fine pebbles; neutral; clear, wavy boundary.

B22t—23 to 32 inches, dark yellowish-brown (10YR 4/4) heavy sandy clay loam; many, fine, distinct, grayish-brown (2.5Y 5/2), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; friable; few roots; common fine pebbles; continuous, grayish-brown (10YR 5/2) ped coatings; thin patchy clay films, mostly on vertical ped surfaces; few black (N 2/0) oxide concretions; moderately alkaline; gradual, wavy boundary.

B3—32 to 37 inches, dark-brown (10YR 4/3) heavy sandy clay loam; many, fine, distinct, yellowish-brown (10YR 5/6) and light brownish-gray (2.5Y 6/2) mottles; weak, fine, subangular blocky structure; friable; few roots; few small shells; thin, very patchy, brown (10YR 5/3) clay films, mostly on vertical ped surfaces; moderately alkaline; calcareous; abrupt, smooth boundary.

IIC—37 to 50 inches, yellowish-brown (10YR 5/4) sand and gravel; many, fine, distinct, yellowish-brown (10YR 5/6) and grayish-brown (2.5Y 5/2) mottles; single grain; loose; matrix color is olive gray (5Y 5/2) below a depth of 44 inches; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 25 to 40 inches. In some places the lower few inches of the solum is calcareous. The content of gravel in the solum ranges from 2 to 20 percent. Digby soils that contain pebbles or gravel occur mainly on the beach ridges or on stream terraces. The soils on outwash plains or along tributaries commonly contain little or no gravel.

The Ap horizon is commonly 8 inches thick, but its thickness ranges from 7 to 11 inches. The horizon generally is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). An A2 horizon is present in some places. The B horizon generally is yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4), but it ranges to dark brown (10YR 4/3) and grayish brown (10YR 5/2). A chroma of 2 is dominant on ped faces. The B horizon is loam, sandy clay loam, or light clay loam, but fine sandy loam commonly occurs in individual subhorizons. Some areas of Digby soils contain ½- to 1-inch seams of silty clay.

The C horizon is commonly grayish brown (10YR 5/2), light brownish gray (10YR 6/2), or yellowish brown (10YR 5/4). It generally is moderately alkaline and calcareous. The C horizon is sandy or gravelly and contains variable amounts of finer material. Contrasting finer textured laucustrine or till material is at a depth below 40 inches.

Digby soils are the somewhat poorly drained members of a drainage sequence that includes the moderately well drained Haney soils and the very poorly drained Millgrove soils. They are commonly adjacent to dark-colored, very poorly drained Millgrove, Mermill, and Hoytville soils. They are adjacent to Haney soils on beach ridges and on stream terraces. The Digby soils differ from Haskins soils by lacking a finer-textured, underlying C horizon within a depth of 40 inches. They have a lower content of fine sand and silt in the B and C horizon than somewhat poorly drained Kibbie soils.

Digby fine sandy loam, 0 to 2 percent slopes (DuA).—This soil is in small areas on uplands and on low knolls. Also, in some places it is in strips parallel to drainageways. A profile of this soil is described as representative for the series. It has a slightly lower available moisture capacity than Digby loam, and it is easy to till.

Included with ths soil in mapping are some small areas of Haskins soils and some small areas of soil that have slopes of more than 2 percent and areas of soils that have a sandy loam surface layer.

Seasonal wetness is a moderate limitation to farming and for many nonfarm uses. Capability unit IIw-6.

Digby loam, 0 to 2 percent slopes (DyA).—This soil is in strips and on low knolls on uplands. It also is in strips along some drainageways and, less commonly, on beach ridges. It generally is slightly finer textured throughout than Digby fine sandy loam. It has a slightly higher available moisture capacity than that soil, and its surface layer tends to be less droughty.

Included with this soil in mapping are small areas of Haskins soils and some small areas of soils that have slopes of more than 2 percent. Also included are areas of poorly drained Millgrove, Mermill, and Hoytville soils in slight depressions and in level spots.

Seasonal wetness is a moderate limitation to farming and for many nonfarm uses. Capability unit IIw-6.

Fulton Series

The Fulton series consists of deep, nearly level to gently sloping, somewhat poorly drained soils on uplands. These soils formed in lacustrine material that has a high content of clay.

In a representative profile of a Fulton soil in a pasture, the surface layer is dark grayish-brown silty clay loam about 4 inches thick. Between depths of 4 and 9 inches is a layer of brown silty clay loam. The subsoil, between depths of 9 and 32 inches, is dark grayish-brown and dark-brown silty clay that is mottled with dark yellowish brown, yellowish brown, and light brownish gray. The underlying material, to a depth of 60 inches, consists of strata of calcareous silty clay, clay, and silt.

Fulton soils have slow permeability and medium available moisture capacity. They are saturated for significant periods in winter and spring and dry out slowly unless they have been artificially drained. The root zone is deep in summer when the water table is low, but root growth may be restricted in the clayey subsoil. The upper 24 inches is medium acid to neutral.

Fulton soils are used mainly for cultivated crops. Many acres have been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Fulton silty clay loam, 0 to 2 percent slopes, in a permanent pasture in Washington Township (SE¼SW¼SE¼NE¼ sec. 6, T. 5 N., R. 8 E.):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine, granular structure; firm; many roots; neutral; clear, wavy boundary.

A2—4 to 9 inches, brown (10YR 4/3) silty clay loam; common, medium, faint, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; firm; few roots; slightly acid; gradual, wavy boundary.

B21tg—9 to 12 inches, dark grayish-brown (10YR 4/2) silty clay; common, medium faint, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; dominant ped coatings of dark grayish brown (10YR 4/2); moderate, medium and fine, angular blocky structure; very firm; few roots; thin, patchy, dark-gray (10YR 4/1) clay films on peds; neutral; gradual, smooth boundary.

B22tg—12 to 24 inches, dark-brown (10YR 4/3) silty clay; few, medium, faint yellowish-brown (10YR 5/6) mottles; ped surfaces are dominantly dark grayish brown (10YR 4/2); strong, medium, angular blocky structure; very firm; few roots, thin, patchy, dark-gray (10YR 4/1) clay films on peds; few very dark gray (10YR 3/1) organic coatings; neutral; gradual, smooth boundary.

B23tg—24 to 32 inches, dark grayish-brown (10YR 4/2) silty clay; few, medium, faint, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) mottles; strong, medium, angular blocky structure; very firm; thin, patchy, dark-gray (10YR 4/1) clay films on peds; neutral; gradual, wavy boundary.

C1g—32 to 36 inches, grayish-brown (10YR 5/2), stratified clay and silt; many, medium, faint, yellowish-brown (10YR 5/6) mottles; weak, thin and medium, platy structure; very firm; few, thin, dark grayish-brown (10YR 4/2) clay films on vertical ped surfaces; mildly alkaline; gradual, irregular boundary.

C2g—36 to 60 inches, yellowish-brown (10YR 5/6), stratified silty clay and silt; few, fine, distinct, grayish-brown (2.5Y 5/2), 10YR 5/2) and greenish-gray (5GY 6/1) mottles; weak, thin and medium, platy structure; very firm; white (N 8/0) calcium accumulations; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 28 to 45 inches. In some places the solum extends several inches into the calcareous horizon.

The Ap horizon is commonly 8 inches thick, but its thickness range from 7 to 10 inches. This horizon generally is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). In uncultivated soils there is an A1 horizon that ranges from 2 to 4 inches in thickness and from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) in color. The A horizon is silty clay loam, silt loam, or loam. An A2 horizon of brown (10YR 4/3 or 5/3) loam or silty clay loam is present in uncultivated soils. This horizon is thin or is absent if the soil has been cultivated.

The matrix colors of the B horizon generally are brown (10YR 4/3), but they range to yellowish brown (10YR 5/4), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2). Mottling is distinct, dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), and light brownish gray (10YR 6/2). Ped coatings are dark grayish brown or dark gray, but they dominantly have a chroma of 2 or less. Clay films typically are thin and patchy, but they range to thin and continuous. The texture of the B horizon is silty clay or clay. In some places thin layers of stratified silty clay loam or silt loam occur, mainly in the lower part of the B horizon.

The C horizon is grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2) in the upper part, but with increasing depth it ranges to dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4 or 5/6). The C horizon is stratified silty clay, silt loam, silt, and fine sand. These thin layers of contrasting textures are commonly ⅛ to 1 inch thick, but thicker layers occur in some places.

Fulton soils are the somewhat poorly drained members of a drainage sequence that includes the moderately well drained Lucas soils and the very poorly drained Toledo soils. They commonly are adjacent to soils of both of these series. They are adjacent to somewhat poorly drained Del Rey soils in some places, especially in Liberty Township. The Fulton soils have a more clayey Bt horizon than the Del Rey soils. They have a lower content of sand and contain fewer coarse fragments than somewhat poorly drained Nappanee soils, and they have a lower content of clay than somewhat poorly drained Roselms soils.

Fulton loam, 0 to 2 percent slopes (FsA).—This soil is on uplands. It is in elongated strips that are parallel to drainageways and also is on low rises in areas of nearly level, very poorly drained Toledo soils. The surface layer is loamy and is not very susceptible to crusting.

Included with this soil in mapping are small areas of dark-colored, wetter Toledo soils, ½ acre to 3 acres in size, that generally are adjacent to the boundary between those soils and this Toledo soil. Also included are small areas of Fulton silty clay loam that generally range from ½ acre to 2 acres in size.

Seasonal wetness is a severe limitation to farming. Wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIIw-3.

Fulton loam, 2 to 6 percent slopes (FsB).—This soil is in elongated strips on breaks along drainageways. Slopes are typically short and mostly range from 2 to 4 percent. Soil crusting is not a severe limitation on this soil.

Included with this soil in mapping, on a few of the higher rises, are some moderately eroded areas. These included areas generally are ½ acre to 1½ acres in size.

Seasonal wetness is a severe limitation to farming. The hazard of erosion also is a limitation, but the loamy surface layer is less susceptible to erosion than the surface layer of Fulton silty clay loam. Seasonal wetness and slow permeability are limitations for most nonfarm uses. Capability unit IIIw–3.

Fulton silty clay loam, 0 to 2 percent slopes (FuA).—This soil is in long strips that parallel drainageways and also is in small areas on low rises. A profile of this soil is described as representative for the series. This soil tends to crust after heavy rainfall, and this adversely affects stands of seedlings. Water enters this soil more slowly than it does Fulton loams and the amount of runoff generally is greater. Also, this soil typically is in poorer tilth than Fulton loams. It can be tilled only within a narrow range of optimum moisture content, and it is likely to clod if not tilled within this range.

Included with this soil in mapping are small areas of soils, ½ acre to 3 acres in size, that have a silt loam or loam surface layer. These inclusions are common. Also included are some areas of the wetter, darker colored Toledo soils in low spots.

Seasonal wetness is a severe limitation to farming. Seasonal wetness and slow permeability are major limitations for many nonfarm uses. Capability unit IIIw–3.

Fulton silty clay loam, 2 to 6 percent slopes (FuB).—This soil is in elongated strips on breaks along drainageways. Slopes typically are short and range from 2 to 4 percent. This soil generally has poorer tilth than any of the other Fulton soils. It tends to crust after heavy rainfall, and this adversely affects stands of seedlings. The surface layer is more clayey than that of Fulton loams, and it has a slower infiltration rate. For these reasons, and also because this soil is more sloping, the amount of runoff is greater than on other Fulton soils.

Included with this soil in mapping are areas of moderately eroded soils that are more difficult to till than the uneroded soils. Also included, on a few higher rises, are areas of ½ acre to 1½ acres where the soils have a surface layer of silt loam.

Seasonal wetness is a severe limitation to farming, but erosion also is a concern in management. Seasonal wetness and slow permeability are major limitations for many nonfarm uses. Capability unit IIIw–3.

Fulton Series, Sandy Subsoil Variant

Soils of the Fulton series, sandy subsoil variant, have sandy and gravelly material within a depth of 40 inches, whereas normal Fulton soils are clayey to a depth of more than 40 inches. The soils of this variant are somewhat poorly drained and most commonly are on uplands adjacent to South Turkeyfoot Creek.

In a representative profile of a Fulton, sandy subsoil variant, soil that is cultivated, the plow layer is dark-gray loam about 9 inches thick. The subsoil, between depths of 9 and 33 inches, is grayish-brown clay and brown clay loam and is mottled with dark brown and dark yellowish brown. It is more clayey than the surface layer. Between depths of 33 and 37 inches, the subsoil is yellowish-brown sandy loam. The underlying material, to a depth of 64 inches or more, consists of silt loam, coarse sand, and stratified, calcareous silty clay, silty clay loam, and coarse sand. The movement of water through the profile is restricted by the clayey layers, but the soil drains slightly more rapidly than normal Fulton soils. The sandy lower part of the subsoil and the substratum commonly provide natural drainage to a slope break.

Fulton, sandy subsoil variant, soils have slow permeability in the clayey subsoil and moderate to rapid permeability in the more sandy part of the subsoil and the substratum. They are saturated for significant periods in winter and spring, but the periods are not quite so long as is typical for normal Fulton soils. They dry out rather slowly in spring unless they are artificially drained. They have medium available moisture capacity and a root zone that is deep in adequately drained areas or in summer.

Fulton, sandy subsoil variant, soils are used mainly for cultivated crops. Many acres have been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Fulton loam, sandy subsoil variant, 0 to 2 percent slopes, in a cultivated field in Monroe Township (SE¼NE¼SE¼NE¼ sec. 6, T. 4 N., R. 7 E.):

AP—0 to 9 inches, dark-gray (10YR 4/1) loam; weak, fine, subangular blocky structure parting to moderate, medium, granular structure; friable; some mixing of B horizon into this horizon; neutral; abrupt, smooth boundary.

B21tg—9 to 15 inches, grayish-brown (10YR 5/2) clay; common, fine, faint, dark-brown (10YR 4/3) mottles; moderate, medium, angular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films around peds; common dark reddish-brown (5YR 3/2) oxide concretions; neutral; clear, wavy boundary.

B22tg—15 to 24 inches, grayish-brown (10YR 5/2) clay; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, angular blocky structure; firm; thin, patchy, gray (10YR 5/1) clay films around peds; few dark reddish-brown (5YR 3/2) oxide concretions; neutral; clear, wavy boundary.

B23tg—24 to 33 inches, brown (10YR 5/3) clay loam; common, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; friable; thin, patchy, gray (10YR 5/1) clay films on vertical ped faces; few dark reddish-brown (5YR 3/2) oxide concretions; mildly alkaline; abrupt, smooth boundary.

IIB3g—33 to 37 inches, yellowish-brown (10 YR 5/4) sandy loam; common, fine, faint, light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; very friable; mildly alkaline; weakly calcareous; clear, wavy boundary.

IIIC1g—37 to 44 inches, olive-gray (5Y 5/2) silt loam; very weak, fine, subangular blocky structure; friable; some light gray (5Y 6/1) calcium accumulation; moderately alkaline; calcareous; clear, wavy boundary.

IVC2—44 to 57 inches, dark yellowish-brown (10YR 4/4) coarse sand; common, fine, faint, brown (10YR 5/3) mottles; single grain; loose; moderately alkaline; calcareous; abrupt, smooth boundary.

VC3—57 to 64 inches, gray (10YR 5/1) strata of silty clay, silty clay loam, and coarse sand; moderate, thick, platy structure; friable and loose; moderately alkaline; calcareous.

The thickness of the solum, and generally the depth to carbonates, ranges from 28 inches to about 44 inches but commonly is 32 to 42 inches. In some places the upper 1 foot of the substratum is only mildly alkaline. The thickness of the stratified sandy subsoil and substratum ranges from about 1 foot to 4 to 6 feet in some places. Sandy strata are typically within a depth of 40 inches. The substratum typically is coarse and medium sand, gravelly loamy sand, or gravelly sandy loam, but in some places layers of silt loam, sandy loam, and silty clay loam occur within the coarse-textured substratum. Fine-textured lacustrine clay or glacial clay till underlies the sandy substratum layer.

Fulton, sandy subsoil variant, soils are adjacent to normal Fulton soils and to Lucas soils. They are not so well drained as the Lucas soils, which are on slope breaks.

Fulton loam, sandy subsoil variant, 0 to 2 percent slopes (FvA).—This soil is in long strips that parallel South Turkeyfoot Creek in Monroe and Harrison Townships. The surface layer generally does not crust and typically has good tilth.

Included with this soil in mapping are small areas, 1 acre to 2 acres in size, of Fulton loam and Fulton silty clay loam. These included soils occur anywhere within the mapped areas, but they are not common. Also included are a few areas of gently sloping soils and a few small areas of dark-colored Toledo soils.

Seasonal wetness is a severe limitation to farming, but this soil is not so wet as Fulton loam and Fulton silty clay loam. The coarse-textured subsoil and substratum in this soil are more permeable and water drains more rapidly than in other Fulton soils. Seasonal wetness and slow permeability are the major limitations for many nonfarm uses. Capability unit IIIw-3.

Galen Series

The Galen series consists of deep, nearly level to gently sloping, moderately well drained soils. These soils formed in thick deposits of fine sand. They are on crests and slopes of knolls and ridges on the lake plain, mainly in the northeastern part of the county.

In a representative profile of a Galen soil that is cultivated, the plow layer is dark grayish-brown fine sand about 10 inches thick. The subsurface layer, between depths of 10 inches and 28 inches, is yellowish-brown fine sand. The lower 8 inches of the subsurface layer has faint yellowish-brown and light brownish-gray mottles. Between depths of 28 inches and 92 inches or more there are layers of fine sand, fine sandy loam, and loamy fine sand. The loamy fine sand and fine sandy loam layers contain slightly more clay than the adjacent fine sand layers. These layers or bands have a darker or stronger color than the less clayey layers. The combined thickness of bands that have clay accumulations is more than 6 inches.

Galen soils have moderately rapid permeability, low available moisture capacity, and a deep root zone. They are medium acid or strongly acid within the upper 24 inches. During windy periods they are affected by soil blowing if they lack a thick plant cover.

Galen soils are used mainly for cultivated crops and woodland.

Representative profile of Galen fine sand, 2 to 6 percent slopes, in a cultivated field in Liberty Township (SE¼NE¼NE¼NE¼ sec. 14, T. 6 N., R. 7 E.):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) fine sand; weak, fine, granular structure; very friable; many roots; slight mixing of A2 horizon into Ap horizon in some places; slightly acid; abrupt, smooth boundary.

A21—10 to 20 inches, yellowish-brown (10YR 5/6) fine sand; single grain; soft; common roots; few, medium, yellowish-red (5YR 4/8) oxide nodules; medium acid; gradual, smooth boundary.

A22—20 to 28 inches, yellowish-brown (10YR 5/4) fine sand; common, fine, faint, yellowish-brown (10YR 5/6) mottles and few light brownish-gray (2.5Y 6/2) mottles; common roots; mottling is more noticeable near bottom of horizon; single grain; soft; very few fine pebbles; medium acid; abrupt, wavy boundary.

B21t—28 to 40 inches, strong-brown (7.5YR 5/6) fine sandy loam; common, fine, faint, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; common roots; thin, patchy, brown (7.5 4/4) clay films on vertical ped faces, and reddish-brown (5YR 4/4) in root channels; few dark reddish-brown (5YR 2/2) oxide concretions; mildly alkaline; abrupt, wavy boundary.

A23—40 to 47 inches, brown (10YR 5/3) fine sand; common, medium, light yellowish-brown (2.5Y 6/4) mottles, faint yellowish-brown (10YR 5/6) mottles, and distinct light brownish-gray (2.5Y 6/2) mottles; single grain; loose; common roots; slightly acid; clear, wavy boundary.

A24&B22t—47 to 54 inches, pale-brown (10YR 6/3) fine sand; many, medium, faint, light yellowish-brown (2.5Y 6/4) and light brownish-gray (2.5Y 6/2) mottles and common, fine, brown (10YR 5/3) mottles; single grain; loose; thin bands of dark-brown (7.5YR 4/4) loamy fine sand; weak, medium, subangular blocky structure; friable; thin, patchy, brown (7.5YR 4/2) clay films on vertical ped faces; few roots; slightly acid; clear, wavy boundary.

A25—54 to 71 inches, pale-brown (10YR 6/3) fine sand; common, fine, distinct, yellowish-brown (10YR 5/6) and brown (10YR 5/3) mottles; single grain; slightly acid; abrupt, wavy boundary.

B23t—71 to 79 inches, dark-brown (7.5YR 4/4) loamy fine sand; weak, medium subangular blocky structure; friable; neutral; abrupt, wavy boundary.

A26—79 to 92 inches, brown (10YR 5/3) fine sand; common, medium, faint, light brownish-gray (2.5Y 6/2) mottles; single grain; loose; neutral.

The thickness of the solum, and commonly the depth to carbonates, ranges from about 40 to 92 inches. In some places the depth to carbonates is 1 foot to 2 feet below the solum.

The Ap horizon is 3 to 10 inches in thickness, depending on the soil loss through soil blowing. The Ap horizon generally is dark grayish brown (10YR 4/2) or brown (10YR 4/3).

The A2 horizon is light yellowish brown (10YR 6/4), yellowish brown (10YR 5/6 or 5/4), brown (10YR 5/3), pale-brown (10YR 6/3), and, in some places, brownish yellow (10YR 6/6). The A2 horizon is mottled with faint, yellowish-brown (10YR 5/6), light brownish-gray (2.5Y 6/2), light yellowish-brown (2.5Y 6/4), and brown (10YR 5/3) mottles.

The Bt horizon generally is strong brown (7.5YR 5/6) or dark brown (7.5YR 4/4). The dominant texture is fine sandy loam, but in some places it is loamy fine sand or light sandy loam. The Bt horizon is either one continuous layer that ranges from 8 to about 28 inches in thickness, or it consists of bands of variable thickness that have a combined thickness of more than 6 inches.

The C horizon (not described) is commonly light brownish gray (2.5Y 6/2), pale brown (10YR 6/3), or gray (10YR 5/1 or 6/1). The texture generally is fine sand, but layers of loamy fine sand, loamy sand, and medium sand occur in some places.

Galen soils are the moderately well drained members of a drainage sequence that includes well drained Arkport soils. They are adjacent to Arkport soils in many places. They are commonly adjacent to somewhat poorly drained Tedrow and very poorly drained Granby soils. In some places Galen soils are adjacent to the well drained Spinks and Oakville soils and the moderately well drained Ottokee soils. Galen soils have a Bt horizon that Oakville soils lack. They have a higher content of clay in the Bt horizon than Spinks and Ottokee soils. Galen soils lack the finer textured, contrasting lower part of the solum of the moderately well drained Seward soils.

Galen fine sand, 0 to 2 percent slopes (GaA).—This soil is on dunes and low sand ridges on uplands. It is less droughty than the more sloping Galen soil. It has a low organic-matter content, and soil blowing is likely to occur during periods of strong winds. The removal of the surface layer by wind is not so severe as it is on the gently sloping Galen soil.

Included with this soil in mapping are areas of Ottokee soils. Also included are areas of well-drained Arkport soils on the higher rises within areas mapped as this Galen soil.

Droughtiness is the major limitation to farming, but it is not so severe as it is on the Ottokee soils or on the more sloping Galen soils. Soil blowing is a moderate hazard where the soil is bare. Droughtiness is a limitation for some nonfarm uses. Capability unit IIs–1.

Galen fine sand, 2 to 6 percent slopes (GaB).—This soil is on sand ridges and dunes on the upland areas of the lake plain. A profile of this soil is described as representative for the series. This soil is more droughty than the nearly level Galen soil, and the hazard of soil blowing is more severe. The content of organic matter is low on this soil, and soil blowing limits its accumulation.

Included with this soil in mapping are areas of Ottokee soils. Also included are small areas of well-drained Arkport soils on the higher rises within some areas mapped as this Galen soil.

Soil blowing is a moderate hazard. Droughtiness also is a limitation to farming. Soil blowing is most severe in spring during periods of high winds. It removes the surface layer, which contains organic matter, and causes damage to seedlings by sand abrasion. Slope and droughtiness are limitations for some nonfarm uses. Capability unit IIe–2.

Genesee Series

The Genesee series consists of deep, nearly level, well-drained soils. These soils formed in alluvial material along the Maumee River and the major creeks near the river. They are flooded during periods of high water. This flooding occurs mainly in winter, but it can occur any time of the year.

In a representative profile of a Genesee soil that is cultivated, the plow layer is dark grayish-brown loam about 8 inches thick. The subsoil, between depths of 8 and 20 inches, is brown or dark grayish-brown loam that is similar to the surface layer. The lower part of the subsoil, to a depth of 28 inches, is brown silt loam. The underlying material, to a depth of 52 inches or more, is calcareous silt loam.

Genesee soils are moderately permeable throughout. They have a deep root zone and high available moisture capacity. They are mildly alkaline in the root zone.

Genesee soils are used mainly for cultivated crops.

Representative profile of Genesee loam, in a cultivated field in Liberty Township (NE¼SE¼NW¼SW¼ sec. 35, T. 6 N., R. 7 E.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; friable; common roots; mildly alkaline; abrupt, smooth boundary.

B21—8 to 13 inches, dark grayish-brown (10YR 4/2) loam; weak, coarse, angular blocky structure; friable; few roots; very dark grayish-brown (10YR 3/2) coatings on some ped surfaces; mildly alkaline; abrupt, smooth boundary.

B22—13 to 20 inches, brown (10YR 5/3) loam; weak, medium, platy structure; friable; few roots; very dark grayish-brown (10YR 3/2) coatings on some ped surfaces; mildly alkaline; abrupt, smooth boundary.

B23—20 to 28 inches, brown (10YR 4/3) silt loam; weak, fine, angular blocky structure; friable; few roots; dark grayish-brown (10YR 4/2) coatings on horizontal ped surfaces; brown (10YR 5/3) sand on surfaces of root and worm channels; mildly alkaline; clear, wavy boundary.

C—28 to 52 inches, brown (10YR 5/3) silt loam; common, fine and medium, distinct, grayish-brown (2.5Y 5/2) and gray (N 5/0) mottles; weak, medium, angular blocky structure; friable; few roots; few dark grayish-brown (10YR 4/2) coatings on vertical faces of peds; common, fine, distinct, dark-brown (7.5YR 4/4) iron stains increasing with depth; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 24 to 40 inches but typically is 24 to 36 inches.

The Ap horizon commonly is 8 inches thick, but is thickness ranges from 7 to 11 inches. This horizon generally is dark grayish brown (10YR 4/2) or brown (10YR 4/3 or 5/3).

The B horizon is brown (10YR 4/3 or 5/3), dark yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2), or yellowish brown (10YR 5/4). Organic coatings on ped surfaces are very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2). The texture of the B horizon generally is silt loam or loam, but strata of sand occur in some places.

The C horizon typically is dark yellowish brown (10YR 4/4) or brown (10YR 4/3 or 5/3). Its texture is silt loam, loam, or light silty clay loam. Some stratification occurs in some places, and sandy layers are not uncommon.

Genesee soils are the well-drained members of a drainage sequence that includes the somewhat poorly drained Shoals soils and the very poorly drained Sloan soils. They are adjacent to those soils in many places. Along the Maumee River, Genesee soils are commonly adjacent to the darker colored, moderately well drained Medway soils and the darker colored, well drained Ross soils.

Genesee loam (Gm).—This nearly level soil is on the flood plains of the Maumee River and its tributaries.

Included with this soil in mapping are areas of soils that have a silt loam surface layer. Also included are small areas of somewhat poorly drained Shoals silt loam in low spots and near the boundaries of mapped areas of the Shoals soil. In addition, there are included areas of soils that are calcareous above a depth of 20 inches.

Flooding is the major limitation to farming or for nonfarm uses. Capability unit IIw–2.

Gilford Series

The Gilford series consist of nearly level, dark-colored, very poorly drained soils in broad areas on the lake plain, principally in Harrison and Damascus Townships. These soils formed in thick loamy material underlain by calcareous loamy fine sand or fine sand.

In a representative profile of a Gilford soil that is cultivated, the plow layer is very dark gray fine sandy loam about 8 inches thick. Between depths of 8 inches and 12 inches is a layer of mottled, very dark grayish-brown fine sandy loam. The subsoil is fine sandy loam that is grayish brown between depths of 12 and 24 inches and is light brownish gray between depths of 24 and 32 inches. The subsoil is mottled with yellowish brown, gray, and brownish yellow and has about the same content of clay as the surface layer. The underlying material, between depths of 32 and 60 inches, is grayish brown and brown calcareous loamy fine sand and fine sand.

Gilford soils have moderately rapid permeability. They have a high water table in winter and spring. They have medium available moisture capacity and a root zone that is deep when the water table is low in summer. The root zone mainly is neutral.

Nearly all the acreage of Gilford soils is used for cultivated crops. Most of the acreage has been artificially drained to improve crop growth and to make fieldwork easier.

Representative profile of Gilford fine sandy loam, in a cultivated field in Damascus Township (NW¼NW¼ NE¼NW¼ sec. 26, T. 5 N., R. 8 E.):

AP—0 to 8 inches, very dark gray (10YR 3/1) fine sandy loam; moderate, fine and medium, subangular blocky structure; friable, slightly hard; many roots; neutral; abrupt, smooth boundary.

A1—8 to 12 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; few, fine, distinct, yellowish-brown (10YR 5/6) and olive-yellow (2.5Y 6/8) mottles in the lower part; weak, medium and coarse, subangular blocky structure; friable, slightly hard; common roots; some very dark gray (10YR 3/1) organic stains; neutral; gradual, wavy boundary.

B21g—12 to 24 inches, grayish-brown (10YR 5/2) fine sandy loam; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles and few, fine, faint, gray (10YR 5/1) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; friable, slightly hard; few roots; patchy coatings in root channels; neutral; clear, wavy boundary.

B22g—24 to 32 inches, light brownish-gray (10YR 6/2 fine sandy loam; many, coarse, distinct, yellowish-brown (10YR 6/6) mottles; moderate, coarse, angular blocky structure; friable, slightly hard; few roots; neutral; clear, wavy boundary.

C1g—32 to 36 inches, grayish-brown (10YR 5/2) loamy fine sand; many, medium, distinct, yellowish-brown (10YR 5/8) mottles and few, fine, distinct, light olive-brown (2.5Y 5/6) mottles; single grain; loose; some 3- to 10-inch pockets of pale-brown (10YR 6/3), calcareous sand; mildly alkaline; clear, wavy boundary.

C2—36 to 60 inches, brown (10YR 5/3) fine sand; single grain; loose; discontinuous bands of yellowish-brown (10YR 5/4) silty clay loam to silty clay that has few, fine, faint mottles between depths of 40 and 44 inches; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 26 to 40 inches but most commonly is 32 to 40 inches. In some places several inches of the sandy substratum is mildly alkaline and noncalcareous.

The dark-colored A horizon is thicker than 10 inches; its thickness generally ranges from 10 to 12 inches, but in some places is 14 inches. This horizon generally is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) but ranges to black (10YR 2/1) in some places.

The B horizon generally is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) but ranges to gray (10YR 5/1) or dark gray (10YR 4/1). Mottling is distinct and is mostly yellowish brown (10YR 5/6 and 5/8) but ranges to brownish yellow (10YR 6/6). A few gray (10YR 5/1) mottles occur on some ped surfaces. In some places the B-horizon mottling is subdued, and the matrix colors are dominantly gray. The B horizon is mainly fine sandy loam but has thin layers of loamy fine sand in some places. Discontinuous, ¼ to 1-inch clay bands occur in some places in the lower part of the B horizon.

The C horizon is commonly grayish brown (10YR 5/2), gray (10YR 5/1), or brown (10YR 5/3). This horizon is fine sand and loamy fine sand that has discontinuous, ½- to 2-inch clay bands occurring rather commonly. Underlying the sandy C horizon is fine-textured lacustrine or glacial till material. This material generally is at a depth of 5 to 10 feet, but in some places it is as shallow as 48 inches.

Gilford soils are adjacent to very poorly drained Millgrove, Granby, Wauseon, and Colwood soils. They are coarser textured throughout than the Colwood and Millgrove soils. They have a higher content of silt and clay than the Granby soils. Gilford soils are similar to Wauseon soils, but they lack the fine-textured C horizon within a depth of about 40 inches. They differ from Cohoctah soils by not being subject to flooding.

Gilford fine sandy loam (Go).—This nearly level soil is in broad areas on uplands. Tilth generally is good, and the content of organic matter is high.

Included with this soil in mapping are small areas, 1 acre to 4 acres in size, of lighter colored Tedrow soils. These somewhat poorly drained inclusions are on low rises, which are widely scattered in the mapped areas. Also included are some areas of the more sandy Granby soils. Other inclusions are areas of Gilford soils where the thickness of the surface layer and subsoil is greater than typical, areas of Gilford soils that have a more clayey subsoil, and some areas of Gilford soils where the depth to carbonates is shallower than typical.

Very poor natural drainage and a seasonal high water table are major limitations for nearly all uses. Capability unit IIw-4.

Granby Series

The Granby series consists of sandy, nearly level, dark-colored soils that are very poorly drained. These soils formed in deep, neutral to slightly acid fine sand that is underlain by fine and medium sand. They are in broad areas on uplands, mainly in Washington and Liberty Townships.

In a representative profile of a Granby soil that is cultivated, the surface layer is black loamy fine sand about 14 inches thick. The subsoil, between depths of 14 and 36 inches, is grayish-brown loamy fine sand in the upper part and light brownish-gray or gray sand in the lower part and is mottled. The content of clay in the subsoil is less than that in the surface layer, and it gradually decreases with increasing depth. The underlying material, between depths of 36 to 63 inches or more, is calcareous fine sand.

Granby soils have rapid permeability throughout but are seasonally saturated for long periods of time. They have low available moisture capacity and a root zone that is deep in summer when the water table is low or in drained areas. They are mostly neutral in the root zone.

Granby soils are used mainly for cultivated crops, but many areas are wooded, mainly in Washington Township. Much of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Granby loamy fine sand, in a cultivated field in Washington Township (SE¼SW¼ SW¼SW¼ sec. 24, T. 6 N., R. 8 E; laboratory data HN-89):

Ap—0 to 10 inches, black (N 2/0) loamy fine sand; weak, fine to medium, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary.

A1—10 to 14 inches, black (N 2/0) loamy fine sand; very weak, thin, platy structure; very friable; many roots; neutral; gradual, smooth boundary.

B2g—14 to 20 inches, grayish-brown (2.5Y 5/2) loamy fine sand; few, medium, distinct, olive-brown (2.5Y 4/4) mottles; very weak, coarse, prismatic structure parting to very weak, coarse, subangular blocky structure; very friable; common roots; some black (10YR 2/1) organic staining on vertical ped surfaces; neutral; clear, wavy boundary.

B31g—20 to 28 inches, light brownish-gray (2.5Y 6/2) fine sand; few, medium, faint, light olive-brown (2.5Y 5/6) mottles; very weak, coarse, prismatic structure parting to single grain; very friable; few roots; neutral; clear, wavy boundary.

B32g—28 to 34 inches, light brownish-gray (2.5Y 6/2) fine sand; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; single grain; loose; few roots; neutral; abrupt, smooth boundary.

B33g—34 to 36 inches, gray (10YR 6/1) sand; few, fine, faint, pale-brown (10YR 6/3) mottles; single grain; loose; few roots; neutral; abrupt, smooth boundary.

Cg—36 to 63 inches, stratified, light brownish-gray (2.5Y 6/2), light olive-brown (2.5Y 5/4), and gray (5Y 5/1) fine sand; few, medium, distinct, dark-brown (10YR 4/3) mottles in the upper part; single grain; loose; moderately alkaline; calcareous; water table at a depth of 60 inches.

The thickness of the solum, and generally the depth to carbonates, ranges from 22 to 55 inches but most commonly is 24 to 38 inches.

The thickness of the dark-colored A horizon is more than 10 inches and generally ranges from 10 to 16 inches. This horizon is very dark gray (10YR 3/1 or N 3/0) or black (10YR 2/1 or N 2/0).

The B horizon is grayish brown (10YR 5/2), gray (10YR 5/1), light brownish-gray (10YR 6/2), or dark gray (10YR 4/1). Mottling in this horizon is faint to distinct, light olive brown (2.5Y 5/6), olive brown (2.5Y 4/4), and yellowish brown (10YR 5/6). In some places the B horizon dominantly is gray and the mottling is subdued. This horizon generally is loamy fine sand and fine sand and has some thin layers of medium or coarser sand.

The C horizon is gray (10YR 5/1) to light brownish gray (2.5Y 6/2) in color and fine or medium sand in texture. Fine-textured lake-deposited clay or glacial till is at a depth ranging from 5 to 12 feet.

Granby soils are the very poorly drained members of a drainage sequence that includes the well drained Oakville soils, moderately well drained Otokee soils, and somewhat poorly drained Tedrow soils. They commonly are adjacent to those soils, and they are adjacent to very poorly drained Millgrove, Gilford, and Colwood soil in some places. The Granby soils are coarser textured than the Gilford, Millgrove, Colwood, or Wauseon soils. They lack the fine-textured C horizon above a depth of 40 inches that is present in the very poorly drained Wauseon soils.

Granby loamy fine sand (Gr).—This nearly level soil is in broad areas on uplands. In wooded areas a high amount of organic matter accumulates in the surface layer. Where the soil is cultivated, however, the organic-matter content is gradually lowered.

Included with this soil in mapping are small areas, 1 acre to 4 acres in size, of lighter colored sandy Tedrow soils on low rises. These are common throughout areas mapped as this Granby soil. Also included are a few areas of soils that have a mucky surface layer and some areas of very poorly drained Gilford soils that most commonly are near the boundary between Gilford and Granby soils.

A high water table is the major limitation for most uses. Some soil blowing occurs during dry windy periods, but it is not a severe hazard. Capability unit IIIw-4.

Gravel Pits

Gravel pits (Gv) is a miscellaneous land type that consists of open excavations in which the upper layers of the soils have been removed so that the underlying sandy and gravelly materials could be excavated. This land type is in areas of local outwash and on beach ridges. Oshtemo and Haney soils commonly were present in these areas before the excavations for sand and gravel were made. Capability unit not assigned.

Haney Series

The Haney series consists of deep, nearly level to sloping, moderately well drained soils that are loamy and have a sandy and loamy substratum. These soils are on beach ridges, outwash plains, and stream terraces.

In a representative profile of a Haney soil that is cultivated, the plow layer is dark grayish-brown loam about 9 inches thick. The subsoil, between depths of 9 and 36 inches, is dark brown and, between depths of 36 and 42 inches, is dark reddish brown. The upper part of the subsoil is loam and fine sandy loam, and the lower part is sandy clay loam and clay loam. The underlying material, between depths of 42 and 80 inches, is dark yellowish-brown loamy sand and dark-brown sandy clay loam.

Haney soils have moderate permeability in the subsoil and rapid permeability in the underlying material. They have a deep root zone and medium available moisture capacity. Unless these soils have been limed, the upper part of the root zone is medium acid or strongly acid.

Haney soils commonly are used for cultivated crops, but the steeper areas generally are in pasture or hay.

Representative profile of Haney loam, 0 to 2 percent slopes, in a cultivated field in Washington Township (SW¼NW¼SW¼NW¼ sec. 7, T. 5 N., R. 8 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium granular structure; friable; medium acid; abrupt, smooth boundary.

B1—9 to 12 inches, dark-brown (10YR 4/3) loam; weak, medium platy structure parting to moderate, fine, angular blocky structure; friable; thin, very patchy, dark reddish-brown (5YR 3/3) clay films on vertical surfaces of peds; slight acid; clear, wavy boundary.

B21t—12 to 28 inches, dark-brown (7.5YR 4/4) fine sandy loam; few, fine, faint, grayish-brown (10YR 5/2) mottles below a depth of 16 inches; moderate, medium, angular blocky structure; friable; slightly hard; thin, patchy, dark reddish-brown (5YR 3/3) clay films around peds; few fine pebbles; medium acid; gradual, wavy boundary.

B22t—28 to 36 inches, dark-brown (7.5YR 4/4) sandy clay loam; few, medium, faint, brown (7.5YR 5/4) mottles and few, fine, faint, grayish-brown (10YR 5/2) mottles; moderate, coarse, angular blocky structure; friable; thin, patchy, dark reddish-brown (5YR 3/3) clay films on surfaces of peds; about 2 percent fine pebbles; medium acid; gradual, wavy boundary.

B23t—36 to 42 inches, dark reddish-brown (5YR 3/4) light clay loam; common, medium, faint, brown (7.5YR 5/4), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) mottles; moderate, medium, angular blocky structure; friable; thin, patchy, dark reddish-brown (5YR 3/3) clay films around peds; about 3 percent fine pebbles; neutral; abrupt, wavy boundary.

IIC1—42 to 46 inches, dark yellowish-brown (10YR 4/4) loamy sand; single grain; loose; mildly alkaline; calcareous; abrupt, wavy boundary.

IIIC2—46 to 63 inches, dark-brown (7.5YR 4/4) sandy clay loam; medium, distinct, yellowish-brown (10YR 5/6) mottles and few, fine, faint, grayish-brown (10YR 5/2) mottles; massive; friable; mildly alkaline; calcareous; abrupt, wavy boundary.

IVC3—63 to 80 inches, dark, yellowish-brown (10YR 4/4) loamy sand; single grain; loose; moderately alkaline; calcareous.

The thickness of the solum, and generally the depth to carbonates, ranges from about 26 to 42 inches but is 32 to 40 inches in most places. In some places the upper part of the C horizon is neutral and carbonates are 1 foot to 3 feet below the upper boundary of this horizon. The content of gravel in the solum ranges from 2 to 20 percent. Haney soils that contain gravel are mainly on the beach ridges and river terraces. In many places the Haney soils on outwash plains or along tributaries contain almost no gravel.

The Ap horizon commonly is 8 inches thick, but its thickness ranges from 7 to 10 inches. This horizon generally is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The

Ap horizon is loam or fine sandy loam. An A2 horizon occurs in uncultivated areas.

The B horizon is dark brown (7.5YR 4/4 or 10YR 4/3), dark yellowish brown (10YR 4/4), dark reddish brown (5YR 3/4), or brown (7.5YR 5/4). Mottles are faint, brown (7.5YR 5/4), strong brown (7.5YR 5/6), and grayish brown (10YR 5/2). The grayish (2-chroma) mottles occur throughout the Bt horizon. The ped coatings generally are dark reddish brown, dark brown, or dark grayish brown. The B horizon normally is sandy clay loam, light clay loam, or loam.

The C horizon commonly is brown (10YR 4/3), dark brown (7.5YR 4/4), grayish brown (10YR 5/2), or dark yellowish brown (10YR 4/4). It generally is calcareous, though the upper part is neutral in some places. Fine and medium sands are the dominant textures, but gravelly loamy sand and some strata of sandy clay loam commonly occur where these soils are on beach ridges and stream terraces. Finer textured lake clay or till material occurs under the coarse materials. The clayey material is at a depth ranging from 4 to 8 feet.

Haney soils are the moderately well drained members of a drainage sequence that includes the well-drained Oshtemo soils, the somewhat poorly drained Digby soils, and the very poorly drained Millgrove soils. They commonly are adjacent to those soils. They are similar to moderately well drained Rawson soils but lack their underlying fine-textured C horizon above a depth of 40 inches. Haney soils typically have a redder hue in the B horizon than Rawson soils. They lack the fine sand and silt that is common in Tuscola soils, and they are not so red throughout as Vaughnsville soils.

Haney fine sandy loam, 0 to 2 percent slopes (HaA).—This soil is on uplands. It has a sandy surface layer that dries out faster than the surface layer of Haney loam.

Included with this soil in mapping are low areas of level, somewhat poorly drained Digby soils that generally are 1 acre to 2 acres in size. Also included are small areas of soils that have a sandy loam surface layer and small, low areas of very poorly drained, dark-colored Millgrove, Mermill, and Hoytville soils that are near the boundaries of this Haney soil. Areas of soils that have a darker colored surface layer than this Haney soil, areas of soils that lack grayish-brown mottles in the upper part of the subsoil, and areas of soils that have a surface layer and subsoil more than 40 inches in combined thickness also are included.

This soil has no major limitation to farming, and it has few limitations for nonfarm uses. Capability unit I–1.

Haney fine sandy loam, 2 to 6 percent slopes (HaB).—This soil is on beach ridges and stream terraces. It has a loamy surface layer that dries quickly and is slightly droughty. Tillage is easy.

Included with this soil in mapping are small areas of nearly level, somewhat poorly drained Digby soils and a few areas of well-drained Oshtemo soils on the higher rises. These included areas generally are ½ to 1 acre in size. Also included are some spots of level, very poorly drained, dark-colored Mermill and Hoytville soils near boundaries of Haney soils. Areas of soils that have a darker colored surface layer than this Haney soil, areas of soils that lack grayish-brown mottles in the upper part of the subsoil, and areas of soils that have a surface layer and subsoil more than 40 inches in combined thickness also are included.

A moderate hazard of erosion is the major limitation to the use of this soil. Slope is a limitation for some nonfarm uses. Capability unit IIe–1.

Haney loam, 0 to 2 percent slopes (HdA).—This soil is mainly in relatively narrow strips on stream terraces along the Maumee River. A profile of this soil is described as representative for the series. This soil is easy to till, and it dries readily in spring.

Included with this soil in mapping are small, low areas, 1 acre to 3 acres in size, of the wetter Digby soils along the boundaries between those soils and this Haney soil. Also included are areas of the darker colored, moderately well drained Medway soils and the well drained Ross soils. These included soils are common along the boundary of this Haney soil and the adjacent flood plains. Other inclusions are small areas of the very poorly drained Millgrove soils that most commonly are near the boundaries between those soils and this Haney soil. Areas of soils that have a darker colored surface layer than this soil, areas of soils that lack grayish-brown mottles in the upper part of the subsoil, and areas of soils that have a surface layer and subsoil 40 inches in total thickness also are included.

Although this soil has no major limitations to farming or for most nonfarm uses, the wetter included areas or areas subject to flooding have some limitations. Capability unit I–1.

Haney loam, 2 to 6 percent slopes (HdB).—This soil is on low, elongated, medium-sized ridges on stream terraces along the Maumee River. It has good tilth and dries readily in spring.

Included with this soil in mapping are small areas, commonly 1 acre to 2 acres in size, of level, somewhat poorly drained Digby soils along the boundaries between those soils and this Haney soil. Also included are a few areas of moderately eroded Haney loam that generally is more sloping than this soil. Small areas of dark-colored, moderately well drained or well drained Medway and Ross soils that commonly are on lower slopes adjacent to flood plains also are included. Other inclusions are areas of soils that have a darker colored surface layer than this Haney soil, areas of soils that lack grayish-brown mottles in the upper part of the subsoil, and areas of soils that have a surface layer and subsoil more than 40 inches in total thickness.

A moderate hazard of erosion is the major limitation to farming. Slope is a limitation for some nonfarm uses. Capability unit IIe–1.

Haney and Rawson loams, 6 to 12 percent slopes (HeC).—These soils are in medium-sized strips on elongated ridges or slope breaks on stream terraces. They are mapped together because they are similar and because they have the same general use and management requirements.

Included with these soils in mapping are a few areas of nearly level, somewhat poorly drained Digby soils. These areas generally are ½ acre to 2 acres in size. Also included are areas of soils that have a darker colored surface layer than this Haney soil. Areas of soils that lack grayish-brown mottles in the upper part of the subsoil and areas of soils that have a surface layer and subsoil more than 40 inches in combined thickness also are included.

A severe hazard of erosion is the major limitation to farming. Slope is a major limitation for many nonfarm uses. Capability unit IIIe–1.

Haskins Series

The Haskins series consists of nearly level, somewhat poorly drained soils on beach ridges, outwash plains, and stream terraces. These soils formed partly in loamy soil material and partly in underlying lacustrine clay or glacial till modified by water action. The finer textured substratum is at a depth of 20 to 40 inches.

In a representative profile of a Haskins soil that is cultivated, the plow layer is dark grayish-brown loam about 7 inches thick. The subsoil, between depths of 7 and 28 inches, is dark yellowish-brown clay loam, dark grayish-brown sandy clay loam, and grayish-brown silty clay. The underlying material, between depths of 28 and 60 inches or more, is grayish-brown silty clay.

Haskins soils have moderate permeability in the subsoil and slow permeability in the fine-textured underlying material. They are saturated for significant periods in winter and summer because of the slowly permeable substratum. They have medium available moisture capacity and a moderately deep root zone. Haskins soils are medium acid to strongly acid in the upper 24 inches unless they are limed.

Nearly all the acreage of Haskins soils is used for cultivated crops. Most of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Haskins loam, 0 to 2 percent slopes, in a cultivated field in Marion Township (NW¼ NE¼SE¼SW¼ sec. 25, T. 3 N., R. 7 E.):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, subangular blocky structure parting to moderate, medium, granular structure; friable, slightly hard; slightly acid; abrupt, smooth boundary.

B21tg—7 to 15 inches, dark yellowish-brown (10YR 4/4) light clay loam; many, fine, faint, dark grayish-brown (2.5Y 4/2) mottles; moderate, fine, subangular blocky structure; firm, hard; dark-gray (10YR 4/1) ped coatings that have thin, patchy, dark-gray (10YR 4/1) clay films; slightly acid; clear, smooth boundary.

B22tg—15 to 24 inches, dark grayish-brown (10YR 4/2) sandy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and pale-brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; firm, hard; dark-gray (10YR 4/1) ped coatings that have thin, patchy, dark-gray (10YR 4/1) clay films; common fine pebbles; neutral; abrupt, smooth boundary.

IIB3tg—24 to 28 inches, grayish-brown (2.5Y 5/2) silty clay; common, medium, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; very firm, very hard; dominantly gray (10YR 5/1) coatings on peds; thin, patchy, gray (10YR 5/1) clay films on vertical ped surfaces, very patchy gray (10YR 5/1) clay films on horizontal ped surfaces; mildly alkaline; few fine pebbles; clear, wavy boundary.

IIICg—28 to 60 inches, grayish-brown (2.5Y 5/2) silty clay; massive; very firm, very hard; few fine pebbles; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from about 24 to 44 inches. In some places the lower few inches of the solum is calcareous. The depth to the fine-textured material of the IIB and IIC horizons ranges from 20 to 40 inches. The gravel content in the solum ranges from 2 percent to about 15 percent.

The Ap horizon commonly is 7 or 8 inches thick and generally is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). The texture is loam or fine sandy loam. An A2 horizon occurs in uncultivated areas. In the B horizon, matrix colors are dark yellowish brown (10YR 4/4) and dark grayish brown (10YR 4/2), but colors range to dark brown (10YR 4/3) and brown (10YR 5/3). Mottling is faint to distinct, dark grayish brown (2.5Y 4/2), yellowish brown (10YR 5/6), and dark yellowish brown (10YR 4/4). Colors of ped coatings are dominantly darker and have a chroma of 2 or less. Texture of the B horizons generally is sandy clay loam or light clay loam, but layers of heavy loam commonly occur. In some places a 2- to 8-inch layer of loamy sand or fine sand occurs above the IIB3tg horizon. This coarse-textured layer is commonly discontinuous. The matrix colors of the IIB horizon are typically grayish brown (2.5Y 5/2), gray (10YR 5/1), or brown (10YR 5/3), and the texture is silty clay, clay, or heavy clay loam.

The IIC horizon commonly is grayish brown (10YR 5/2, 2.5Y 5/2) or brown (10YR 4/3) but ranges to gray (10YR 5/1), and the texture generally is silty clay, clay, or clay loam. This horizon typically is calcareous.

Haskins soils are the somewhat poorly drained members of a drainage sequence that includes the moderately well drained Rawson soils and the very poorly drained Mermill soils. They are adjacent to the Mermill soils in many places. They are less commonly adjacent to the Rawson soils. The Haskins soils are similar to Digby soils in some properties but lack a sandy or loamy C horizon. They have a lower content of fine sand and silt than the somewhat poorly drained Kibbie soils.

Haskins fine sandy loam, 0 to 2 percent slopes (HkA).—This soil is on low ridges and low knolls on uplands. Because the surface layer and upper part of the subsoil are coarser textured and the available water capacity is slightly lower, this soil is slightly more droughty than Haskins loam.

Included with this soil in mapping are areas of Haskins loam ½ acre to 2 acres in size, a few spots of Rimer loamy fine sand ½ acre to 2 acres in size, areas of gently sloping soils, and areas of very poorly drained, dark-colored Mermill and Hoytville soils. The Mermill and Hoytville inclusions are in the more nearly level areas and are near areas mapped as those two soils. Also included are areas of soils that are darker colored than is typical for Haskins soils. The darker color in these inclusions generally extends to a depth of less than 10 inches. Areas of soils in which the surface layer and upper part of the subsoil are loamy and range from 14 to 20 inches in thickness are also included.

Seasonal wetness is the major limitation to farming. Wetness and erosion are limitations in a few areas of included gently sloping soils, but the hazard of erosion generally is not so significant as the wetness limitation. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIw–6.

Haskins loam, 0 to 2 percent slopes (HlA).—This soil is in strips on low knolls on uplands. A profile of this soil is described as representative for the series. This soil generally is easy to till.

Included with this soil in mapping are small areas of Haskins fine sandy loam, commonly 1 to 3 acres in size; areas of gently sloping soils; a few spots of Rimer loamy fine sand ½ acre to 2 acres in size; and areas of dark-colored, very poorly drained Mermill and Hoytville soils. Also included are areas of soils that are darker colored than is typical for Haskins soils. In these inclusions the darker color generally extends to a depth of less than 10 inches. Areas of soils in which the surface layer and upper part of the subsoil are loamy and range from 14 to 20 inches in thickness also are included.

Wetness is the major limitation to farming. Erosion is a hazard on the included gently sloping soils. Seasonal wetness and slow permeability are major limitations for many nonfarm uses. Capability unit IIw-6.

Haskins fine sandy loam, stratified substratum, 0 to 2 percent slopes (HnA).—This soil is on low knolls on uplands. It differs from typical Haskins soils in having a stratified substratum below a depth of 40 inches. This substratum consists of layers of sandy clay loam, silty clay, clay, sandy loam, and medium or coarse sands. Clayey till or lake clay material is beneath the stratified substratum at a depth of 4 to 9 feet.

Included with this soil in mapping are areas of Rimer soils that have a stratified substratum and are ½ acre to 2 acres in size, areas of nonstratified Haskins soils, and areas of dark-colored, very poorly drained Mermill soils that have a stratified substratum. The Mermill inclusions commonly occur near areas mapped as Mermill soils. Also included are areas of soils that are darker colored than is typical for Haskins soils. In these inclusions the dark color generally extends to a depth of less than 10 inches. Areas of soils in which the surface layer and upper part of the subsoil are loamy and range from 14 to 20 inches in thickness also are included.

Wetness is the major limitation to farming. Erosion is a slight hazard on the included gently sloping soils. Seasonal wetness and slow permeability are major limitations for many nonfarm uses. Capability unit IIw-6.

Hoytville Series

The Hoytville series consists of nearly level, dark-colored, very poorly drained soils. The soils formed in clayey glacial till beveled and reworked by lake action. They are in broad flats on uplands, chiefly in the southern part of the county and north and west of Napoleon.

In a representative profile of a Hoytville soil that is cultivated, the plow layer is very dark grayish-brown clay about 7 inches thick. The subsoil, between depths of 7 and 37 inches is gray and olive-gray clay that is mottled with yellowish brown or dark yellowish brown, or both. The underlying material, between depths of 37 and 60 inches, is dark yellowish-brown clay glacial till. The upper foot or two of this compact till material is partially weathered. It contains numerous pebbles and fragments of limestone and there are some coarse fragments and pebbles throughout the soil.

Hoytville soils have moderately slow permeability in the subsoil and slow permeability in the till material. They commonly are saturated during winter and spring and dry out slowly in spring unless they have been artificially drained. They have high available moisture capacity and a root zone that is deep where they are adequately drained or when water in the soil is depleted in summer. Hoytville soils are slightly acid to neutral in the upper part of the root zone.

Nearly all the acreage of Hoytville soils is used for cultivated crops, except for many small woodlots. These woodlots are gradually being cleared for farm use. Most of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Hoytville clay, in a cultivated field in Pleasant Township (SW¼NW¼SW¼SE¼ sec. 27, T. 3 N., R. 6 E.):

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) clay; moderate, medium and coarse, angular blocky structure; firm; 2 percent coarse fragments; slightly acid; abrupt, smooth boundary.

B21tg—7 to 11 inches, gray (10YR 5/1) clay; many, medium, distinct, yellowish-brown (10YR 5/4 or 5/6) mottles; moderate, medium, angular blocky structure; firm; some black (10YR 2/1) organic staining on peds; thin, patchy, grayish-brown (10YR 5/2) clay films on peds; 2 percent angular coarse fragments; neutral; clear, smooth boundary.

B22tg—11 to 16 inches, olive-gray (5Y 5/2) clay; common, medium, prominent, yellowish-brown (10YR 5/6) and dark yellowish-brown (10YR 4/4) mottles; moderate, medium and fine, angular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films on peds; 4 percent angular coarse fragments; neutral; clear, smooth boundary.

B23tg—16 to 27 inches, olive-gray (5Y 5/2) clay; common, medium, prominent, brownish-yellow (10YR 6/8) and dark yellowish-brown (10YR 4/4) mottles; weak, medium and coarse, prismatic structure parting to moderate, medium and fine, angular blocky; very firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films around peds; 4 percent angular coarse fragments; neutral; gradual, smooth boundary.

B3tg—27 to 37 inches, olive-gray (5Y 5/2) clay; common, medium, prominent yellowish-brown (10YR 5/4 or 5/6) mottles; moderate, coarse, prismatic structure parting to moderate, medium, angular blocky; firm; thin continuous, dark grayish-brown (2.5Y 4/2) clay firms on vertical ped surfaces; 5 percent angular coarse fragments; neutral; clear, smooth boundary.

C—37 to 60 inches, dark yellowish-brown (10YR 4/4) clay; light-gray (10YR 7/2) calcareous areas common on vertical cleavage faces; massive; firm, sticky; thin, patchy, gray (5Y 5/1) clay films on vertical cleavage faces; 6 percent angular coarse fragments; mildly alkaline.

The thickness of the solum, and commonly the depth to carbonates, ranges from 36 to 55 inches but most commonly is 40 to 50 inches. In some places the upper part of the C horizon is calcareous only in patchy areas. Coarse fragments, which are dominantly limestone but include some shale and igneous pebbles, make up about 2 to 8 percent of the soil mass.

The thickness of the dark-colored Ap horizon generally is 7 to 8 inches but ranges from 6 to 9 inches. This horizon is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1). The dominant texture is clay, but it is clay loam in some places.

The B horizon generally is gray (10YR 5/1 or 6/1 or 5Y 5/1) or olive gray (5Y 5/2) but ranges to dark gray (10YR 4/1). This horizon has distinct to prominent, yellowish-brown (10YR 5/4 and 5/6) and dark yellowish-brown (10YR 4/4) mottles. Gray mottles and gray or grayish-brown clay films are common on ped surfaces. The B horizon is clay and has a content of clay ranging from 40 to 50 percent.

The C horizon is commonly dark yellowish brown (10YR 4/4) or grayish brown (10YR 5/2), but it is gray (10YR 5/1 or 5Y 5/1) in places. This horizon has few or common mottles of yellowish brown (10YR 5/6 and 5/8), dark yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2), gray (5Y 5/1), olive gray (5Y 5/2), or grayish brown (10YR 5/2). The horizon is heavy clay loam or clay.

Hoytville soils are the very poorly drained members of a drainage sequence that includes the moderately well drained St. Clair soils and the somewhat poorly drained Nappanee soils. They are adjacent to those soils in areas where well-developed drainageways occur, but elsewhere they mainly are adjacent to the Nappanee soils. They commonly are adjacent to very poorly drained Lenawee, Latty, and Toledo soils in some places. The Hoytville soils have about the same content of clay as Toledo and Latty soils, but they formed in glacial till material, whereas the Toledo and Latty soils formed in lacustrine silty clay material. Hoytville soils differ from Lenawee soils in having a higher content of clay and a lower content of sand in the B horizon. In addition, they formed in till, whereas the Lenawee soils formed in stratified lacustrine material.

Hoytville clay loam (Ho).—This level soil is in broad, elongated strips adjacent to areas of more sandy soils on uplands. It has a higher content of sand in the surface layer than Hoytville clay and can be tilled throughout a wider range of moisture content than that soil.

Included with this soil in mapping are areas of very poorly drained Mermill soils. These included areas are 1 acre to 4 acres in size. They occur throughout the mapped areas but are most common near the boundary between Mermill soils and this Hoytville soil. Also included are small areas, ½ acre to 2 acres in size, of lighter colored Haskins soils on low knolls and ridges and small areas of lighter colored Rimer loamy fine sand. Other inclusions are areas of Hoytville soils where the surface layer and subsoil combined are either thicker or thinner than is typical for the series.

Soil wetness is the major limitation to farming. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIw-5.

Hoytville clay (Hv).—This level soil is in broad areas on uplands. A profile of this soil is described as representative for the series. The surface layer is more difficult to till than that of Hoytville clay loam. It clods if it is worked when wet. If this soil is intensively cultivated, crusting occurs after heavy rainfall, and this can adversely affect plant seedlings.

Included with this soil in mapping are small areas, 1 acre to 4 acres in size, of less clayey, very poorly drained Mermill soils. These inclusions generally are rather widely scattered. Also included are areas of lighter colored Nappanee soils, ½ acre to 3 acres in size, on slight knolls and nearly level ridges that commonly are near drainageways, and a few areas of lighter colored, sandy Rimer soils and loamy Haskins soils. Other inclusions are areas of Hoytville soils where the surface layer and subsoil combined are either thicker or thinner than is typical for the series.

Wetness is the major limitation to farming. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIw-5.

Hoytville Series, Thin Solum Variant

The Hoytville series, thin solum variant, consists of dark-colored, very poorly drained soils. These soils formed in clayey glacial till that was modified or reworked by water. They are in fairly broad areas in a small valley in Ridgeville Township that is 5 to 6 feet lower than the uplands.

In a representative profile of a Hoytville, thin solum variant, soil that is cultivated, the plow layer is black clay about 9 inches thick. Between depths of 9 and 13 inches, there is a subsoil of dark grayish brown clay that has distinct, light olive-brown mottles. The underlying material, between depths of 13 and 60 inches or more, is compact clay glacial till. The upper 12 inches of the till shows considerable evidence of having been reworked by lake water.

Hoytville, thin solum variant, soils have slow permeability in the subsoil and in the till material. They are seasonally saturated for a significant period of time, and they dry out very slowly in spring unless they have been adequately drained. They have low available moisture capacity and a root zone that is shallow to moderately deep where it is adequately drained.

Nearly all the acreage of Hoytville, thin solum variant, soils is used for cultivated crops. Most of this has been artificially drained to improve plant growth and to help make fieldwork easier.

Representative profile of Hoytville clay, thin solum variant, in a cultivated field in Ridgeville Township (NE¼NW¼NE¼ sec. 14, T. 6 N., R. 5 E.):

Ap—0 to 9 inches, black (10YR 2/1) clay; weak, medium, subangular blocky structure parting to moderate, medium, granular structure; firm; neutral; abrupt, smooth boundary.

Bg—9 to 13 inches, dark grayish-brown (2.5Y 4/2) clay; few, medium, distinct, light olive-brown (2.5Y 5/4 and 5/6) mottles; moderate, medium, angular blocky structure; firm; thin, very patchy, dark-gray (10YR 4/1) coatings on vertical ped faces; few, fine, angular stones and pebbles; mildly alkaline; clear, wavy boundary.

C1g—13 to 20 inches, dark grayish-brown (2.5Y 4/2) clay; common, medium, distinct, light olive-brown (2.5Y 5/4 and 5/6) mottles; weak, medium, angular blocky structure; firm; some pebbles and coarse fragments; moderately alkaline; calcareous; clear, wavy boundary.

C2g—20 to 23 inches, dark grayish-brown (2.5Y 4/2) clay; common, medium, distinct, light olive-brown (2.5Y 5/4) and olive-brown (2.5Y 4/4) mottles; weak, thick, platy structure; firm; common strong-brown (7.5YR 5/6) oxide coatings; some pebbles and angular stones; moderately alkaline; calcareous; abrupt, wavy boundary.

C3—23 to 60 inches, brown (10YR 4/3) clay; common, medium, distinct, dark grayish-brown (10YR 4/2) and yellowish-brown (10YR 5/6) mottles; massive; firm; numerous pebbles and angular fragments; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 12 to 20 inches. The B horizon generally has lower color values and fewer bright mottles than is typical for the Hoytville series.

These Hoytville soils are adjacent to Mermill soils and to lighter colored Nappanee soils, which occur on the adjacent valley slopes. They have a much thinner Bt horizon than normal Hoytville soils. They are much darker colored than the adjacent, lighter colored Nappanee soils.

Hoytville clay, thin solum variant (Hw).—This level soil is in slightly depressional areas. It generally has poor tilth, and it can be tilled only within a narrow range of moisture content.

Included with this soil in mapping are areas of very poorly drained Mermill soils. These inclusions are 1 acre to 4 acres in size. They have a less clayey surface layer and are easier to farm than this Hoytville variant.

Seasonal wetness is the major limitation to farming. This soil is not so well suited to artificial drainage as normal Hoytville soils, which have a thicker combined surface layer and subsoil. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIw-5.

Kibbie Series

The Kibbie series consists of deep, nearly level, somewhat poorly drained soils that are mainly in Liberty Township. These soils formed in loamy materials on uplands.

In a representative profile of a Kibbie soil that is cultivated, the plow layer is dark grayish-brown fine sandy loam about 13 inches thick. The subsurface layer is pale-brown fine sandy loam about 2 inches thick. The subsoil between depths of 15 and 38 inches, is yellowish-brown and pale-brown loam and light yellowish-brown very fine sandy loam. It has yellowish-brown and grayish-brown mottles. The subsoil has a slightly higher content of clay than the surface layer. The underlying material, between depths of 38 and 72 inches, is stratified, calcareous silt, fine sand, and silt loam.

Kibbie soils have moderate permeability in the subsoil and in the underlying stratified materials. They are seasonally saturated for long periods and dry out slowly in spring unless they have been adequately drained. They have high available moisture capacity. The root zone is deep if the soils are adequately drained and in summer when the water table is low. The root zone is slightly acid to neutral.

Nearly all the acreage of Kibbie soils is used for cultivated crops. Most of this soil has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Kibbie fine sandy loam, 0 to 2 percent slopes, in a cultivated field in Liberty Township (SW¼SW¼NW¼NW¼ sec. 33, T. 6 N., R. 7 E.):

Ap1—0 to 9 inches, dark grayish-brown (10YR 4/2, 6/2 dry) fine sandy loam; very weak, fine, subangular blocky structure parting to moderate, fine, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary.

Ap2—9 to 13 inches, dark grayish-brown (10YR 4/2, 6/2 dry) fine sandy loam; weak, medium, platy structure parting to moderate, fine, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary.

A2—13 to 15 inches, pale-brown (10YR 6/3) fine sandy loam; common, fine, distinct, yellowish-brown (10YR 5/6) and dark-brown (7.5YR 4/4) mottles; weak, medium, platy structure parting to weak, very fine, subangular blocky structure; very friable; common roots; slightly acid; clear, smooth boundary.

B21t—15 to 24 inches, yellowish-brown (10YR 5/4) loam; few, fine, faint, light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/6) mottles, and many, medium, grayish-brown (2.5Y 5/2) mottles; moderate, fine, angular blocky structure; friable; common roots; thin, patchy, grayish-brown (10YR 5/2) clay films on peds; many, medium, grayish-brown (2.5Y 5/2) mottles on peds; slightly acid; clear, smooth boundary.

B22t—24 to 31 inches, pale-brown (10YR 6/3) loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles and many, medium, faint, grayish-brown (2.5Y 5/2) mottles; weak, fine, angular blocky structure; friable; few roots; thin, patchy, grayish-brown (2.5Y 5/2) clay films around peds; many, medium, faint, grayish-brown (2.5Y 5/2) mottles on ped faces; neutral; clear, wavy boundary.

B3—31 to 38 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; common, fine, distinct, yellowish-brown (10YR 5/8) mottles; very weak, medium, subangular blocky structure parting to very weak, fine, subangular blocky structure; friable; few roots; thin, very patchy, dark grayish-brown (10YR 4/2) clay films on vertical ped surfaces; mildly alkaline; clear, wavy boundary.

Cg—38 to 72 inches, grayish-brown (2.5YR 5/2), stratified silt, silt loam, and fine sand; many, medium, distinct, gray (10YR 6/1) mottles and few, medium, distinct, strong-brown (7.5YR 5/6) mottles; very coarse platy structure; friable; light-gray (10YR 7/1) calcium carbonate accumulations; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 24 to 48 inches but in most places is between 26 and 44 inches.

The Ap horizon ranges from 7 to 13 inches in thickness. Its color generally is dark grayish brown (10YR 4/2), though it appears to be very dark grayish brown (10YR 3/2) until crushed. The dominant texture of the Ap horizon is fine sandy loam, but its texture ranges to very fine sandy loam, loam, and silt loam.

The B horizon generally is brown (10YR 5/3), pale brown (10YR 6/3), or yellowish brown (10YR 5/4) but ranges to grayish brown (10YR 5/2) or light yellowish brown (10YR 6/4). Mottling is faint to distinct, light yellowish brown (10YR 6/4), yellowish brown (10YR 5/6), grayish brown (10YR 5/2 or 2.5Y 5/2), gray (10YR 5/1), and brown (10YR 4/3). Ped surfaces in the Bt horizon have a dominant chroma of 2. The B horizon is loam, heavy fine sandy loam, or light sandy clay loam; light clay loam and heavy silt loam layers occur in some places.

The C horizon is commonly grayish brown (2.5Y 5/2) but ranges to brown (10YR 5/3), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 4/4). It is typically stratified with layers of fine sand, very fine sand, silt, and silt loam. The layers range from ⅛ inch to about 5 inches in thickness.

Kibbie soils are the somewhat poorly drained members of a drainage sequence that includes the moderately well drained Tuscola soils and the very poorly drained Colwood soils. They are adjacent to those soils in areas where well-developed drainageways occur. They commonly are adjacent to somewhat poorly drained Del Rey soils. The Kibbie soils have a lower content of clay in the B horizon than the Del Rey soils, and they have a higher content of fine sand. They have a higher content of silt and fine sand in the B horizon than somewhat poorly drained Digby soils. They differ from Haskins soils in lacking a finer textured C horizon within a depth of 40 inches.

The Kibbie soils in this county have a lighter colored A horizon and grayer ped surfaces in the B horizon than the defined range for the series. These differences do not greatly affect the use or management of these soils.

Kibbie fine sandy loam, 0 to 2 percent slopes (KfA).—This soil is on low knolls and elongated low ridges, most commonly near drainageways. A profile of this soil is described as representative for the series. This soil generally has good tilth and very low susceptibility to surface crusting. If this soil is artificially drained, it dries out and warms readily in spring.

Included with this soil in mapping are small areas, ½ acre to 3 acres in size, of somewhat poorly drained Haskins fine sandy loam, stratified substratum, and small areas of Tedrow loamy fine sand, silty subsoil variant. Also included are areas of Kibbie soils that have a darker-colored surface layer than is typical for the series and some areas of gently sloping Kibbie soils.

Seasonal wetness is the major limitation to farming. Erosion is a slight hazard on the gently sloping included soils. Seasonal wetness is the dominant limitation for many nonfarm uses. Capability unit IIw-6.

Kibbie loam, 0 to 2 percent slopes (KlA).—This soil is on low knolls and somewhat elongated low ridges, most commonly near drainageways but also in other areas. It has a slightly higher available moisture capacity than Kibbie fine sandy loam, but it also has a greater tendency to crust after heavy rains.

Included with this soil in mapping are small areas of Kibbie fine sandy loam, generally ½ acre to 1½ acres in size. Also included are areas of soils that are gently sloping and areas of soils that have a darker colored surface layer than is typical for the series. Small areas of moderately well drained Tuscola soils on slightly higher knolls or slope breaks also are included.

Seasonal wetness is the major limitation to farming, and it also is a dominant limitation for many nonfarm uses. Capability unit IIw-6.

Latty Series

The Latty series consists of deep, level to nearly level, very poorly drained soils. These soils formed in lacustrine clay that is underlain by Wisconsin-age clayey glacial till. They are in broad areas on uplands and are only in Pleasant and Ridgeville Townships.

In a representative profile of a Latty soil that is cultivated, the plow layer is dark-gray clay about 8 inches thick. The subsoil, between depths of 8 and 41 inches, is gray clay that contains many, distinct, yellowish-brown mottles. The subsoil has about the same content of clay as the surface layer. The underlying material, between depths of 41 to 71 inches, is calcareous clay glacial till. This material is compact and contains numerous pebbles and fragments of limestone.

Latty soils have slow permeability in the subsoil and very slow permeability in the underlying till. They are saturated for long periods in winter and spring, and they are slow to dry out in spring unless they have been adequately drained. They have medium available moisture capacity and a root zone that is mostly moderately deep if the soil is drained. Latty soils are slightly acid to neutral in the upper part of the root zone.

Nearly all the acreage of Latty soils is used for cultivated crops. A few small woodlots remain in some places. Most of the cultivated acreage has been artificially drained to improve plant growth and to help make fieldwork easier.

Representative profile of Latty clay, in a cultivated field in Pleasant Township (NE¼NE¼NE¼NW¼ sec. 31, T. 3 N., R. 6 E.):

Ap—0 to 8 inches, dark-gray (10YR 4/1) clay; few, fine, faint, dark-brown (10YR 4/3) mottles; weak, medium, granular structure between depths of 0 and 2 inches, weak, medium, angular blocky structure between depths of 2 and 8 inches; firm; many roots; slightly acid; abrupt, smooth boundary.

B21g—8 to 15 inches, gray (N 5/0) clay; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, prismatic structure parting to moderate, fine, angular blocky structure; firm; common roots; dark-gray (10YR 4/1) ped surfaces that have common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; neutral; gradual, smooth boundary.

B22g—15 to 28 inches, gray (N 5/0) clay; medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; firm; common roots; dark-gray (N 4/0) ped surfaces that have common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; neutral; gradual, smooth boundary.

B23g—28 to 41 inches, gray (5Y 5/1) clay; many, coarse, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, angular blocky structure; firm; few roots; few small pebbles; mildly alkaline; clear, smooth boundary.

IIC—41 to 71 inches, yellowish-brown (10YR 5/4) clay; many, medium, distinct, grayish-brown (10YR 5/2) and greenish-gray (5GY 5/1) mottles; massive; firm; few light-gray (10YR 7/1) calcium carbonate accumulations; few pebbles and shale fragments; moderately alkaline; calcareous.

The thickness of the solum, and generally the depth to carbonates, ranges from 34 to 60 inches, but more commonly is 36 to 45 inches.

The Ap horizon generally is dark gray (10YR 4/1), but it ranges to dark grayish brown (10YR 4/2).

The B horizon is gray (5Y 5/1; 2.5Y 5/1; N 5/0), but ranges to dark grayish brown (2.5Y 4/2), olive gray (5Y 5/2), and dark gray (10YR 4/1) in some subhorizons. Mottling is mainly distinct, yellowish brown (10YR 5/4), dark yellowish brown (10YR 4/4), or brown (10YR 4/3), but in some places it ranges to light olive (2.5Y 5/4) or 5/6) or strong brown (7.5YR 5/6). The B horizon has a content of clay ranging between 48 and 56 percent.

The C horizon commonly is yellowish brown (10YR 5/4), gray (10YR 5/1; N 5/0; 5Y 5/1), dark grayish brown (10YR 4/2), or dark brown (10YR 4/3) and is mottled with olive gray (5Y 5/2), olive (5Y 5/6), grayish brown (10YR 5/2), brown (7.5YR 5/4), and greenish gray (5GY 6/1). This horizon dominantly is clay but ranges to heavy clay loam.

Latty soils are adjacent to somewhat poorly drained Nappanee soils on slight knolls. They are commonly adjacent to very poorly drained Paulding soils but have less clay in the solum than the Paulding soils; they generally contain 48 to 56 percent clay, whereas the Paulding soils have a clay content of more than 60 percent. Latty soils differ from Toledo soils in lacking a dark-colored surface layer and in having less well developed structure. They differ from very poorly drained Hoytville soils in lacking a dark-colored surface layer. Latty soils lack the pebble content in the upper part of the solum that is common in Hoytville soils.

Latty clay (La).—This level soil is in broad areas on uplands. The surface layer is difficult to till, and it crusts following heavy rains. At times this crusting adversely affects stands of seedlings. This soil is subject to cracking when dry.

Included with this soil in mapping are a few spots of finer textured Paulding soils and darker colored Hoytville soils. These inclusions are near the boundaries between those soils and Latty clay. Also included are some small areas, ¾ acre to 2 acres in size, of less poorly drained Nappanee soils on slight rises. Small areas of very poorly drained, darker colored Mermill soils and some small areas of somewhat poorly drained Haskins soils also are included. These inclusions generally are in areas ¾ acre to 2 acres in size.

Very poor natural drainage and a clay texture are the major limitations to farming. This soil dries out slowly in the spring and is difficult to drain artificially. Wetness, very slow permeability, and a clay texture are major limitations for most nonfarm uses. Capability unit IIIw-5.

Lenawee Series

The Lenawee series consists of deep, level and nearly level, dark-colored soils that are very poorly drained. These soils formed in stratified lacustrine sediment that dominantly is silty clay loam and clay loam in texture. They are in broad areas on uplands on the lake plain, mainly in Napoleon, Liberty, and Flatrock Townships.

In a representative profile of a Lenawee soil that is cultivated, the plow layer is very dark grayish-brown silty clay loam about 8 inches thick. The subsoil, between depths of 8 and 43 inches, is grayish-brown silty clay loam and clay loam mottled with olive gray, yellowish brown, and light brownish gray. The underlying material, between depths of 43 and 61 inches or more, is stratified, calcareous silty loam, silt, silt loam, and silty clay.

Lenawee soils have moderately slow permeability in both the subsoil and the stratified underlying material. They are saturated for long periods in winter and spring. They have high available moisture capacity and a root zone that is deep if the soil is adequately drained and in summer when the water table is low. The root zone is mostly neutral.

Nearly all the acreage of Lenawee soils is used for cultivated crops, except for a few small woodlots. Most of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Lenawee silty clay loam, in a cultivated field in Liberty Township (NW¼NE¼NE¼ sec. 7, T. 5 N., R. 7 E.):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, medium, subangular blocky structure parting to moderate, medium, granular structure; firm; neutral; abrupt, smooth boundary.

B21g—8 to 16 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, faint, olive-gray (5Y 5/2) mottles and common, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, angular blocky structure; firm; few yellowish-red (5YR 4/6) iron stains; ped faces are gray (10YR 5/1); thin, very patchy, gray (10YR 5/1) clay films; neutral; clear, smooth boundary.

B22tg—16 to 34 inches, grayish-brown (2.5Y 5/2) heavy clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure parting to strong, medium, angular blocky structure; firm; thin, patchy, gray (10YR 5/1) clay films on peds; neutral; gradual, smooth boundary.

B23tg—34 to 37 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6), light brownish-gray (2.5Y 6/2), and gray (5Y 5/1) mottles; weak, medium, subangular blocky structure; firm; ped surfaces are gray (10YR 5/1); thin, patchy, gray (10YR 5/1) clay films on peds; neutral; gradual, smooth boundary.

B3g—37 to 43 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam; common, fine and medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; weak, medium, subangular blocky structure; firm; thin, very patchy, gray (10YR 5/1) clay films on vertical ped faces; mildly alkaline; clear, wavy boundary.

C1g—43 to 54 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, fine and medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; mildly alkaline; slightly calcareous; diffuse, smooth boundary.

C2g—54 to 61 inches, grayish-brown (2.5Y 5/2), stratified silt, silt loam, and silty clay; many, fine and medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; moderately alkaline; calcareous.

The thickness of the solum, and generally the depth to carbonates, ranges from 36 to 56 inches, but it commonly is 40 to 50 inches.

The Ap horizon generally is very dark grayish brown (10YR 3/2) but ranges to very dark gray (10YR 3/1). Its texture is silty clay loam or loam.

The B horizon generally is grayish brown (2.5Y 5/2) or gray (5Y 5/1) but ranges to dark grayish brown (2.5Y 4/2). The mottling is of both high and low chroma. The texture of the B horizon dominantly is heavy silty clay loam or heavy clay loam; however, layers of silt loam and light silty clay occur in some places.

The C horizon commonly is grayish brown (2.5Y 5/2) or gray (5YR 5/1). Mottling is of high chroma. The C horizon is stratified with layers that dominantly are silty clay loam and clay loam, but there are layers of silt, silt loam, and silty clay in some places.

Lenawee soils are the very poorly drained members of a drainage sequence that includes the moderately well drained Shinrock soils and the somewhat poorly drained Del Rey soils. They are adjacent to those soils in areas where well-developed drainageways occur. They are commonly adjacent to very poorly drained Toledo soils, but they are less clayey than the Toledo soils. Lenawee soils have a higher content of clay and a lower content of silt and fine sand in the B horizons than the very poorly drained Colwood soils. Lenawee soils formed in stratified sediment, in contrast to the very poorly drained Hoytville soils, and they have less clay in the B horizon than Hoytville soils.

The Lenawee soils in this county have a Bt horizon and generally a thicker solum than the defined range for the series. These differences, however, are not such that they greatly change the use or management of the soils.

Lenawee loam (Le).—This level soil is in broad, elongated areas on uplands. It has better tilth than Lenawee silty clay loam, because it has less clay in the plow layer.

Included with this soil in mapping are small areas, 1 acre to 3 acres in size, of Lenawee silty clay loam and a few small areas, ½ acre to 1 acre in size, of lighter colored, somewhat poorly drained Del Rey soils. These inclusions commonly are on low rises and are readily apparent in plowed fields. Also included are areas of Lenawee soils that have a thicker dark-colored surface layer than is typical for the series.

Wetness, caused by a seasonal high water table, is the major limitation to farming and for many nonfarm uses. Capability unit IIw-3.

Lenawee silty clay loam (Lf).—This level soil is in broad areas on uplands. A profile of this soil is described as representative for the series. This soil has a silty clay loam surface layer that is sticky when wet, and it can be tilled only within a rather narrow range of moisture content. It is not susceptible to damaging surface crusting unless it is intensively cultivated.

Included with this soil in mapping are small areas, ½ acre to 3 acres in size, of lighter colored Del Rey soils on low rises that commonly are near drainageways. Also included are areas, 1 acre to 4 acres in size, of clayey, very poorly drained Toledo soils. These generally are most common near the boundaries of the Toledo soils and this Lenawee soil. A few areas of Lenawee soils that have a thicker, dark-colored surface layer than is typical for the series are included.

Wetness, caused by a seasonally high water table, is the major limitation to farming and for most nonfarm uses. Capability unit IIw-3.

Lucas Series

The Lucas series consists of gently sloping to very steep, moderately well drained soils. These soils formed in clayey lacustrine sediment. They are on slope breaks along streams that dissect the lake plain.

In a representative profile of a Lucas soil that is severely eroded, the surface layer is dark yellowish-brown silty clay about 5 inches thick. From 7 to 10 inches of the original soil has been eroded away, and the present surface layer is subsoil material. The subsoil, between depths of 5 and 25 inches, is dark yellowish-brown silty clay. Some faint yellowish-brown and grayish-brown mottling occurs in the lower part of the subsoil. The underlying material, between depths of 25 to 60 inches, is stratified, calcareous silty clay that has thin lenses of silt, silt loam, or very fine sand.

Lucas soils have slow permeability in the subsoil and very slow permeability in the stratified underlying material. They have medium available moisture capacity and a root zone that is moderately deep. They are saturated for short periods in winter and spring. Lucas soils are strongly acid or medium acid in the upper 24 inches.

Lucas soils are used mainly for cultivated crops and for pasture, but some areas are wooded. Most areas of these soils are moderately or severely eroded.

Representative profile of Lucas silty clay, 12 to 45 percent slopes, severely eroded, in a permanent pasture in Washington Township (SW¼SE¼SW¼NE¼ sec. 6, T. 5 N., R. 8 E.):

Ap—0 to 5 inches, dark yellowish-brown (10YR 4/4) silty clay; moderate, medium, angular blocky structure; firm; thin, patchy, dark-brown (10YR 4/3) clay films on vertical faces; brown (10YR 5/3) silty coatings on ped faces in upper part of horizon; strongly acid; clear, wavy boundary.

B22t—5 to 9 inches, dark yellowish-brown (10YR 4/4) silty clay; strong, medium, angular blocky structure; very firm; thin, continuous, dark yellowish-brown (10YR 3/4) clay films; strongly acid; clear, wavy boundary.

B23t—9 to 20 inches, dark yellowish-brown (10YR 4/4) silty clay; moderate, coarse, prismatic structure parting to moderate, medium, angular blocky structure; very firm; thin, continuous, dark yellowish-brown (10YR 3/4) clay films; medium acid; clear, wavy boundary.

B3—20 to 25 inches, dark yellowish-brown (10YR 4/4) silty clay; many, medium, faint, yellowish-brown (10YR 5/6) mottles and few, fine, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, angular blocky structure; very firm; thin, patchy, dark yellowish-brown (10YR 3/4) clay films on vertical faces; slightly acid; gradual, wavy boundary.

C1—25 to 28 inches, dark grayish-brown (10YR 4/2) silty clay; common, medium, faint, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; massive, but there is a tendency towards weak, thick, platy structure; very firm; gray (10YR 6/1) lime accumulations on vertical cleavages; moderately alkaline; calcareous; clear, smooth boundary.

C2—28 to 60 inches, dark grayish-brown (10YR 4/2) silty clay; few, fine, faint, yellowish-brown (10YR 5/6) mottles; laminated fine-textured lacustrine material and a few thin lenses of silt and very fine sand; very firm; moderately alkaline; calcareous.

The thickness of the solum, and generally the depth to carbonates, ranges from 20 to 36 inches, but in places the depth to carbonates ranges from 18 to 40 inches.

The light-colored Ap horizon, where present, generally is 4 to 8 inches thick, but in most places it has been all or nearly all removed by erosion. This horizon commonly is dark yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2), dark brown (10YR 4/3), or brown (10YR 5/3), but it ranges to grayish brown (10YR 5/2). The A horizon is silty clay loam or silty clay.

The Bt horizon generally is dark yellowish-brown (10YR 4/4) or dark brown (10YR 4/3), but it ranges to brown (10YR 5/3) or yellowish brown (10YR 5/4). The faint mottling is yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2), The Bt horizon dominantly is silty clay or clay and has a content of clay ranging from 45 to 60 percent. Thin horizons of silty clay loam occur in some places.

The C horizon is dark grayish brown (10YR 4/2), brown (10YR 4/3), or dark yellowish brown (10YR 4/4). It dominantly is silty clay, but in some places it is clay. Thin strata or layers of silty clay loam, silt loam, silt, or very fine sand occur in many places.

Lucas soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Fulton soils and the very poorly drained Toledo soils. They are adjacent to those soils in areas where well-developed drainageways occur. They are adjacent to moderately well drained St. Clair soils in some places. Lucas soils have fewer pebbles and less sand throughout than St. Clair soils. They have a much higher content of clay throughout than moderately well drained Shinrock or Tuscola soils.

Lucas silty clay loam, 2 to 6 percent slopes, moderately eroded (LwB2).—This soil is in narrow, elongated strips on slope breaks along drainageways. Most areas have short slopes. About 60 percent or more of each area mapped as this soil is moderately eroded. These eroded areas commonly are on the more sloping parts of the mapped areas. The plow layer is sticky and cloddy because plowing has mixed some of the clayey subsoil with the original surface layer. Most areas of this soil generally have a low organic-matter content. Crusting and cloddiness are severe, and commonly they have an adverse effect on stands of seedlings.

Included with this soil in mapping are small areas, ½ acre to 1½ acres in size, of severely eroded Lucas soils and sandy Seward soils.

A severe hazard of erosion is the major limitation to farming. Very slow permeability and slope are limitations for many nonfarm uses. Capability unit IIIe–2.

Lucas silty clay loam, 6 to 12 percent slopes, moderately eroded (LwC2).—This soil is on narrow, elongated slope breaks along drainageways. Slopes generally are short. About 80 percent or more of each area mapped as this soil is moderately eroded. The plow layer is sticky and cloddy, because much of the original surface layer has been removed by erosion and plowing has mixed some of the clayey subsoil with the remaining part of the original surface layer. Most areas have a low organic-matter content. Crusting and cloddiness are severe, and stands of seedlings commonly are adversely affected.

Included with this soil in mapping are areas of severely eroded Lucas soils, 1 acre to 4 acres in size. These areas generally are in the steeper parts of mapped areas. Also included are small areas of moderately well drained St. Clair soils in narrow, continuous strips that commonly are on the lower part of the slopes and can be identified by pebbles and coarse fragments on the surface.

A very severe hazard of erosion is the major limitation to farming. Slope and very slow permeability are limitations for many nonfarm land uses. Capability unit IVe–2.

Lucas silty clay, 6 to 12 percent slopes, severely eroded (LxC3).—This soil is in elongated strips on slope breaks along drainageways. Slopes generally are less than 300 feet in length. About 80 percent or more of each area mapped as this soil is severely eroded. The severely eroded areas can be identified from the less eroded areas, because the present surface layer is subsoil material that is sticky and cloddy. This soil generally has a very low organic-matter content. The soil tends to seal after heavy rainfall, and this adversely affects stands of seedlings.

Included with this soil in mapping are areas of moderately eroded Lucas soils. These inclusions commonly are 1 acre to 4 acres in size and generally are in the less sloping parts of mapped areas. Also included are small areas of St. Clair soils that are generally in long, narrow strips on the lower slopes in mapped areas. These soils can be identified by pebbles and coarse fragments on the surface.

A severe hazard of erosion is the major limitation to farming. This Lucas soil is too severely eroded to be used for cultivated crops, except under very intensive management. It is mainly used for pasture. Slope and very slow permeability are major limitations for many nonfarm uses. Capability unit VIe–1.

Lucas silty clay, 12 to 45 percent slopes, severely eroded (LxE3).—This soil is in long, narrow areas on slope breaks along drainageways on uplands. A profile of this soil is described as representative for the series. Slopes generally are less than 75 feet in length. About 70 percent or more of each area mapped as this soil is severely eroded. In farmed areas nearly 100 percent of the soil is severely eroded. Typically, the surface layer is sticky, difficult to till, and very low in organic-matter content.

Included with this soil in mapping are areas of less eroded Lucas soils. These included soils commonly are in areas of 1 to 4 acres. They generally are in the less sloping parts of mapped areas and in wooded areas that have not been pastured. Also included are many small areas of moderately well drained St. Clair soils that generally are on the lower parts of slopes and in narrow, elongated strips. They can be identified by the pebbles and coarse fragments on the surface.

A very severe hazard of erosion is the major limitation to the use of this soil for pasture. Runoff is rapid, and erosion is a continuing hazard unless the soil is protected by a thick plant cover. Very slow permeability and slope are the dominant limitations for most nonfarm uses. Capability unit VIIe-1.

Medway Series

The Medway series consists of deep, nearly level, dark-colored soils that are moderately well drained. These soils formed in alluvial deposits on flood plains along the Maumee River. They are flooded during periods of high water. Flooding occurs mainly during winter months, but it can occur any time of the year.

In a representative profile of a Medway soil that is cultivated, the plow layer is very dark gray silt loam about 9 inches thick. The next layer is very dark gray silt loam to a depth of 18 inches and dark-brown silty clay loam to a depth of 29 inches. The subsoil, between depths of 29 and 34 inches, is dark-brown clay loam. The underlying material, between depths of 34 inches and more than 60 inches, is dark-brown clay loam that is mottled with brown and grayish brown.

Medway soils are moderately permeable throughout the solum and underlying material. They have a deep root zone that is neutral, and they are high in available moisture capacity. They have a seasonally high water table for short periods.

The Medway soils are used mainly for cultivated crops.

Representative profile of Medway silt loam, in a cultivated field in Washington Township (SW¼SW¼SW¼ NW¼ sec. 7, T. 5 N., R. 8 E.):

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A11—9 to 18 inches, very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) crushed; weak, fine, angular blocky structure; friable; few roots; neutral; gradual, wavy boundary.

A12—18 to 29 inches, dark-brown (10YR 3/3) light silty clay loam, very dark grayish brown (10YR 3/2) crushed; weak, medium, angular blocky structure; friable; few dark-gray (10YR 4/1) organic coatings on peds and in root channels; neutral; gradual, wavy boundary.

B—29 to 34 inches, dark-brown (7.5YR 4/2) light clay loam; few, fine and medium, faint, brown (10YR 5/3) and grayish-brown (10YR 5/2) mottles; moderate, medium, angular blocky structure; friable; neutral; clear, wavy boundary.

C—34 to 60 inches, dark-brown (7.5YR 4/4) light clay loam; few, fine, faint, brown (10YR 5/3) and grayish-brown (10YR 5/2) mottles: very weak, medium, subangular blocky structure to massive; friable; mildly alkaline; weakly calcareous.

The thickness of the solum, and generally the depth to carbonates, ranges from about 30 to 50 inches. In some places the lower part of the solum is weakly calcareous.

The dark-colored A horizon generally is 24 to 34 inches thick. It commonly is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) but ranges to very dark brown (10YR 2/2) in some places. Rubbed colors are slightly lighter. The A12 horizon is silt loam or light silty clay loam. The A horizon commonly is neutral to mildly alkaline. In places the A12 horizon is weakly calcareous.

The B horizon generally is dark brown (10YR 4/3 or 7.5YR 4/2) to brown (10YR 5/3). Mottling is faint, brown (10YR 5/3), yellowish brown (10YR 5/4), and grayish brown (10YR 5/2). The texture of the B horizon generally is silt loam or loam but ranges to light clay loam or light silty clay loam. The content of sand in the silt loam and light silty clay loam is more than 15 percent.

The C horizon generally is brown (10YR 4/3) or dark brown (7.5YR 4/4), but it ranges to yellowish brown (10YR 5/4 or 5/6) in some places. This horizon has few to common, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4), brown (10YR 5/3), or dark-brown (10YR 4/3) mottles. The C horizon generally is calcareous loam, silt loam or clay loam. In many places it is stratified and commonly there are coarser layers of sandy loam, loamy sand, and sand and gravel. Many of these layers are thin.

Medway soils are the moderately well drained members of a drainage sequence that includes well-drained Ross soils. They are commonly adjacent to the Ross soils and differ from them in having low-chroma mottles in the B horizon. They also are adjacent to the lighter colored, well-drained Genesee soils, the somewhat poorly drained Shoals soils, and the dark-colored, very poorly drained Sloan soils. Medway soils are less gray and have fewer mottles in the B horizon than do Sloan soils. They have a darker A horizon and less grayness and mottling in the solum than Shoals soils.

In this county the dark-colored A horizon of Medway soils, and commonly their solum, are thicker than typical for the series. These differences do not greatly affect the use and management of the soils.

Medway silt loam (Md).—This nearly level soil is in fairly broad, elongated strips on the flood plains of the Maumee River.

Included with this soil in mapping are areas, 1 acre to 3 acres in size, of lighter colored Genesee soils. These included soils commonly are near the boundaries that separate those soils from this Medway soil. Also included are small areas of dark-colored, well-drained Ross soils.

Flooding is the major limitation for most uses. It generally occurs during winter, but it can occur at any time of the year after heavy rains. Capability unit IIw-2.

Mermill Series

The Mermill series consists of nearly level, dark-colored, very poorly drained soils. These soils formed in loamy material and underlying finer textured material. They are in broad areas on uplands and in scattered smaller areas in other parts of the county.

In a representative profile of a Mermill soil that is cultivated, the plow layer is very dark brown loam about 9 inches thick. The subsoil, between depths of 9 and 40 inches, is dark-gray or light brownish-gray sandy clay loam and heavy clay loam that contain distinct, yellowish-brown, brownish-yellow, and grayish-brown mottles. The underlying material, between depths of 40 and 60 inches or more, is calcareous lacustrine clay or clayey glacial till.

Mermill soils have moderate permeability in the subsoil and very slow permeability in the fine-textured underlying material. They are saturated for significant periods during winter and spring. They have medium available moisture capacity, and the root zone is moderately deep when the water table is lowered by artificial drainage or in summer when the water table is low.

Mermill soils are used mainly for cultivated crops. Some areas are wooded. Most of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Mermill loam, in a cultivated field in Harrison Township (NW¼SW¼ sec. 36, T. 5 N., R. 7 E.):

Ap—0 to 9 inches, very dark brown (10YR 2/2) loam; weak, medium, subangular blocky structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B21tg—9 to 17 inches, dark-gray (10YR 4/1) sandy clay loam; common, fine, distinct, yellowish-brown (10YR 5/4 and 5/8) mottles; moderate, medium, angular blocky structure; firm; many roots; thin patchy films on peds; slightly acid; gradual, wavy boundary.

B22tg—17 to 34 inches, light brownish-gray (10YR 6/2) sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/4 and 5/8) and grayish-brown (10YR 5/2) mottles; weak, medium, prismatic structure parting to moderate, medium, subangular blocky structure; firm; common roots; thin patchy clay films on peds; neutral; clear, wavy boundary.

IIB3g—34 to 40 inches, dark-gray (5Y 4/1) heavy clay loam; many, coarse, distinct, brownish-yellow (10YR 6/8) and yellowish-brown (10YR 5/4) mottles; moderate, coarse, prismatic structure in upper part of the horizon, massive in the lower part; very firm; few roots; mildly alkaline; clear, smooth boundary.

IIC1g—40 to 52 inches, olive-gray (5Y 5/2) clay; common, coarse, distinct, yellowish-brown (10YR 5/8) and brownish-yellow (10YR 6/8) mottles; massive; very firm; some vertical cracks extend into the horizon, and the vertical faces have thick coatings; moderately alkaline; calcareous; gradual, smooth boundary.

IIC2g—52 to 60 inches, dark-gray (10YR 4/1) clay; massive; very firm; common black shale and limestone fragments; moderately alkaline; calcareous.

The thickness of the solum ranges from 24 to 40 inches, and the depth to the fine-textured C horizon ranges from 20 to 40 inches. The solum commonly extends several inches into the finer textured material. The content of gravel in the solum ranges from none to about 15 percent. Mermill soils that contain gravel mainly are on the beach ridges and stream terraces.

The Ap horizon commonly is about 7 to 9 inches thick and generally is very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish-brown (10YR 3/2). It dominantly is loam, but it is clay loam or fine sandy loam in places.

The B horizon is dark gray (10YR 4/1), olive gray (5Y 5/2), light brownish gray (10YR 6/2), or grayish brown (10YR 52) and is mottled with distinct, yellowish-brown (10YR 5/4 and 5/6), dark yellowish-brown (10YR 4/4) and grayish-brown (10YR 5/2) mottles. The B horizon generally is sandy clay loam or clay loam, but it ranges to heavy loam. In some places a 2- to 8-inch layer of loamy sand or fine sand occurs above the IIB3g horizon. The IIB horizon is typically dark gray (5Y 4/1), grayish brown (10YR 5/2), or dark brown (10YR 4/3), but in some places it is dark yellowish brown (10YR 4/4). The IIB horizon is silty clay, clay, or heavy clay loam.

The C horizon commonly is olive gray (5Y 5/2), dark gray (10YR 4/1), dark grayish brown (10YR 4/2), or dark brown (10YR 4/3). It is calcareous clay, silty clay, or heavy clay loam. The C horizon materials are either lacustrine or glacial till deposits. The lacustrine C horizon is commonly 1 to 4 feet thick over glacial till.

Mermill soils are the very poorly drained members of a drainage sequence that includes the moderately well drained Rawson soils and the somewhat poorly drained Haskins soils. They are adjacent to both of those soils in many places. They are similar to Millgrove soils in some properties, but lack the underlying sandy or gravelly loamy sand C horizon. Mermill soils lack the fine sand and silt that are common in very poorly drained Colwood soils. They are finer textured in the upper 20 to 40 inches than the very poorly drained Wauseon soils.

Mermill loam (Me).—This level or nearly level soil is in broad, elongated strips on shallow outwash plains and in low areas along some drainageways. A profile of this soil is described as representative for the series.

Included with this soil in mapping are small areas of lighter colored, somewhat poorly drained Haskins soils. These inclusions are ½ acre to 3 acres in size and are on slight rises throughout the mapped areas. Also included are small areas of Hoytville soils. These are generally 1 acre to 4 acres in size and are common near the boundaries between Mermill and Hoytville soils. A few areas of soils that have a silt loam or fine sandy loam surface layer and some areas of soils that have a thicker dark-colored surface layer than is typical for Mermill soils are included.

Wetness is the major limitation to farming. Seasonal wetness and very slow permeability are major limitations for many nonfarm uses. Capability unit IIw–3.

Mermill clay loam (Mf).—This level or nearly level soil is in broad, elongated strips on outwash plains and localized deposits on uplands. It also occupies low areas along drainageways. It has a finer textured surface layer and subsoil than Mermill loam and generally poorer tilth. This soil can be tilled only within a relatively narrow range of moisture content.

Commonly included with this soil in mapping are areas of lighter colored, somewhat poorly drained Haskins soils. These inclusions are ½ acre to 2 acres in size and and are on low rises throughout the mapped areas. Also included are small areas of clayey, very poorly drained Hoytville soils. These are generally 1 acre to 4 acres in size and are most common near the boundaries between Mermill and Hoytville soils. Some areas of Mermill soils that have a thicker dark-colored layer than is typical for the series also are included.

Seasonal wetness is the major limitation to farming, but this soil can be artificially drained rather easily. Seasonal wetness and very slow permeability are limitations for many nonfarm uses. Capability unit IIw–3.

Mermill loam, stratified substratum (Mg).—This nearly level soil is in broad upland areas of outwash plains, and it commonly is in wide, elongated areas. It has a profile that is similar to that of the Mermill soil described as representative of the series, except that it has a stratified substratum within a depth of 40 inches. Between depths of about 35 and 60 inches, the substratum consists of strata that have a texture of silty clay, clay, sand, or clay loam. The strata range from three to 12 in number and from ½ inch to 12 inches in thickness. The thick, clayey substratum that is typical of Mermill soils occurs in this soil at a depth of 4 to 9 feet.

Included with this soil in mapping are small areas of lighter colored, sowewhat poorly drained Haskins soils that have a stratified substratum. These inclusions are typically 1/2 acre to 2 acres in size and are on slight rises within areas mapped as this Mermill soil. Also included are small areas of lighter colored, sandy Rimer soils that have a stratified substratum.

Seasonal soil wetness is the major limitation to farming, but the soil drains readily if artificial drainage is installed. Seasonal wetness and very slow permeability are dominant limitations for many nonfarm uses. Capability unit IIw-3.

Millgrove Series

The Millgrove series consists of nearly level, dark-colored, very poorly drained soils. These soils formed in loamy material underlain by stratified sandy and gravelly material. They are in broad areas on uplands in the central part of the county, and they are also in scattered smaller tracts on or near beach ridges and along drainageways elsewhere in the county.

In a representative profile of a Millgrove soil that is cultivated, the plow layer is very dark brown loam about 9 inches thick. The lower part of the surface layer is very dark grayish-brown loam about 3 inches thick. The subsoil, between depths of 12 and 42 inches, is gray sandy clay loam and clay loam that is mottled with distinct yellowish brown, light olive brown, and gray. The underlying material, between depths of 42 and 72 inches, is calcareous sand.

Millgrove soils have moderate permeability in the subsoil and rapid permeability in the sandy or gravelly underlying material. They are saturated for a significant period during winter and spring. They have high available moisture capacity and a root zone that is deep if excess water is removed by artificial drainage or when the seasonal water table is low. They are mostly slightly acid to neutral but, in some places, are medium acid in the upper 18 inches.

Nearly all the acreage of Millgrove soils is used for cultivated crops. Most of this has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Millgrove loam, in a cultivated field in Napoleon Township (SW1/4SE1/4SE1/4SE1/4 sec. 24, T. 5 N., R. 6 E.):

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

A1—9 to 12 inches, very dark grayish-brown (10YR 3/2) loam; weak, medium, subangular blocky structure parting to moderate, medium, granular structure; very friable; many roots; slightly acid; gradual, smooth boundary.

B1g—12 to 17 inches, gray (5Y 5/1) light sandy clay loam; many, fine, distinct, yellowish-brown (10YR 5/6), light olive-brown (2.5Y 5/4), and gray (10YR 6/1) mottles; weak, medium, subangular blocky structure; friable; common roots; thin, very patchy, very dark brown (10YR 2/2) clay films on peds; slightly acid; clear, smooth boundary.

B21tg—17 to 27 inches, gray (5Y 5/1) clay loam; many, medium, distinct, yellowish-brown (10YR 5/6), light olive-brown (2.5Y 5/4), and very dark gray (10YR 3/1) mottles; moderate, medium, angular blocky structure; firm; common roots; medium, patchy, very dark gray (10YR 3/1) and black (10YR 2/1) clay films on peds; neutral; gradual, wavy boundary.

B22tg—27 to 38 inches, gray (5Y 5/1) clay loam; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) and strong-brown (7.5YR 5/6) mottles; moderate, medium, prismatic structure parting to moderate, coarse, subangular blocky structure; very firm; few roots; medium, continuous, dark-gray (10YR 4/1) clay films on peds; neutral; clear, wavy boundary.

B23tg—38 to 42 inches, gray (5Y 6/1) sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) and strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; few roots; thin, patchy, light olive-brown (2.5Y 5/4) clay films on vertical ped faces; mildly alkaline; clear, wavy boundary.

IIC1—42 to 48 inches, light brownish-gray (2.5Y 6/2) sand; few, coarse, distinct, brownish-yellow (10YR 6/6 and 6/8) mottles; single grain; loose; moderately alkaline; calcareous; gradual, smooth boundary.

IIC2—48 to 72 inches, gray (10YR 6/1) sand; single grain; loose; 1/4- to 1/2-inch clay bands at depths of 55, 58, and 72 inches; moderately alkaline; calcareous; clear, wavy boundary.

Thickness of the solum, and commonly the depth to carbonates, ranges from 28 to 42 inches, but it typically is 32 to 40 inches. In some places several inches of the upper part of the substratum is only mildly alkaline. The content of gravel in the solum ranges from 2 to about 20 percent. Millgrove soils that contain gravel are mainly on the beach ridges and stream terraces.

The thickness of the A horizon commonly is about 11 inches but ranges from 10 to 13 inches. The colors are chiefly very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2), and very dark gray (10YR 3/1). The A horizon dominantly is loam or clay loam.

The B horizon generally is gray (10YR 5/1, 5Y 5/1, or 5Y 6/1) or dark gray (10YR 4/1) and it is mottled. The B horizon generally is sandy clay loam or fine loam, but it ranges to light clay loam.

The C horizon commonly is light brownish-gray (2.5Y 6/2), pale brown (10YR 6/3), or gray (10YR 5/1 or 6/1). It is calcareous, and the texture is loamy fine sand or gravelly loamy sand. In some places there are thin lenses or layers of silty clay in bands that range from 1/4 to 1 inch in thickness.

Millgrove soils are the very poorly drained members of a drainage sequence that includes the moderately well drained Haney soils and the somewhat poorly drained Digby soils. They commonly are adjacent to those soils and to the very poorly drained Mermill, Colwood, and Gilford soils. Millgrove soils are similar to Mermill soils, except that their substratum is sandy or gravelly material rather than fine-textured material. They have a Bt horizon but the Gilford and Colwood soils do not.

Millgrove loam (Mh).—This nearly level soil is in broad, elongated strips and in more extensive areas on outwash plains and stream terraces. It is also in rather narrow, elongated strips along drainageways. A profile of this soil is described as representative for the series.

Included with this soil in mapping are areas, 1/2 acre to 3 acres in size, of lighter colored Digby and Haskins soils. These inclusions are on low rises, most commonly near drainageways. Also included are a few areas of soils that have a fine sandy loam surface layer, and areas of Millgrove soils where the combined thickness of the surface layer and subsoil is greater than is typical for the series. Other inclusions are small areas of Mermill loam, stratified substratum.

Soil wetness is the major limitation to farming and for nonfarm uses. This soil drains readily if artificial drainage is installed. Capability unit IIw-3.

Millgrove clay loam (Mk).—This nearly level soil is in elongated strips on level outwash plains and terraces and is also along drainageways on uplands. It has a finer textured surface layer and subsoil than Millgrove loam, and it is more sticky and more difficult to till.

The range of moisture content at which this soil can safely be tilled is narrower than that of Millgrove loam.

Included with this soil in mapping are areas, 1 acre to 3 acres in size, of lighter colored, somewhat poorly drained Digby soils. These inclusions are on slight rises, commonly along or near drainageways. Also included are small areas of Millgrove loam and some areas of Millgrove soils where the combined thickness of the surface layer and subsoil is greater than is typical for the series. Small areas of Hoytville clay loam also are included.

Soil wetness is the major limitation to farming and for most nonfarm uses. This soil can be readily drained. Capability unit IIw-3.

Nappanee Series

The Nappanee series consists of nearly level to gently sloping, somewhat poorly drained soils on uplands. These soils formed in Wisconsin-age heavy clay loam or clayey glacial till.

In a representative profile of a Nappanee soil that is cultivated, the plow layer is dark grayish-brown silty clay loam about 9 inches thick. The subsoil, between depths of 9 and 24 inches, is grayish-brown silty clay loam and clay mottled with many, faint, yellowish-brown and dark yellowish-brown mottles. The underlying material, between depths of 24 and 60 inches, is brown clay loam glacial till. The upper 12 to 24 inches of this material is partially weathered, and it is compact and limy. It contains many pebbles and fragments of limestone and shale.

Nappanee soils have slow permeability in the subsoil and very slow permeability in the underlying glacial till material. They are saturated for significant periods during winter and spring and are slow to dry out in spring unless they have been adequately drained. Nappanee soils have a moderately deep root zone and medium to low available moisture capacity. The upper 18 inches commonly is strongly acid or medium acid.

Nappanee soils are mainly used for cultivated crops, but some areas are in pasture or woodlots. Most of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Nappanee silty clay loam, 0 to 2 percent slopes, in a cultivated field in Richfield Township (NE¼SE¼SW¼ sec. 30, T. 4 N., R. 8 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silty clay loam; weak, medium, angular blocky structure, except that structure in the upper 2 inches is moderate, medium, granular; friable; many roots; 2 percent coarse fragments of shale and limestone; slightly acid; clear, smooth boundary.

B21tg—9 to 12 inches, grayish-brown (10YR 5/2) heavy silty clay loam; many, medium, faint, dark yellowish-brown (10YR 4/4) mottles and common, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; firm; common roots; thin, patchy, very dark grayish-brown (10YR 3/2) clay films on peds; common, fine, black (N 2/0) oxide concretions and very dark gray (N 3/0) stains; 2 percent coarse fragments; medium acid; clear, smooth boundary.

B22tg—12 to 20 inches, grayish-brown (10YR 5/2) clay; many, fine, faint, dark yellowish-brown (10YR 4/4) mottles and few, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, prismatic to moderate, medium, prismatic structure in lower part parting to moderate, medium, angular blocky structure; firm; few roots; thin, patchy, dark grayish-brown (2.5Y 4/2) clay films on peds (ped coatings have a chroma dominantly of 2); many, medium, faint, dark grayish-brown (10YR 4/2) surface mottles; very dark gray (N 3/0) oxide stains; 5 percent coarse fragments; neutral; gradual, wavy boundary.

B3tg—20 to 24 inches, grayish-brown (10YR 5/2) clay; many, fine, faint, dark yellowish-brown (10YR 4/4) mottles and few, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; few roots; thin, patchy, dark grayish-brown (10YR 4/2) clay films on vertical ped surfaces, very patchy on horizontal ped surfaces; few, fine, distinct, greenish-gray (5GY 6/1) mottles on ped surfaces; 10 percent coarse fragments; moderately alkaline; spotty calcareous zones; clear, wavy boundary.

C—24 to 60 inches, brown (10YR 4/3) clay loam; common, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, angular blocky structure in upper 3 inches, massive below; firm; few roots; thin, very patchy, grayish-brown (2.5Y 5/2) clay films on vertical ped surfaces and in vertical cleavages; moderately alkaline; calcareous.

The thickness of the solum, and generally the depth to carbonates ranges from 18 to 33 inches, but it is commonly 22 to 33 inches. In some places the solum extends several inches into the calcareous material.

The thickness of the Ap horizon commonly is 8 inches but ranges from 6 to 10 inches. The color of this horizon generally is dark grayish brown (10YR 4/2) but ranges to grayish brown (10YR 5/2), and the dominant textures are silty clay loam and loam. An A2 horizon occurs in undisturbed soils.

The B horizon generally is grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2), but in some places it is brown (10YR 4/3 or 5/3). This horizon is mottled with faint to distinct, dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/4 or 5/6), and dark grayish-brown (10YR 4/2), or dark-gray (10YR 4/1) mottles. The B horizon is clay, silty clay, or heavy clay loam, and its content of clay ranges between 38 and 46 percent. Ped surfaces have a chroma dominantly of 2.

The C horizon commonly is brown (10YR 4/3) or dark grayish brown (10YR 4/2), but in some places it is dark yellowish brown (10YR 4/4). It is mottled with grayish-brown (10YR 5/2), gray (10YR 5/1), dark grayish-brown (10YR 4/2), and yellowish-brown (10YR 5/4 or 5/6) mottles. The C horizon is light clay or heavy clay loam, and its content of clay ranges from about 38 to 44 percent.

Nappanee soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Hoytville soils and the moderately well drained St. Clair soils. They are adjacent to the Hoytville soils in many places, and to the St. Clair soils mainly along the larger drainageways. They are adjacent to Fulton soils in some areas. Nappanee soils differ from Fulton soils by having formed in glacial till in contrast to lacustrine material. They also differ from Fulton soils in having many pebbles and limestone fragments throughout the profile and in having a higher content of sand in the B horizon. Nappanee soils are similar to Del Rey soils, but they have a higher content of clay in the B horizon than those soils and formed in glacial till instead of lacustrine material.

Nappanee loam, 0 to 2 percent slopes (NaA).—This soil is on uplands. It occupies low knolls and low, elongated rises of moderate size. It also is in wider, more extensive areas near drainageways. The surface layer is less clayey than that of Nappanee silty clay loam; it is not so susceptible to crusting; and it is easier to till.

Included with this soil in mapping are some small areas, ½ acre to 2 acres in size, of dark-colored Hoytville soils that commonly are near the boundaries between those soils and this Nappanee soil. Also included are small areas of Nappanee silty clay loam and spots of sandy Rimer soils. These light-colored inclusions commonly are ½ acre to 1½ acres in size. Areas of Nappanee soils that have a darker surface layer and areas that have a less clayey subsoil than is typical for the series also are included.

Seasonal wetness is the major limitation to farming this soil. Erosion is a hazard where slopes are near 2 percent. Seasonal wetness and very slow permeability are limitations for many nonfarm uses. Capability unit IIIw-3.

Nappanee loam, 2 to 6 percent slopes (NaB).—This soil is on elongated slope breaks along drainageways. It has a less clayey surface layer than Nappanee silty clay loam and is not so susceptible to crusting.

Included with this soil are small areas, commonly ½ acre to 1½ acres in size, of Nappanee silty clay loam and small areas of dark-colored Hoytville soils in some low areas, most commonly near the boundaries between those soils and this Nappanee soil. Also included are small areas of somewhat poorly drained Haskins soils and sandy Rimer soils. Areas of Nappanee soils that have a less clayey subsoil than is typical for the series also are included.

Seasonal soil wetness is the major limitation to farming, but the hazard of erosion also is a limitation. Erosion control is important in disturbed or cultivated areas, but artificial drainage is more important. Seasonal wetness and very slow permeability are the dominant limitations for many nonfarm uses. Capability unit IIIw-3.

Nappanee silty clay loam, 0 to 2 percent slopes (NtA).—This soil is on low knolls or low, elongated rises on uplands. Near drainageways the areas are wider and more extensive. A profile of this soil is described as representative for the series. This soil has a surface layer that is susceptible to crusting, which adversely affects stands of seedlings. The surface layer is sticky, and good tilth is hard to maintain.

Included with this soil in mapping are areas, ½ acre to 2 acres in size, of Nappanee loam. These inclusions commonly are anywhere in the mapped areas. Also included are areas, 1 acre to 3 acres in size, of dark-colored Hoytville soils, which most commonly are near the boundary between those soils and this Nappanee soil, and small areas of somewhat poorly drained Haskins and Rimer soils. Other inclusions are areas of soils that have a darker surface layer than is typical for Nappanee soils and areas that have a less clayey subsoil than is typical.

Seasonal wetness is the major limitation to farming. Some erosion is likely in cultivated areas where slopes are near 2 percent. Seasonal wetness and very slow permeability are limitations for many nonfarm uses. Capability unit IIIw-3.

Nappanee silty clay loam, 2 to 6 percent slopes (NtB).—This soil is on elongated slope breaks along drainageways. In most places slopes are 2 to 4 percent and are short. Soil crusting is a severe limitation in cultivated areas.

Included with this soil in mapping are some areas, generally ½ acre to 2 acres in size, of Nappanee loam. These inclusions can occur anywhere in mapped areas. Also included are small areas of dark-colored, very poorly drained Hoytville soils that generally are in the more nearly level to depressional areas of the landscape. Some small areas of loamy Haskins soils and sandy Rimer soils and areas of Nappanee soils that have a less clayey subsoil than is typical for the series also are included.

Seasonal wetness is the major limitation to farming this soil, but the hazard of erosion also is a limitation. Seasonal wetness and very slow permeability are dominant limitations for many nonfarm uses. Capability unit IIIw-3.

Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded (NtB2).—This soil is in moderate to long strips on slope breaks along drainageways. In most places slopes are 3 to 5 percent and generally are short. Because of erosion the surface layer is sticky and clayey and has a low organic-matter content. The surface tends to crust after heavy rainfall, and this adversely affects seedling stands. Sealing of the surface layer causes rapid runoff in cultivated areas.

Included with this soil in mapping are small areas, 1 acre to 2 acres in size, of moderately well drained St. Clair soils. These inclusions are in the steeper parts of mapped areas. Also included are small areas of slightly eroded Nappanee loam and silty clay loam that generally are ½ acre to 2 acres in size and are in the less sloping parts of mapped areas. Areas of Nappanee soils that have a less clayey subsoil than is typical for the series also are included.

Seasonal wetness is the major limitation to farming, but the effects of past erosion and short slopes also are limitations. Artificial drainage and optimum management to offset poor physical characteristics of the soil are equally important. Seasonal wetness, a sticky surface layer, and very slow permeability are limitations for many nonfarm uses. Capability unit IIIw-3.

Oakville Series

The Oakville series consists of deep, gently sloping to sloping, well-drained, sandy soils. These soils formed on sandy postglacial beach ridges and dunes. They occupy knolls and long ridges on the lake plain, mainly in Washington, Liberty, and Harrison Townships.

In a representative profile of an Oakville soil that is wooded, the upper 3 inches of the surface layer is dark grayish-brown fine sand. The lower 6 inches is dark yellowish-brown fine sand. The subsoil, between depths of 9 inches and 81 inches, is strong-brown fine sand, yellowish-brown fine sand, and brownish-yellow fine sand. In the lower layers of the subsoil, there are few, faint, light yellowish-brown, yellowish-brown, and light-gray mottles. The underlying material, between depths of 81 and 100 inches or more, is made up of strata of pale-brown and yellowish-brown fine sand.

Oakville soils have rapid permeability in both the subsoil and the underlying limy sand. They have very low available moisture capacity and a root zone that is deep but droughty. They have a very low capacity for the storage and release of plant nutrients, and they are subject to soil blowing if they are bare of vegetation. Oakville soils are medium acid to strongly acid in the upper 24 inches.

Oakville soils are used mainly for cultivated field crops and trees. A large acreage has been planted to pines, especially white pine and Scotch pine. Part of these plantings were made to help control soil blowing.

Representative profile of Oakville fine sand, 2 to 12 percent slopes, in a wooded area in Washington Township (SW¼SE¼NW¼SE¼ sec. 23, T. 6 N., R. 8 E.; laboratory No. HN-76):

A11—0 to 3 inches, dark grayish-brown (10YR 4/2) fine sand; very weak, fine, granular structure; loose; common roots; strongly acid; clear, wavy boundary.

A12—3 to 9 inches, dark yellowish-brown (10YR 4/4) fine sand; very weak, very fine, granular structure; loose; few roots; discontinuous, very dark grayish-brown (10YR 3/2) fine sand at depths of 8 to 9 inches; medium acid; clear, wavy boundary.

B21—9 to 12 inches, strong-brown (7.5YR 5/6) fine sand; very weak, single grain; loose; few roots; medium acid; clear, wavy boundary.

B22—12 to 41 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; few roots; few strong-brown (7.5YR 5/8) iron nodules; slightly acid; diffuse, wavy boundary.

B23—41 to 57 inches, brownish-yellow (10YR 6/6) fine sand; few, fine, faint, yellowish-brown (10YR 5/8) mottles; single grain; loose; few roots; neutral; diffuse, wavy boundary.

B24—57 to 81 inches, brownish-yellow (10YR 6/6) fine sand; few, fine, faint, yellowish-brown (10YR 5/8) and light yellowish-brown (10YR 6/4) mottles; single grain; loose; neutral; clear, wavy boundary.

C—81 to 100 inches, pale-brown (10YR 6/3) fine sand; few, fine, distinct, strong-brown (7.5YR 5/8) and brownish-yellow (10YR 6/6) mottles; single grain; very friable; medium acid; clear, wavy boundary.

Depth to carbonates ranges from 60 to 130 inches but most commonly is 80 to 100 inches. The upper part of the solum is strongly acid to medium acid, and the lower part is mostly neutral.

The A horizon ordinarily is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) but ranges to brown (10YR 4/3) or dark yellowish brown (10YR 4/4) in places.

The B horizon commonly is strong brown (7.5YR 5/6) or yellowish brown (10YR 5/4 or 5/6) but ranges to brownish yellow (10YR 6/6) or light yellowish brown (10YR 6/4). The brighter values and chromas generally are in the upper layer. Some low-chroma mottling occurs in the lower part of the solum in some places. The B horizon commonly is fine sand, but in some places south of the Maumee River, medium sand is dominant in some layers.

The C horizon commonly is light brownish gray (2.5Y 6/2), pale brown (10YR 6/3), or grayish brown (2.5Y 5/2) mottled with dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6). The texture is fine sand. Thin, dark-brown (7.5YR 4/4) lamellae occur in some places. These lamellae are commonly about ⅛ inch thick and at a depth below about 80 inches. They vary in number, contain 5 to 8 percent more clay and slightly more silt than the surrounding fine sand, and are loamy sand in texture. Silty clay or clay underlies these soils at a depth ranging from about 10 to 30 feet.

Oakville soils are the well drained members of a drainage sequence that includes the moderately well drained Ottokee soils, the somewhat poorly drained Tedrow soils, and the very poorly drained Granby soils. They are adjacent to those soils in many places. They are adjacent to well-drained Spinks soils in some places but lack the thin, dark-brown lamella or bands in the B horizon that are common in Spinks soils. Oakville soils are similar to moderately well drained Seward soils in the upper part, but they lack the finer textured lower part of the B horizon and C horizon that are present within a depth of 40 inches in Seward soils.

The Oakville soils in this county have a thicker B horizon than Oakville soils in other survey areas. This difference does not significantly affect the use and management of the soils.

Oakville fine sand, 2 to 12 percent slopes (OaC).—This soil is on sand ridges or dunes in upland areas of the lake plain. It has a low organic-matter content in the surface layer because of losses through soil blowing.

Included with this soil in mapping are small areas, ½ acre to 4 acres in size, of moderately well drained Ottokee soils. These commonly are in the less sloping parts of mapped areas. Also included are small areas of somewhat poorly drained Tedrow soils in small, nearly level spots or more commonly near the boundaries between Tedrow soils and this Oakville soil. Some areas of this soil have thin lamella or bands at a depth of 50 to 80 inches.

Droughtiness is the major limitation to farming, but soil blowing is a severe hazard. Texture of the surface layer, slope, and droughtiness are limitations for many nonfarm uses. Capability unit IVs-1.

Oshtemo Series

The Oshtemo series consists of deep, gently sloping, well-drained soils. These soils formed in thick loamy material underlain by calcareous gravelly loam or gravel and sand. They are on the crests and upper slopes on the beach ridge in Ridgeville Township.

In a representative profile of an Oshtemo soil that is cultivated, the plow layer is dark-brown sandy loam about 7 inches thick. The subsoil, between depths of 7 and 44 inches, is dark-brown sandy loam and gravelly sandy loam that has a higher content of clay than the surface layer. The underlying material, between depths of 44 and 70 inches, is calcareous gravelly loam.

Oshtemo soils have moderately rapid permeability. They have low available moisture capacity and a deep root zone. Unless these soils have been limed, the root zone is medium acid to strongly acid in the upper part.

Oshtemo soils are used mainly for cultivated crops and for meadows. They are well suited to orchards and the production of small fruit. They are being increasingly used for home sites, especially near the towns that are located on the beach ridge.

Representative profile of Oshtemo sandy loam, 2 to 6 percent slopes, in a cultivated field that had been limed in Pleasant Township (NE¼SE¼ sec. 25, T. 3 N., R. 6 E.):

Ap—0 to 7 inches, dark-brown (10YR 4/3) sandy loam; weak, fine, granular structure; very friable; common roots; few small pebbles; neutral; abrupt, smooth boundary.

B1—7 to 17 inches, dark-brown (7.5YR 4/4) sandy loam; very weak, fine, subangular blocky structure; very friable; few roots; few to common pebbles; neutral; clear, smooth boundary.

B21t—17 to 29 inches, dark-brown (7.5YR 4/4) heavy sandy loam; weak, fine to medium, subangular blocky structure; very friable; common small pebbles; thin patchy clay films on ped surfaces and clay bridging on sand grains; discontinuous thin layer of calcareous sand; neutral; gradual, smooth boundary.

B22t—29 to 44 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; weak, fine, subangular blocky structure in upper part, massive in the lower part; very friable; thin patchy clay films on ped surfaces and bridging sand grains; few pockets of gravelly sandy clay loam; neutral; clear, smooth boundary.

C—44 to 70 inches, gray (N 5/0) gravelly loam; olive-yellow (2.5Y 6/8), olive-gray (5Y 5/2), and gray (5Y 5/1 or 10YR 6/1) mottles; massive; very friable; 4 inches of gray (10YR 6/1) sand at a depth of 62 inches; moderately alkaline; calcareous; abrupt, smooth boundary.

The thickness of the solum, and commonly the depth to carbonates, ranges from 40 to 60 inches, but typically is 40 to 50 inches. Gravel content of the solum ranges from about 2 to 18 percent.

The Ap horizon generally is 6 to 10 inches thick and is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). The dominant texture of the horizon is sandy loam.

The B horizon commonly is dark brown (7.5YR 4/4) but ranges to dark yellowish brown (10YR 4/4) or brown (10YR 4/3). The lower part of the solum is dark brown (10YR 3/3) in places. The texture of this horizon generally is sandy loam, but layers of sandy clay loam, less than 10 inches thick, occur in some places. Thin lenses of loam or sand occur in the B horizon in places.

The C horizon commonly is grayish brown (2.5Y 5/2), olive brown (2.5Y 4/4), or gray (N 5/0 or N 6/0) but ranges to dark grayish brown (10YR 4/2), brown (10YR 5/3), or dark yellowish brown (10YR 4/4). It is mottled with yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles. Textures in the C horizon range from fine gravel and sand to gravelly loam. Finer textured lake clay or glacial till commonly occurs between depth of 5 and 9 feet.

Oshtemo soils are adjacent to the moderately well drained Haney soils and the somewhat poorly drained Digby soils in many places. In some places they are adjacent to the very poorly drained Millgrove soils. The Oshtemo soils have a coarser textured B horizon than the Haney, Digby, or Millgrove soils and lack the evidence of wetness associated with those nearby soils.

Oshtemo sandy loam, 2 to 6 percent slopes (OsB).—This soil is on the crest and upper slopes of a postglacial beach ridge. Good tilth is easily maintained, and the infiltration rate is good.

Included with this soil in mapping are small areas of loamy Rawson soils and areas of sandy Seward soils. These inclusions commonly are ½ acre to 2 acres in size and are in the less sloping parts of mapped areas. Also included are a few areas of Oshtemo soils that have a darker surface layer and a few areas that have a lower content of clay in the subsoil than is typical for the Oshtemo series.

Droughtiness is the major limitation to farming, but erosion is a hazard in some places, particularly in the more sloping areas. Slope is the dominant limitation for some nonfarm uses. Capability unit IIIs–1.

Ottokee Series

The Ottokee series consists of deep, sandy soils that are moderately well drained. These soils formed in sandy material on post glacial, sandy beach ridges and dunes. They are nearly level to gently sloping and occupy knolls and long ridges, principally in Washington, Liberty, and Harrison Townships.

In a representative profile of an Ottokee soil that is wooded, the surface layer is dark grayish-brown fine sand about 4 inches thick. The upper part of the subsoil, between depths of 4 and 24 inches, is strong-brown fine sand. Below a depth of 24 inches, the subsoil is light yellowish-brown or brownish-yellow fine sand to a depth of 77 inches, except for a layer of yellowish-red loamy fine sand that lies between depths of 47 and 49 inches. Below a depth of 77 inches, the underlying material is calcareous, olive-gray fine sand that extends to a depth of 81 inches or more.

Ottokee soils have rapid permeability, a low available moisture capacity, and a deep root zone. They have a very low capacity for the storage and release of plant nutrients, and they are subject to soil blowing when the surface is bare. They are medium acid to neutral in the upper part and less acid as depth increases.

Ottokee soils are used for both cultivated crops and trees. A considerable acreage has been planted to pine, mainly white pine and Scotch pine. Part of these plantings were made to help control soil blowing.

Representative profile of Ottokee fine sand, 1 to 5 percent slopes, in a wooded area in Washington Township (SW¼NW¼NE¼SE¼ sec. 13, T. 6 N., R. 8 E.; laboratory data No. HN–87):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2, 6/2 dry) fine sand; very weak, fine, granular structure; very friable; strongly acid; abrupt, wavy boundary.

B21—4 to 24 inches, strong-brown (7.5YR 5/8) fine sand; single grain; loose; discontinuous, thin, gray layer at upper boundary; medium acid; clear, wavy boundary.

B22—24 to 32 inches, brownish-yellow (10YR 6/6) fine sand; few, fine, faint, yellowish-brown (10YR 5/4 or 5/6) mottles; single grain; loose; few dark yellowish-brown (10YR 4/4) iron streaks; medium acid; clear, wavy boundary.

B23—32 to 47 inches, brownish-yellow (10YR 6/6) fine sand; common, medium and coarse, faint, yellowish-brown (10YR 5/4), brownish-yellow (10YR 6/8), and light brownish-gray (10YR 6/2) mottles occur below a depth of 40 inches; single grain; loose; few dark-red (2.5YR 3/6) iron concretions; medium acid; clear, irregular boundary.

B24t—47 to 49 inches, yellowish-red (5YR 4/6) loamy fine sand; common, fine, distinct, brownish-yellow (10YR 6/6) and light brownish-gray (10YR 6/2) mottles; very weak, fine, subangular blocky structure parting to massive; friable; some lenses of fine sand within the horizon; clay bridging evident on sand grains; slightly acid; abrupt, wavy boundary.

B25—49 to 77 inches, light yellowish-brown (10YR 6/4) fine sand; common, medium and coarse, distinct, yellowish-brown (10YR 5/8) and brownish-yellow (10YR 6/8) mottles; single grain; loose; neutral; abrupt, irregular boundary.

C—77 to 81 inches, olive-gray (5Y 5/2) fine sand; common, coarse, distinct, olive-yellow (2.5Y 6/6) mottles; single grain; loose; neutral; gradual, wavy boundary.

The solum ranges from about 40 to 90 inches in thickness, but its thickness typically is 50 to 80 inches. The depth to carbonates commonly coincides with the solum thickness, but in places the upper 12 to 24 inches of the C horizon is noncalcareous.

The A1 horizon in uncultivated areas is generally dark grayish brown (10YR 4/2) or dark brown (10YR 4/3), but in some places it ranges to very dark grayish brown (10YR 3/2, 6/2 dry).

The B2 horizon commonly is strong brown (7.5YR 5/8), brownish yellow (10YR 6/6), or light yellowish brown (10YR 6/4) in the upper part; it changes with depth to pale brown (10YR 6/3) or light brownish gray (10YR 6/2). The B horizon, within a depth of 40 inches, generally is mottled with yellowish brown (10YR 5/4 or 5/6), pale brown (10YR 6/3), or brownish yellow (10YR 6/8). Light brownish-gray (10YR 6/2) mottles occur below a depth of 40 inches. Common, fine or medium, yellowish-red (5YR 5/6) iron stains are in the lower horizons in many places. Redder iron concretions also are common in many of the horizons. Thin, dark-brown (7.5YR 4/4) lamellae (Bt horizons) occur in Ottokee soils at a depth of 30 to 50 inches. The lamellae vary in number, but their total thickness is less than 6 inches. The lamellae contain 5 to 8 percent more clay and slightly more silt than do the adjacent layers of sand, and most commonly they are loamy sand. The texture of the B2 horizon generally is fine sand, but in some places south of the Maumee River, medium sand is dominant in some layers.

The C horizon commonly is gray (10YR 5/1, N 5/0), grayish brown (10YR 5/2), or olive gray (5Y 5/2), but pale olive (5Y 6/3) and light brownish gray (10YR 6/2) also occur. The texture of this horizon generally is fine sand, but it is medium sand in some places. Silty clay or clay underlies the Ottokee soils at depths ranging from 5 feet to about 20 feet.

Ottokee soils are the moderately well drained members of a drainage sequence that includes the well drained Oakville soils, the somewhat poorly drained Tedrow soils, and the very poorly drained Granby soils. They are adjacent to each of those soils in many places. They also are adjacent to Seward soils in some places. Ottokee soils have a higher content of sand throughout than Seward soils and lack the finer textured IIB and IIC horizons that occur above a depth of 40 inches in those soils. Ottokee soils have a less thick Bt horizon than the moderately well drained Galen soils.

Ottokee fine sand, 1 to 5 percent slopes (OtB).—This soil is on sandy ridges or dunes. Its surface layer is mostly loose, except where it has a permanent plant cover. It is very low in organic-matter content. Soil blowing is a severe hazard if the soil is cultivated.

Included with this soil in mapping are small areas of somewhat poorly drained Tedrow soils in level areas near the boundary between those soils and this Ottokee soil. A few areas of included soils have a thicker horizon of clay accumulation in the subsoil than is normal for Ottokee soils.

Droughtiness is the major limitation to farming, but soil blowing is a serious hazard. Blowing sand damages plant seedlings. Droughtiness, slopes, and sandy texture are limitations for some nonfarm uses. Capability unit IIIs-1.

Paulding Series

The Paulding series consists of nearly level soils that are poorly drained. These soils formed in clayey lacustrine sediment in broad areas on uplands in Pleasant and Ridgeville Townships.

In a representative profile of a Paulding soil that is cultivated, the plow layer is dark-gray clay about 8 inches thick. The subsoil, between depths of 8 and 50 inches, is gray clay mottled with gray, dark yellowish brown, and yellowish brown. Below the subsoil, between depths of about 50 and 60 inches or more, the underlying material is gray, calcareous clay.

Paulding soils have very slow permeability in both the subsoil and the fine-textured underlying material. They are saturated with free water for significant periods in winter and in spring, and they dry out slowly in spring. Paulding soils have a medium available moisture capacity and mostly a moderately deep root zone when the water table is low in summer or has been lowered by artificial drainage. The root zone is neutral to mildly alkaline.

Nearly all the acreage of Paulding soils is used for cultivated crops and meadow, but there are still some scattered woodlots. Much of the cultivated acreage has been surface drained or drained by tile to increase crop production and to make fieldwork easier. Artificial drainage by tile is slow.

Representative profile of Paulding clay, in a cultivated field in Pleasant Township (SW¼NW¼SW¼SW¼ sec. 31, T. 3 N., R. 6 E.):

Ap—0 to 8 inches, dark-gray (10YR 4/1) clay; weak, fine, angular blocky structure; firm; common roots; neutral; abrupt, smooth boundary.

B21g—8 to 16 inches, gray (N 6/0) clay; many, medium, faint, grayish-brown (2.5YR 5/2) mottles and common, fine, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4 or 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; few roots; continuous grayish brown (2.5Y 5/2) on vertical faces of peds; neutral; gradual, smooth boundary.

B22g—16 to 30 inches, gray (N 5/0) heavy clay; many, medium, faint, grayish-brown (2.5Y 5/2) mottles and common, fine, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; few roots; continuous dark gray (N 4/0) on vertical surface of peds; neutral; clear, smooth boundary.

B23g—30 to 39 inches, gray (10YR 5/1 to N 5/0) heavy clay; many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, fine, subangular blocky structure; very firm; few roots; continuous dark gray (N 4/0) on vertical surfaces of peds; neutral; diffuse, smooth boundary.

B3g—39 to 50 inches, gray (10YR 5/1 to N 5/0) heavy clay; medium, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, fine, subangular blocky structure parting to massive as depth increases; very firm; mildly alkaline; clear, smooth boundary.

Cg—50 to 60 inches, gray (10YR 5/1) clay; greenish-gray (5GY 6/1) and yellowish-brown (10YR 5/4) mottles; massive and has some vertical cleavage; very firm; few pebbles; light-gray (10YR 7/1) carbonate accumulations; moderately alkaline; calcareous.

The solum ranges from about 38 to 55 inches in thickness, but more commonly it is 45 to 55 inches thick. The depth to carbonates coincides with the solum thickness; however, vertical cleavage in places extends several inches into the substratum.

The Ap horizon commonly is about 8 inches thick, but its thickness ranges from 6 to 9 inches. Its color generally is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2, 6/2 dry). The texture is clay.

The B horizon generally is gray (10YR 5/1, N 5/0, or N 6/0) but ranges to dark gray (10YR 4/1 or 5Y 4/1) or olive gray (5Y 5/2). Mottling is faint to distinct and dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), and gray (N 5/0). Texture of the B horizon is clay, and the content of clay ranges from 60 to 80 percent.

The C horizon commonly is gray (10YR 5/1) or dark grayish brown (10YR 4/2) and has common, dark-brown (10YR 4/3), greenish-gray (5GY 6/1), and yellowish-brown (10YR 5/4) mottles. The texture is heavy clay, and the content of clay is 60 to 80 percent.

Paulding soils are the very poorly drained members of a drainage sequence that includes the somewhat poorly drained Roselms soils. They are adjacent to Roselms soils and to Latty soils in some places. They have a higher content of clay in the B horizon than the Latty soils. Paulding soils differ from Toledo soils in lacking a dark-colored surface layer and in having a higher content of clay in the B horizon than those soils.

Paulding clay (Pa).—This nearly level soil is in broad areas on uplands. Mapped areas of this soil include small areas of Latty soils, which are near the boundary between those soils and this Paulding soil. Soils of both series are very poorly drained.

This soil is difficult to till because of its clay texture. The surface is sticky and cloddy, and severe crusting occurs following heavy rainfall. This crust adversely affects stands of seedlings. The soil cracks readily in dry periods. Very slow permeability causes tile drainage to be slow.

Wetness is the major limitation to most uses of this soil. The very high content of clay drastically restricts internal drainage. Seasonal wetness, very slow permeability, and high clay content are limitations for many nonfarm uses. Capability unit IIIw-5.

Rawson Series

The Rawson series consists of deep soils that are moderately well drained. These soils formed in water-deposited loamy material and the underlying lacustrine clay or clay glacial till. They are gently sloping and are on beach ridges, outwash plains, and stream terraces. Rawson soils have a contrasting clayey texture in the lower part of the subsoil and in the underlying material within a depth of 40 inches.

In a representative profile of a Rawson soil that is cultivated, the plow layer is dark-brown sandy loam about 9 inches thick. The subsoil, between depths of 9 and 26 inches, is dark-brown fine sandy loam and fine sandy clay loam; this is mottled below a depth of 15 inches with dark yellowish brown and light olive brown. Between depths of 26 and 30 inches, the subsoil is dark yellowish-brown silty clay mottled with yellowish brown and olive gray. The underlying material, to a depth of 60 inches, is dark-brown, calcareous clay.

Rawson soils have moderate permeability in the subsoil and very slow permeability in the fine-textured underlying material. They have a medium available moisture capacity and in most places a moderately deep root zone. They are saturated above the underlying material for short periods in winter and in spring. They commonly are strongly acid in the root zone unless they are limed.

Rawson soils are used mostly for cultivated crops.

Representative profile of Rawson sandy loam, 2 to 6 percent slopes, in a cultivated field in Freedom Township (SE¼NW¼SE¼NW¼ sec. 19, T. 6 N., R. 6 E.):

Ap1—0 to 3 inches, dark-brown (10YR 4/3) sandy loam; weak, fine, subangular blocky structure parting to weak, fine, granular structure; friable; many roots; 5 percent fine gravel; neutral; abrupt, smooth boundary.

Ap2—3 to 9 inches, dark-brown (10YR 4/3) sandy loam; weak, medium, subangular blocky structure parting to weak, medium, granular structure; friable; many roots; 5 percent fine gravel; neutral; clear, smooth boundary.

B1t—9 to 12 inches, dark-brown (7.5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable; common roots; thin, patchy, dark-brown (10YR 3/3) clay films that occur principally in scattered pockets of reddish-brown (5YR 4/4) fine sandy clay loam; 15 percent fine gravel; mildly alkaline; clear, wavy boundary.

B2t—12 to 26 inches, dark-brown (7.5YR 4/4) fine sandy clay loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) and light olive-brown (2.5Y 5/4) mottles below a depth of 15 inches; moderate, medium, subangular blocky structure; firm; common roots; thin, patchy, dark-brown (10YR 3/3) clay films on peds; about 20 percent fine gravel; mildly alkaline; abrupt, smooth boundary.

IIB3t—26 to 30 inches, dark yellowish-brown (10YR 4/4) silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) and olive-gray (5Y 5/2) mottles; strong, medium, angular blocky structure parting to strong, fine, angular blocky structure; very firm; thin, patchy, dark-brown (7.5YR 3/2) clay films on peds; common roots; mildly alkaline; abrupt, smooth boundary.

IIC—30 to 60 inches, dark-brown (10YR 4/3) clay; many, medium, distinct, yellowish-brown (10YR 5/6) and gray (10YR 5/1) mottles; massive and has vertical cleavages; very firm; few fine roots; thin, very patchy, gray (5Y 5/1) clay films on vertical surfaces of cleavages; few light-gray (10YR 7/2) lime zones; calcareous.

The solum ranges from 26 to 42 inches in thickness. Generally, the depth to carbonates also is 26 to 42 inches. The contrasting fine-textured material occurs at depths ranging from about 22 to 42 inches. The gravel content in the solum ranges from about 2 to 20 percent.

The Ap horizon ranges from 6 to 9 inches in thickness. It generally is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). The texture of the Ap horizon is loam, fine sandy loam, or sandy loam, and these three textures are about equal in extent. An A2 horizon is in uncultivated areas.

The B horizon generally is dark brown (10YR 4/3 or 7.5YR 4/4) or dark yellowish brown (10YR 4/4) and is distinctly mottled with light olive brown (2.5YR 5/4), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 3/4). The texture of the B horizon generally is sandy clay loam, but it ranges to light clay loam, heavy loam, and heavy fine sandy loam. In some places, a layer of loamy sand or fine sand, 2 to 6 inches thick, occurs above the IIB3t horizon. This coarse-textured layer typically is discontinuous. The IIB horizon typically is dark yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2), or gray (10YR 5/1), that is mottled with yellowish brown (10YR 5/4 or 5/6), pale brown (10YR 6/3), olive gray (5Y 5/2), and dark gray (10YR 4/1). It generally is silty clay or clay but ranges to heavy clay loam. Clay coatings on the vertical surfaces of peds most commonly are in darker colors, generally dark brown (7.5YR 3/2) or dark grayish brown (10YR 4/2).

The C horizon commonly is dark brown (10YR 4/3) or brown (10YR 5/3) and is mottled with yellowish brown (10YR 5/6), pale brown (10YR 6/3), and gray (10YR 5/1). It generally is calcareous and ranges from clay to clay loam in texture.

The Rawson soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Haskins soils and the very poorly drained Mermill soils. They are commonly adjacent to those soils. In contrast to the moderately well drained Haney soils, Rawson soils are fine textured in the lower part of the B horizon and in the C horizon, whereas the Haney soils are coarser textured in the lower part of the B horizon and have a sandy and gravelly C horizon. They also differ from the moderately well drained Tuscola soils in being fine textured in the lower part of the B horizon and in the C horizon. Rawson soils lack the reddish colors that are inherent in the Vaughnsville soils.

Rawson sandy loam, 2 to 6 percent slopes (RaB).—A profile of this soil is described as representative for the series. This Rawson soil has a coarser textured surface layer and subsoil than the other Rawson soils. Tilth generally is good, and the soil is easy to till.

Included with this soil in mapping are small areas, ½ to 2 acres in size, where the surface layer is fine sandy loam. Also included are small areas of nearly level soils; small areas of the wetter Haskins soils; and small areas of dark-colored, very poorly drained Mermill or Hoytville soils, commonly near the edges of areas mapped as this Rawson soil. Other inclusions are areas where the combined surface layer and subsoil are either thinner or thicker than is typical for the Rawson soils.

Erosion is a moderate hazard if this soil is cultivated. The surface layer dries out fairly quickly, and seedlings can suffer from lack of moisture, but this generally does not seriously affect crop growth. Very slow permeability and slope are limitations for some nonfarm uses. Capability unit IIe-1.

Rawson loam, 2 to 6 percent slopes (RdB).—This soil is mainly in strips of moderate size and on low knolls on uplands and stream terraces. A few areas are on low beach ridges. This soil has a finer textured surface layer than other Rawson soils, and it is more susceptible to crusting. It generally has good tilth, however, and is easy to farm.

Included with this soil in mapping are small areas of Rawson sandy loam, 1/2 to 2 acres in size. Also included are small areas of nearly level soils; small areas of the wetter Haskins soils, commonly near the boundary of areas mapped as this Rawson soil; and areas of dark-colored, very poorly drained Hoytville and Mermill soils near the edge of some areas mapped as this soil.

A moderate hazard of erosion is the major limitation to farm uses. Very slow permeability and slope are limitations for some nonfarm uses. Capability unit IIe-1.

Rawson fine sandy loam, stratified substratum, 2 to 6 percent slopes (ReB).—This soil lies in areas of outwash deposits on uplands. It occurs mainly in elongated strips or on low knolls. In a few places it occupies the breaks of slopes. This soil is similar to Rawson sandy loam, except that within a depth of 40 inches its underlying material is stratified instead of clayey. This material consists of layers of sandy loam and more clayey materials. The clay substratum that is typical of Rawson soils occurs beneath the stratified material between depths of 4 and 9 feet. The sandy layers in this soil cause engineering interpretations to differ from those for the typical Rawson soils.

Included with this soil in mapping are small areas of Haskins soils that have a stratified substratum. These inclusions generally are in the most nearly level parts of areas mapped as this soil, and they are 1/2 acre to 2 acres in size.

A moderate hazard of erosion is the major limitation to farming. Very slow permeability and slope are limitations for many nonfarm uses. Capability unit IIe-1.

Rimer Series

The Rimer series consists of nearly level, somewhat poorly drained soils that occupy slight rises on uplands, mainly south of the Maumee River. These soils formed in moderately thick sandy material and in the underlying lacustrine clay or clay glacial till. The boundary between these contrasting textures occurs within a depth of 40 inches.

In a representative profile of a Rimer soil that is cultivated, the plow layer is dark grayish-brown loamy fine sand about 9 inches thick. The subsurface layer, between depths of 9 and 22 inches, is yellowish-brown loamy fine sand that is distinctly mottled with dark brown, yellowish brown, and pale brown. The subsoil, which extends to a depth of 28 inches, is yellowish brown and has pale-brown, light brownish-gray, and grayish-brown mottles. It is fine sandy loam in the upper part and silty clay in the lower part. The underlying material, between depths of 28 and 70 inches, consists of yellowish-brown and gray, calcareous silty clay and clay.

Rimer soils have rapid permeability in the coarse-textured upper part and very slow permeability in the finer textured underlying material. The uppermost 20 to 40 inches commonly is saturated for long periods in winter and early in spring. These soils have a low to medium available moisture capacity and a moderately deep root zone. The root zone is mostly neutral or slightly acid, but in places it is strongly acid.

Rimer soils commonly are used for cultivated crops. Many areas have been drained to improve plant growth and to make fieldwork easier.

Representative profile of Rimer loamy fine sand, 0 to 2 percent slopes, in a cultivated field in Damascus Township (NW1/4SW1/4SE1/4NW1/4 sec. 12, T. 5 N., R. 8 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2; 6/2 dry) loamy fine sand; weak, fine, granular structure; loose; neutral; abrupt, smooth boundary.

A2—9 to 22 inches, yellowish-brown (10YR 5/4) loamy fine sand; common, medium, distinct, dark-brown (7.5YR 4/4), yellowish-brown (10YR 5/6), and pale-brown (10YR 6/3) mottles; single grain; loose; neutral clear, smooth boundary.

B21t—22 to 24 inches, yellowish-brown (10YR 5/4) fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/8) and light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; soft, thin, patchy, dark-brown (10YR 4/3) clay films on peds and clay bridging sand grains; neutral; clear, smooth boundary.

IIB22t—24 to 28 inches, yellowish-brown (10YR 5/4) silty clay; many, medium, distinct, grayish-brown (2.5YR 5/2), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/6) mottles and common, strong-brown (7.5YR 5/6 and 5/8) mottles; moderate, medium, angular blocky structure; firm; moderate, continuous, dark grayish-brown (10YR 4/2) clay films on vertical faces of peds and thin patchy clay films on horizontal faces; neutral; clear, smooth boundary.

IIC1—28 to 34 inches, yellowish-brown (10YR 5/4) silty clay; many, medium, distinct, greenish-gray (5GY 6/1) and yellowish-brown (10YR 5/6) mottles; massive; firm; mildly alkaline; clear, smooth boundary.

IIC2g—34 to 66 inches, gray (10YR 5/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, thick, platy structure; firm; includes several thin strata or lenses of fine sand or silt; moderately alkaline; calcareous; clear, smooth boundary.

IIIC3g—66 to 70 inches, gray (10YR 5/1) clay; many, coarse, distinct, yellowish-brown (10YR 5/4) mottles; massive; very firm; common limestone pebbles and shale fragments; moderately alkaline and calcareous.

The solum ranges from about 24 to 44 inches in thickness, but mostly it is 26 to 40 inches. The depth to carbonates normally is the same as the thickness of the solum, but in some places, several inches of the lower part of the solum are slightly calcareous. The fine-textured IIB and IIC horizons occur at a depth ranging from about 22 to 40 inches but more commonly are at a depth of 24 to 38 inches.

The Ap horizon ranges from 6 to 10 inches in thickness. Its color generally is dark grayish brown (10YR 4/2, 6/2 dry) but ranges to dark gray (10YR 4/1) in some places. The A2 horizon generally is pale brown (10YR 6/3) but ranges to yellowish brown (10YR 5/4). Mottling is distinct, dark brown (7.5YR 4/4), yellowish brown (10YR 5/6), pale brown (10YR 6/3), and light brownish gray (10YR 6/2). The texture is loamy fine sand or fine sand.

The B21t horizon is yellowish brown (10YR 5/4) or brown (7.5YR 4/4) and contains distinct, yellowish-brown (10YR 5/8) and light brownish-gray (10YR 6/2) mottles. The texture in this horizon is fine sandy clay loam. The thickness of the B21t horizon ranges from 2 to 8 inches.

The IIB horizon ranges from yellowish brown (10YR 5/4) to grayish brown (10YR 5/2) and contains distinct, light brownish-gray (10YR 6/2), strong-brown (7.5YR 5/6 or 5/8), and yellowish-brown (10YR 5/6) mottles. Its texture normally is silty clay or clay but ranges to heavy clay loam.

The C horizon commonly is gray (10YR 5/1), dark brown (10YR 4/3), or dark yellowish brown (10YR 4/4) and is mottled with yellowish brown (10YR 5/6), greenish gray (5GY 6/1), or grayish brown (10YR 5/2). It normally is calcareous, and it ranges in texture from silty clay or clay to clay loam.

In this county the Rimer soils have less mottling and less gray colors in the subsoil than typical Rimer soils. These differences, however, do not greatly affect the use or behavior of the soils.

Rimer soils are the somewhat poorly drained members of a drainage sequence that includes the moderately well drained Seward soils and the very poorly drained Wauseon soils. They are adjacent to Seward soils in many places and to Wauseon soils in a few places. The Rimer soils differ from the somewhat poorly drained Tedrow soils because they are clayey in the lower part of the B horizon and in the C horizon, whereas Tedrow soils are underlain by calcareous sands.

Rimer loamy fine sand, 0 to 2 percent slopes (RfA).—This soil lies on sandy, low ridges or knolls on uplands. A profile of this soil is described as representative for the series.

Included with this soil in mapping are small areas of somewhat poorly drained Haskins soils, 1/2 to 1 1/2 acres in size. Small areas of very poorly drained Mermill and Hoytville soils also occur in some mapped areas, commonly in the lowest parts of the landscape. Also included are areas of soils that have less than 20 inches of loamy fine sand or coarser textured material. These soils have coarse-textured upper horizons that range from 14 to 20 inches in thickness. Other inclusions are areas of soils in which the combined thickness of the surface layer and subsoil is greater than typical for Rimer soils, and small areas of soils that have a dark-colored surface layer generally 9 inches or less in thickness.

Seasonal wetness is a moderate limitation to farming. Droughtiness also is a limitation. Soil blowing is a slight hazard in the more sloping areas if plant cover is sparse or lacking. Seasonal wetness and very slow permeability are limitations for many nonfarm uses. Capability unit IIw-7.

Rimer loamy fine sand, stratified substratum, 0 to 2 percent slopes (RmA).—This soil is on low ridges or knolls in sandy areas on uplands. It is similar to the typical Rimer soils, except that within a depth of 40 inches its substratum is stratified rather than uniformly clayey. This substratum consists of layers that are alternately clayey and loamy. The typical clayey substratum occurs beneath the stratified substratum between depths of 4 and 9 feet.

Included with this soil in mapping are small areas of Haskins fine sandy loam that has a stratified substratum. These inclusions generally are 1/2 acre to 2 acres in size and are fairly common. In some low places there are small included areas of very poorly drained Mermill loam that has a stratified substratum. Also included are areas of soils that have less than 20 inches of loamy fine sand or coarser textured material. These soils have coarse-textured upper horizons that range in thickness from 14 to 20 inches. Other inclusions are areas of soils in which the combined thickness of the surface layer and subsoil is greater than typical for Rimer soils, and small areas of soils that have a dark-colored surface layer generally 9 inches or less in thickness.

Seasonal wetness is a moderate limitation to farming. Droughtiness in summer also is a limitation but is of concern only during extended dry periods. Soil blowing is a slight hazard in some areas if plant cover is sparse or lacking. Seasonal wetness and very slow permeability are limitations for some nonfarm uses. Capability unit IIw-7.

Roselms Series

The Roselms series consists of somewhat poorly drained soils that occupy nearly level to slight rises on uplands, only in Ridgeville Township. These soils formed in clayey lacustrine sediment.

In a representative profile of a Roselms soil that is cultivated, the plow layer is dark grayish-brown silty clay loam about 6 inches thick. The subsoil, between depths of 6 and 25 inches, is dark grayish-brown and brown clay mottled with yellowish brown, dark yellowish brown and gray. The underlying material, between depths of 25 and 72 inches, is dark grayish-brown, calcareous clay.

Roselms soils have very slow permeability. They are seasonally saturated with free water for rather long periods. In spring, they dry out slowly unless they have been artificially drained. Roselms soils have a medium available moisture capacity and a root zone that is mostly moderately deep because the clayey subsoil hinders root growth. The root zone is medium acid or strongly acid unless it has been limed.

Roselms soils are used mostly for meadow and for cultivated crops. A few acres have been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Roselms silty clay loam, 0 to 2 percent slopes, in a cultivated field in Ridgeville Township (SW1/4SW1/4 sec. 31, T. 6 N., R. 5 E.):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, medium, subangular blocky structure; firm; many roots; strongly acid; abrupt, smooth boundary.

B1tg—6 to 9 inches, dark grayish-brown (10YR 4/2) clay; many, fine, distinct, yellowish-brown (10YR 5/6) and gray (10YR 5/1) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; common roots; very patchy light-gray (10YR 7/1) silt coatings; thin, patchy, dark-gray (10YR 4/1) clay films on peds; medium acid; gradual, smooth boundary.

B21tg—9 to 13 inches, brown (10YR 4/3) clay; many, fine, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; common roots; very patchy light-gray (10YR 7/1) silt coatings; thin, patchy, dark grayish-brown (10YR 4/2) clay films on peds; ped surfaces are dominantly 2 in chroma; medium acid; clear, wavy boundary.

B22tg—13 to 25 inches, dark grayish-brown (10YR 4/2) clay; many, fine, distinct, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles; moderate, coarse, prismatic structure parting to moderate, medium, angular blocky structure; very firm; few roots; thin, patchy, dark grayish-brown (10YR 4/2) clay films on peds; ped surfaces are dominantly 2 in chroma; few very dark gray (N 3/0) iron stains; mildly alkaline; gradual, smooth boundary.

C1g—25 to 33 inches, dark grayish-brown (10YR 4/2) clay; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, prismatic structure parting to weak, medium, subangular blocky structure; very firm; few roots; thin, very patchy, dark-gray (10YR 4/1) clay films on vertical faces of peds; some medium and coarse quartz grains on ped surfaces; moderately alkaline; weakly calcareous; gradual, wavy boundary.

C2g—33 to 60 inches, dark grayish-brown (10YR 4/2) clay; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; massive and has vertical cleavages; very firm; dark-gray (N 4/0) and greenish-gray (5G 6/1) coatings on vertical faces of cleavages; some medium and coarse quartz grains on cleavage surfaces; moderately alkaline and calcareous.

The thickness of the solum, and typically the depth to carbonates, ranges from about 22 to 32 inches.

The Ap horizon ranges from 5 to 8 inches in thickness. Its color generally is dark grayish brown (10YR 4/2) but ranges to dark gray (10YR 4/1) or grayish brown (10YR 5/2). Texture of the A horizon is silty clay loam. A silty clay A2 horizon occurs in uncultivated areas and areas of shallow-plowed soils.

The B horizon is brown (10YR 4/3), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2) and contains gray (10YR 5/1), pale-brown (10YR 6/3), dark yellowish-brown (10YR 4/4), and yellowish-brown (10YR 5/4 or 5/6) mottles. The B horizon is clay and has a clay content that ranges from 60 to 75 percent.

The C horizon commonly is dark grayish brown (10YR 4/2), light brownish gray (10YR 6/2), or grayish brown (10YR 5/2) and contains dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) mottles. This horizon is chiefly clay and has a clay content of more than 60 percent; however, in some places, silty clay occurs in the lower part of the C horizon.

Roselms soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Paulding soils, which commonly are adjacent to them. Roselms soils are also adjacent to the somewhat poorly drained Fulton and Nappanee soils in some areas. The Roselms soils have a higher content of clay in the B horizon than Fulton soils. They differ from Nappanee soils in having a higher clay content in the B horizon and in having formed in lacustrine sediment rather than glacial till.

Roselms silty clay loam, 0 to 2 percent slopes (RoA).—This soil is on uplands in Ridgeville Township. It occupies low knolls or ridges of moderate size throughout the area. The soil is difficult to till because the surface is sticky and tends to be cloddy. Crusting is severe after periods of heavy rainfall. This soil cracks readily during dry weather.

Included with this soil in mapping are a few small areas of soils that have a loamy surface layer. Small areas of very poorly drained Paulding soils also are included near the edge of a few areas mapped as this Roselms soil.

Wetness is a severe limitation to farming this soil. The very high content of clay drastically restricts internal drainage and causes tile drainage to be slow. Seasonal wetness, high clay content, and very slow permeability are limitations for most nonfarm uses. Capability unit IIIw-3.

Ross Series

The Ross series consists of nearly level, dark-colored soils that are well drained. These soils formed in loamy alluvial material on flood plains along the Maumee River. They are flooded during periods of stream overflow, mainly in winter, but flooding can occur in other seasons as well.

In a representative profile of a Ross soil that is cultivated, the plow layer is very dark grayish-brown loam about 10 inches thick. The lower part of the surface layer, between depths of 10 and 36 inches, is very dark grayish-brown and dark-brown loam and silt loam. The underlying material, between depths of 36 and 61 inches or more, is brown, calcareous silt loam.

Ross soils are moderately permeable throughout. They have a high available moisture capacity and a deep root zone. They are mostly neutral to mildly alkaline.

These soils are used mostly for cultivated crops that can be planted after the danger of flooding has lessened in spring.

Representative profile of Ross loam, in a cultivated field in Liberty Township (SE¼NW¼NE¼NW¼ sec. 11, T. 5 N., R. 7 E.):

Ap1—0 to 6 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) loam; weak, medium, subangular blocky structure parting to moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

Ap2—6 to 10 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) loam; moderate, thick, platy structure parting to weak, fine, angular blocky structure; friable; many roots; neutral; abrupt, smooth boundary.

A11—10 to 21 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) loam; weak, fine, subangular blocky structure; friable; common roots; mildly alkaline; clear, smooth boundary.

A12—21 to 32 inches, dark-brown (10YR 3/3, 3/3 rubbed) silt loam; weak, medium, subangular blocky structure; firm; common roots; very dark grayish-brown (10YR 3/2) ped faces; mildly alkaline; gradual, smooth boundary.

A13—32 to 36 inches, dark-brown (10YR 3/3, 3/3 rubbed) silt loam; weak, fine, subangular blocky structure; friable; few roots; very dark grayish brown (10YR 3/2) on ped faces; few shells; moderately alkaline; gradual, wavy boundary.

C1—36 to 52 inches, brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; few roots; dark brown (10YR 3/3) on ped surfaces; few shells; moderately alkaline; calcareous; gradual, smooth boundary.

C2—52 to 61 inches, brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure parting to massive; friable; moderately alkaline and calcareous.

The depth to carbonates commonly is the same as the depth to the C horizon.

The dark-colored A horizon generally is 24 to 36 inches thick, but in some places it is 40 inches thick. Its colors commonly are very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), and in places, very dark brown (10YR 2/2). Rubbed colors have a chroma of 3 or less.

The C horizon commonly is brown (10YR 4/3 or 5/3) but ranges to dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4). Texture of the C horizon is silt loam or loam. In many places the C horizon is stratified, and layers of sandy loam, loamy sand, and sand and gravel are common.

Ross soils are the well drained members of a drainage sequence that includes the moderately well drained Medway soils, which commonly are adjacent to these soils. Ross soils are also adjacent to the lighter colored Genessee and Shoals soils and to the wetter Sloan soils. Ross soils resemble the dark-colored Sloan soils, but they lack a B horizon that has gray colors and mottling, which indicate a fluctuating high water table. They have a darker colored A horizon than the Shoals soils and lack the mottling that is common in those soils.

Ross loam (Rs).—This nearly level soil typically occurs as fairly wide, elongated strips in slightly higher parts of the Maumee River flood plain.

Included with this soil in mapping are some areas having a silt loam surface layer. Small areas of lighter colored Genesee soils occur in some places. Also included are some areas of soils that have a thinner dark-colored horizon than is typical for Ross soils.

Flooding is the major limitation to most uses of this soil. The flooding commonly occurs in winter, but it can take place during any season of the year. In most years, however, this soil can be used safely for summer crops. Flooding is a major limitation for most nonfarm uses. Capability unit IIw-2.

St. Clair Series

The St. Clair series consists of deep, gently sloping to very steep, moderately well drained soils on slope breaks along streams and drainageways that dissect the county. These soils formed in clay loam or clay glacial till.

In a representative profile of a St. Clair soil that is in permanent pasture, the surface layer is very dark grayish-brown and dark grayish-brown silty clay loam about 5 inches thick. The subsoil, between depths of 5 and 23 inches, is dark yellowish-brown clay that is faintly mottled with yellowish brown and gray in the lower part. The underlying material, between depths of 23 and 60 inches, is brown and dark yellowish-brown clay glacial till. The upper 12 to 24 inches of this material is partially weathered, but most of it is compact and limy. It contains pebbles and fragments of limestone and shale.

St. Clair soils have very slow permeability. They are seasonally saturated for short periods. The available moisture capacity is medium, and the root zone is mostly moderately deep. These soils are medium acid to neutral in the root zone.

St. Clair soils are used mainly for pasture and woodland, but the less sloping areas are cultivated. Most areas of cultivated crops and pasture are eroded.

Representative profile of St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded, in permanent pasture in Richfield Township (NW¼NE¼SW¼SE¼ sec. 1, T. 4 N., R. 8 E.):

Ap1—0 to 2 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) silty clay loam; moderate, fine, granular structure; slightly hard; many roots; slightly acid; clear, smooth boundary.

Ap2—2 to 5 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine, subangular blocky structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B21t—5 to 9 inches, dark yellowish-brown (10YR 4/4) light clay; moderate, coarse, prismatic structure parting to moderate, medium, subangular blocky structure; very firm; common roots; thin, patchy, dark-brown 10YR 3/3) clay films; slightly acid; clear, smooth boundary.

B22t—9 to 16 inches, dark yellowish-brown (10YR 4/4) clay; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, coarse, prismatic structure parting to strong, medium, subangular blocky structure; very firm; common roots; medium, continuous, dark-brown (10YR 3/3) clay films; common fine fragments of limestone and shale; slightly acid; gradual, wavy boundary.

B3t—16 to 23 inches, dark yellowish-brown (10YR 4/4) clay; common, medium, faint, yellowish-brown (10YR 5/6) mottles and few greenish-gray (5GY 6/1) mottles; moderate, medium, prismatic structure parting to strong, medium, angular blocky structure; very firm; few roots; medium, continuous, dark grayish-brown (10YR 4/2) clay films; common, medium, distinct, gray (10YR 5/1) and greenish-gray (5GY 6/1) mottles on faces of peds; moderately alkaline; gradual, wavy boundary.

C1—23 to 35 inches, brown (10YR 4/3) clay; common, medium, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/6) mottles; moderate, fine, angular blocky structure; very firm; few roots; thin, patchy, dark grayish-brown (10YR 4/2) clay films on vertical faces of peds, very patchy on horizontal faces; few, fine, black (N 2/5) iron and manganese stains; numerous fine fragments of limestone and shale; moderately alkaline; calcareous; gradual, wavy boundary.

C2—35 to 60 inches, dark yellowish-brown (10YR 4/4) clay; common, fine, faint, yellowish-brown (10YR 5/6) and grayish-brown (2.5Y 5/2) mottles; massive and has vertical cleavages; very firm; thin, patchy, dark grayish-brown (10YR 4/2) clay coatings on vertical faces of cleavages; numerous fragments of limestone and shale; moderately alkaline and calcareous.

The thickness of the solum commonly is 18 to 30 inches. In many places much of the solum has been eroded away. The depth to carbonates commonly is the same as the thickness of the solum, but in some places the solum extends into the calcareous material for several inches.

The Ap horizon commonly is 4 to 8 inches thick where these soils are not severely eroded. In severely eroded areas, the A horizon is either completely missing or is only 1 to 3 inches thick. The Ap horizon commonly is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2), and its dominant texture is silty clay loam, except on severely eroded areas, where is is silty clay. An A2 horizon occurs in the profile in uncultivated, uneroded areas.

The B horizon color generally is dark yellowish brown (10YR 4/4), brown (10YR 5/3), or dark brown (10YR 4/3). Mottling is faint yellowish brown (10YR 5/6) in the B22 horizon. A few greenish-gray (5GY 6/1) mottles are in the lower part of the B horizon. Some pale-brown (10YR 6/3), patchy silt coatings occur in the B21t horizon in some places. Texture of the B horizon is clay, and the clay content ranges from 40 to 46 percent.

The C horizon generally is brown (10YR 4/3) or dark yellowish brown (10YR 4/4) and is distinctly mottled with gray (10YR 5/1), yellowish brown (10YR 5/6), and grayish brown (2.5Y 5/2). This horizon is light clay or heavy clay loam in some places, and it has a clay content ranging from about 36 to 44 percent.

St. Clair soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Nappanee soils and the very poorly drained Hoytville soils. They are adjacent to the Nappanee soils in areas that have well-developed drainageways. They are also adjacent to Hoytville soils in some areas. The St. Clair soils commonly are adjacent to the moderately well drained Lucas soils in some places. They differ from Lucas soils in having pebbles and fragments of limestone throughout the soil.

St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded (SbB2).—This soil is on the breaks of elongated slopes along drainageways. Slopes are mostly 3 to 5 percent, and most of them are short. From 60 to 70 percent of each mapped area is moderately eroded. A few included areas are severely eroded. The surface layer is sticky and cloddy because plowing has mixed some of the underlying clay with the remaining part of the original surface layer. This soil generally has a low organic-matter content. It tends to crust after heavy rainfall, and this adversely affects stands of seedlings.

Included with this soil in mapping are areas of the more poorly drained Nappanee soil. These areas generally are ½ to 2 acres in size and are commonly along the upper edge of the breaks on slopes. Also included in some places are small areas of sandy Seward soils or loamy Rawson soils and a few areas of soils that are steeper than 6 percent.

A severe hazard of erosion is the major limitation to farming. Very slow permeability and slope are limitations for some nonfarm uses. Capability unit IIIe–2.

St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded (SbC2).—This soil is on the breaks of slopes along drainageways. A profile of this soil is described as representative for the series. Slopes generally are fairly short, and about 80 percent of each mapped area is eroded. The plow layer is sticky and cloddy because plowing has mixed some of the clayey subsoil with the remaining part of the original surface layer. Most areas of this soil have a rather low organic-matter content. Crusting is a serious concern because it adversely affects stands of seedlings.

Included with this soil in mapping are small areas of the wetter Nappanee soils. These inclusions are ½ to 2 acres in size and occur on the upper edge of the breaks of slopes. Also included in some areas are small spots of sandy Seward soils or loamy Rawson soils and a few areas of more sloping St. Clair soils.

A very severe hazard of erosion is the major limitation to the use of this soil for cultivated crops. Surface runoff is rapid. Slope and very slow permeability are limitations for many nonfarm uses. Capability unit IVe-2.

St. Clair silty clay, 6 to 12 percent slopes, severely eroded (ScC3).—This clayey soil is on the breaks of slopes along drainageways. Slopes are rather short to moderate in length. About 75 percent of each mapped area is severely eroded. The plow layer is sticky and cloddy because the original surface layer has been removed by water erosion. This soil has a low organic-matter content and tends to be very cloddy, which adversely affects stands of seedlings. The soil can be tilled only within a narrow range of moisture content.

Included with this soil in mapping are areas of moderately eroded St. Clair soils. These areas commonly are ½ acre to 2 acres in size and generally are in the less sloping parts of the breaks. Some areas of sandy Seward soils or loamy Rawson soils and a few areas of steeper St. Clair soils also are included.

A severe hazard of erosion is the major limitation to the use of this soil for farming unless a thick cover of plants is maintained. The soil generally is too severely eroded for row crops. Surface runoff is rapid, and continuing erosion is likely unless the soil is protected by thick vegetation. Slope and very slow permeability are limitations for many nonfarm uses. Capability unit VIe-1.

St. Clair silty clay, 12 to 18 percent slopes, severely eroded (ScD3).—This soil is on the breaks of slopes along drainageways. Slopes generally are short to moderate in length. About 80 percent or more of each mapped area is severely eroded. Some of the less severely eroded areas are wooded. The surface layer in severely eroded areas typically is sticky, low in content of organic matter, and difficult to till.

Included with this soil in mapping are areas of moderately eroded St. Clair soils. These generally are in the less sloping parts of mapped areas. In some places there are included small areas of Lucas soils and spots of sandy Seward soils or loamy Rawson soils. These generally are on the upper edge of the breaks. Other inclusions in some places are areas of steeper St. Clair soils.

A very severe hazard of erosion is the major limitation to use for farming. Surface runoff is rapid, and continuing severe erosion is likely unless the soil is protected by a thick cover of plants. Slope, very slow permeability, and erosion are limitations for many nonfarm uses. Capability unit VIIe-1.

St. Clair silty clay, 18 to 25 percent slopes, severely eroded (ScE3).—This soil is on the breaks of slopes along drainageways. Slopes are short to moderate in length. About 70 percent or more of each mapped area is severely eroded. The surface layer typically is sticky when wet and low in content of organic matter.

Included with this soil in mapping are areas of moderately eroded St. Clair soils, most of which are less sloping and wooded. Some areas of the wetter Nappanee soils are also included in some places near the upper edge of slope breaks.

A very severe hazard of erosion is the major limitation to use for farming. Runoff is very rapid unless the soil is protected by a thick cover of plants. Slope, very slow permeability, and erosion are limitations for many nonfarm uses. Capability unit VIIe-1.

St. Clair silty clay, 25 to 45 percent slopes, severely eroded (ScF3).—This soil is on the breaks of slopes along larger drainageways. Slopes are short to moderate in length, and about 75 percent or more of each mapped area is severely eroded. The surface layer is sticky when wet and very low in content of organic matter.

Included with this soil in mapping are areas of moderately eroded St. Clair soils. Most of these are either wooded or are in the less sloping parts of mapped areas.

A very severe hazard of erosion is the major limitation to use for farming. Surface runoff is very rapid unless the soil is protected by a thick cover of plants. Very steep slopes, very slow permeability, and a severe hazard of erosion are serious limitations for many nonfarm uses. Capability unit VIIe-1.

Seward Series

The Seward series consists of deep, gently sloping to moderately steep, moderately well drained soils on knolls and long ridges on uplands, mainly south of the Maumee River. These soils formed in moderately thick sandy material and the underlying lacustrine clay or clay glacial till.

In a representative profile of a Seward soil that is cultivated, the plow layer is dark grayish-brown loamy fine sand about 10 inches thick. The subsurface layer, between depths of 10 and 26 inches, is mottled, yellowish-brown loamy fine sand in the upper 11 inches and mottled, dark-brown loamy fine sand in the lower 5 inches. The upper part of the subsoil, between depths of 26 and 34 inches, is mottled, yellowish-brown heavy sandy loam. The lower part of the subsoil, between depths of 34 and 44 inches, is mottled, dark yellowish-brown clay. The underlying material, to a depth of 60 inches, is mottled, dark-brown, calcareous clay.

Seward soils commonly have rapid permeability in the coarse-textured upper part of the profile and slow permeability in the clayey underlying material. Permeability is variable in the underlying material of the Seward soils that have a stratified substratum. All the Seward soils have low to medium available moisture capacity and a root zone that mainly is moderately deep. The root zone is strongly acid to neutral in the upper 20 inches.

These soils are used mainly for cultivated crops and meadow.

Representative profile of Seward loamy fine sand, 2 to 6 percent slopes, in a cultivated field in Ridgeville Township (SW¼SW¼SE¼SE¼ sec. 34, T. 6 N., R. 5 E.):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A21—10 to 21 inches, yellowish-brown (10YR 5/4) loamy fine sand; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles in lower part; single grain; very friable; common roots; few fine pebbles; slightly acid; clear, wavy boundary.

A22—21 to 26 inches, dark-brown (7.5YR 4/4) loamy fine sand; many, fine, distinct, pale-brown (10YR 6/3), yellowish-brown (10YR 5/4), and dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few roots; few, fine, black (5YR 2/1) iron and manganese stains; few fine pebbles; slightly acid; gradual, wavy boundary.

B22t—26 to 34 inches, yellowish-brown (10YR 5/4) heavy sandy loam; many, medium, distinct, pale-brown (10YR 6/3) and dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; thin, patchy, brown (10YR 4/3) clay films on peds and in root channels; neutral; abrupt, smooth boundary.

IIB23t—34 to 44 inches, dark yellowish-brown (10YR 4/4) clay; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure in upper part, massive and has vertical cleavages in lower part; very firm; thin, patchy, dark-brown (10YR 3/3) clay films on peds and in vertical cleavages; mildly alkaline; gradual, wavy boundary.

IIC—44 to 60 inches, dark-brown (10YR 4/3) clay; common, fine, distinct, gray (10YR 6/1) mottles; massive and has vertical cleavages; very firm; gray (5YR 5/1) and greenish-gray (5GY 6/1) films on faces of vertical cleavages; few light-gray (10YR 7/1) lime blotches; mildly alkaline; calcareous.

The solum ranges from about 26 to 44 inches in thickness. The depth to carbonates generally is about 26 to 44 inches, but in places several inches of the lower part of the solum is lightly calcareous. The fine-textured IIB and C horizons are at a depth that ranges from about 22 to 40 inches, but they commonly are at a depth of 24 to 36 inches.

The Ap horizon is 8 to 10 inches thick and generally is dark grayish brown (10YR 4/2), but it ranges to dark gray (10YR 4/1) in places. The A2 horizon is yellowish brown (10YR 5/4) or dark brown (7.5YR 4/4) and loamy fine sand or fine sand.

The B horizon is dark brown (7.5YR 4/4) and is mottled with pale brown (10YR 6/3), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/4). The texture is loamy fine sand, fine sandy loam, and light sandy clay loam. The upper part of the horizon ranges from 2 to 20 inches in thickness. The IIB horizon is commonly dark yellowish brown (10YR 4/4) or dark brown (10YR 4/3) and is mottled with yellowish brown (10YR 5/6) and gray (5Y 6/1, 10YR 5/1). The texture generally is silty clay or clay but ranges to heavy clay loam. The thickness ranges from 2 to 15 inches.

The C horizon generally is dark brown (10YR 4/3), brown (10YR 5/3), or dark grayish brown (10YR 4/2) mottled with gray (10YR 6/1) but is yellowish brown (10YR 5/4) in places. It generally is calcareous silty clay or clay but is calcareous clay loam in places.

The Seward soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Rimer soils and the very poorly drained Wauseon soils. They are adjacent to the Rimer soils is many places and to Wauseon soils in some areas. Seward soils are finer textured in the lower part of the B horizon and in the clay C horizon than Ottokee and Galen soils, which formed in thick sands.

Seward loamy fine sand, 2 to 6 percent slopes (SdB).—This soil is on sandy knolls and low ridges on uplands. A profile of this soil is described as representative for the series.

Included with this soil in mapping are areas of the wetter, somewhat poorly drained Haskins and Rimer soils. These inclusions are ½ acre to 2 acres in size and generally lie near the boundary between those soils and this Seward soil. Also included are small areas of dark-colored, very poorly drained Mermill and Hoytville soils. Other inclusions are areas of soils where the combined thickness of the loamy fine sand or coarser textured surface layer and subsurface layer ranges from 14 to 20 inches, which is thinner than is typical for the Seward soils, and a few areas of soils that have a dark-colored surface layer generally no more than 9 inches thick.

A moderate hazard of erosion is the major limitation to the use of this soil for cultivated crops. Droughtiness also is a limitation. Soil blowing is a moderate hazard in bare areas, especially in spring. Slope and slow permeability are limitations for some nonfarm uses. Capability unit IIe–2.

Seward loamy fine sand, 6 to 12 percent slopes (SdC).—This soil is on breaks along drainageways. It is more droughty than the gently sloping Seward soils.

Included with this soil in mapping are areas of less sloping soils, generally ½ acre to 2 acres in size, and small areas of Lucas and St. Clair soils. These inclusions generally are on the lower parts of slopes and in the steeper areas. Also included are areas of soils where the combined thickness of the loamy fine sand or coarser textured surface layer and subsurface layer ranges from 14 to 20 inches, which is thinner than is typical for the Seward soils, and a few areas of soils that have a dark-colored surface layer generally no more than 9 inches thick.

A severe hazard of erosion is the major limitation to the use of this soil for cultivated crops. Droughtiness also is a limitation; it is severe during extended dry periods. Soil blowing is a moderate hazard if this soil is not covered by vegetation. Slope and slow permeability are limitations for many nonfarm uses. Capability unit IIIe–3.

Seward loamy fine sand, 12 to 18 percent slopes (SdD).—This soil is on elongated breaks along drainageways. It is very droughty.

Included with this soil in mapping are small areas of less sloping Seward soils and areas of Lucas and St. Clair soils. These inclusions generally are on the lower slopes and in the steeper areas. Also included are areas of soils in which the combined thickness of the loamy fine sand or coarser textured surface layer and subsurface layer ranges from 14 to 20 inches, which is thinner than is typical for Seward soils, and a few areas of soils that have a dark-colored surface layer generally no more than 9 inches thick.

A very severe hazard of erosion is the major limitation to farming. Though water enters the soil readily, the soil is steep enough that during heavy rains runoff is rapid enough to cause erosion. Soil blowing is a hazard unless a thick plant cover is maintained. Droughtiness is almost as severe a limitation as erosion. Slope and slow permeability are limitations for many nonfarm uses. Capability unit IVe–1.

Seward loamy fine sand, stratified substratum, 2 to 6 percent slopes (SeB).—This soil is on breaks, knolls, and low ridges on sandy uplands. A profile of this soil is similar to that described as representative for the series, except that the substratum is stratified within a depth of 40 inches. The strata are sand, clay loam, silty clay, and silty clay loam. They differ in permeability and therefore influence the underdrainage of this soil.

Included with this soil in mapping are areas, ½ acre to 2 acres in size, of nearly level, somewhat poorly drained Rimer soils that have a stratified substratum and small areas of the wetter Haskins soils that have a stratified substratum. Also included are areas of soils in which the combined thickness of the loamy fine sand or coarser textured surface layer and subsurface layer ranges from 14 to 20 inches, which is thinner than is typical for the Seward soils, and a few areas of soils that have a dark-colored surface layer generally no more than 9 inches thick.

A moderate hazard of erosion is the major limitation to use of this soil for cultivated crops. Droughtiness also is a limitation and is severe during extended dry periods. Soil blowing is a moderate hazard in the more sloping areas if the soil is not protected by a thick plant cover. Slow permeability is the dominant limitation for many nonfarm uses. Capability unit IIe-2.

Seward loamy fine sand, stratified substratum, 6 to 12 percent slopes (SeC).—This soil is on breaks along drainageways. It is similar to the soil described as representative for the series but has a stratified substratum. The strata are sand, clay loam, silty clay, and silty clay loam, and they vary in permeability.

Included with this soil in mapping are areas of stratified and nonstratified Seward soils that have slopes of less than 6 percent or more than 12 percent. The inclusions are ½ acre to 2 acres in size. Also included are areas of somewhat poorly drained Rimer soils that have a stratified substratum and generally are near the upper edge of breaks. Areas of Lucas and St. Clair soils are on the lower part of breaks and in the steeper areas. Other inclusions are areas of soils where the combined thickness of the loamy fine sand or coarser textured surface and subsurface layers ranges from 14 to 20 inches, which is thinner than is typical for Seward soils, and a few areas of soils that have a dark-colored surface layer generally no more than 9 inches thick.

A severe hazard of erosion is the major limitation to the use of this soil for cultivated crops. Soil blowing is a hazard in areas that lack a thick plant cover. Droughtiness also is a severe limitation, especially during extended dry periods. Slope and slow permeability are limitations for many nonfarm uses. Capability unit IIIe-3.

Shinrock Series, Sandy Subsoil Variant

The Shinrock series, sandy subsoil variant, consists of deep soils that are moderately well drained to well drained. These soils formed in loamy material that overlies sandy or sandy and gravelly material. They are nearly level and are on uplands of the lake plain, mainly in Flatrock Township near the slope breaks on the south side of the Maumee River.

In a representative profile of a Shinrock, sandy subsoil variant, soil that is cultivated, the plow layer is dark grayish-brown silt loam about 9 inches thick. The upper part of the subsoil, between depths of 9 and 21 inches, is dark yellowish-brown heavy silt loam and silty clay loam. The lower part of the subsoil is brown silty clay loam and light clay loam mottled with dark yellowish brown and grayish brown. The underlying material, between depths of 37 and 82 inches, is slightly acid to neutral, brown and dark-brown coarse sand.

Shinrock, sandy subsoil variant, soils have moderately slow permeability in the subsoil and rapid permeability in the underlying material. They are seasonally saturated for short periods in winter and spring. They have medium available water capacity and a deep root zone. Unless they have been limed, these soils are medium acid to strongly acid in the upper 24 inches.

Almost all of the acreage of these soils is used for cultivated crops.

Representative profile of Shinrock silt loam, sandy subsoil variant, 0 to 2 percent slopes, in a cultivated field in Flatrock Township (NE¼SE¼SW¼NE¼ sec. 8, T. 4 N., R. 6 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, subangular blocky structure parting to moderate, medium, granular structure; friable; many roots; mildly alkaline; abrupt, smooth boundary.

B1—9 to 16 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; very weak prismatic structure parting to moderate, medium, subangular blocky structure; firm; common roots; thin, very patchy, dark-brown (7.5YR 4/4) clay films on vertical faces of peds; thin, patchy, brown (10YR 5/3, 6/3 dry) silt coatings on ped surfaces; strongly acid; gradual, smooth boundary.

B21t—16 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay loam; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; firm; common roots; thin, very patchy, dark-brown (7.5YR 4/4) clay films on peds; thin, very patchy, brown (10YR 5/3, 6/3 dry) silt coatings on ped surfaces; strongly acid; clear, smooth boundary.

B22t—21 to 28 inches, brown (10YR 4/3) silty clay loam; common, fine, faint, dark yellowish-brown (10YR 4/4) and grayish-brown (2.5YR 5/2) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; common roots; thin, patchy, brown (10YR 5/3, 6/3 dry) silt coatings on ped surfaces; strongly acid; abrupt, smooth boundary.

IIB3—28 to 37 inches, brown (7.5YR 4/4) light clay loam: common, fine, faint, dark yellowish-brown (10YR 4/4) and grayish-brown (2.5Y 5/2) mottles; weak, coarse, prismatic structure parting to moderate, coarse, subangular blocky structure; very firm; few roots; thin, very patchy, dark-brown (7.5YR 3/2) clay films and clay bridging of sand grains on vertical faces of peds; structural units coated with coarse sandy loam 2 to 7 millimeters thick; 5 percent fine pebbles; strongly acid; gradual, wavy boundary.

IIC1—37 to 47 inches, brown (7.5YR 4/4) coarse sand; many fine, faint, grayish-brown (2.5YR 5/2) and dark yellowish-brown (10YR 4/4) mottles; single grain; loose; slightly acid; gradual, smooth boundary.

IIC2—47 to 77 inches, dark-brown (10YR 4/3) coarse sand; common, fine, faint, dark grayish-brown (10YR 4/2) mottles; single grain; loose; slightly acid; gradual, smooth boundary.

IIC3—77 to 82 inches, dark-brown (10YR 4/3) coarse sand; many, fine, faint, dark grayish-brown (10YR 4/2) mottles; single grain; loose; neutral; clear, smooth boundary.

The solum ranges from 32 to 48 inches in thickness, but it is 36 to 42 inches thick in most places. Carbonates generally are 2 to 4 feet below the solum, but in some places they are deeper. The depth to the sandy horizons generally is the same as the thickness of the solum.

The Ap horizon generally is dark grayish brown (10YR 4/2) or brown (10YR 4/3 or 5/3). An A2 horizon occurs in uncultivated areas where plowing has not destroyed it.

The B horizon generally ranges from dark yellowish brown (10YR 4/4) to brown or dark brown (10YR 4/3), but it ranges to brown (10YR 5/3) or yellowish brown (10YR 5/4) in some places. Faint, grayish-brown (2.5YR 5/2), dark yellowish-brown (10YR 4/4), and yellowish-brown (10YR 5/4 to 5/6) mottles occur in the lower part of the solum, commonly between depths of 20 and 32 inches. The B horizon generally is silty clay loam, but it ranges to light silty clay or clay loam and in some places the upper part of the B horizon is heavy silt loam. The content of clay ranges from more than 25 to about 42 percent in the upper part of the Bt horizon.

The C horizon commonly is brown to dark brown (7.5YR 4/4) or dark yellowish brown (10YR 4/4) and has grayish-brown (2.5Y 5/2), dark grayish-brown (10YR 4/2), and dark yellowish-brown (10YR 4/4) mottles. This horizon is coarse sand, medium sand, and sand and gravel. In some places thin strata of silty clay loam or coarser material occur in the C horizon. In most places these strata are only a few inches thick. The C horizon ranges from neutral to moderately alkaline.

Shinrock, sandy subsoil variant, soils are the moderately well drained to well drained members of a drainage sequence that includes the somewhat poorly drained Del Rey soils and the very poorly drained Lenawee soils. They are adjacent to the Del Rey and Lenawee soils in a few places, but more commonly they are adjacent to the soils of other drainage sequences. The Shinrock, sandy subsoil variant, soils have a higher content of clay in the B horizon than the moderately well drained Tuscola soils. They have a lower content of clay in the B horizon than the moderately well drained Lucas soils.

Shinrock silt loam, sandy subsoil variant, 0 to 2 percent slopes (SfA).—This soil occurs in fairly broad, elongated areas on uplands adjacent to escarpments along the Maumee River. The coarse-textured substratum allows more rapid internal drainage in this soil than in normal Shinrock soils in other survey areas.

Included with this soil in mapping are areas of somewhat poorly drained Digby and Del Rey soils. These inclusions are ½ acre to 2 acres in size. Also included are areas of dark-colored, very poorly drained soils in low spots near the boundaries between those soils and this Shinrock variant.

Major limitations to the use of this soil for crops are few, but crops occasionally are affected by a lack of soil moisture during extended dry periods in summer. Rapid permeability in the substratum is a limitation for some nonfarm uses of this soil. Capability unit IIs-2.

Shoals Series

The Shoals series consists of deep, nearly level, somewhat poorly drained soils. These soils formed in loamy sediment on flood plains along the Maumee River and its tributaries. They are subject to flooding, especially in winter and at other times of the year after periods of heavy rainfall.

In a representative profile of a Shoals soil that is cultivated, the plow layer is dark grayish-brown silt loam about 10 inches thick. The subsoil, between depths of 10 inches and 31 inches, is dark grayish-brown silt loam and loam mottled with dark gray, grayish brown, and dark brown. The underlying material, between depths of 31 and 60 inches, is grayish-brown loam that has olive-gray and dark reddish-brown mottles.

Shoals soils are moderately permeable throughout. They have a seasonally high water table for a significant period of time, and they are slow to dry out in the spring unless they have been artificially drained. They have high available moisture capacity, and the root zone is deep when the water table is low in summer. They are slightly acid to mildly alkaline.

Shoals soils are used mainly for cultivated crops and pasture, but some areas are wooded.

Representative profile of Shoals silt loam, in a cultivated field in Liberty Township (SE¼SE¼NW¼SW¼ sec. 35, T. 6 N., R. 7 E.):

Ap1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; common roots; mildly alkaline; abrupt, smooth boundary.

Ap2—5 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, coarse, angular blocky structure; friable; common roots; ped surfaces are slightly darker than the matrix; mildly alkaline; abrupt, smooth boundary.

B1g—10 to 13 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, faint, dark-gray (10YR 4/1) and grayish-brown (10YR 5/2) mottles; weak, coarse, angular blocky structure parting to weak, medium, angular blocky structure; friable; common roots; mildly alkaline; clear, smooth boundary.

B2g—13 to 31 inches, dark grayish-brown (10YR 4/2) loam; common, medium, faint, grayish-brown (2.5YR 5/2) mottles and many, medium, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few roots; few dark-gray (10YR 4/1) mottles on peds; few pockets of brown (10YR 5/3) fine sandy loam; mildly alkaline; gradual, wavy boundary.

Cg—31 to 60 inches, grayish-brown (10YR 5/2) loam; common, medium, faint, olive-gray (5Y 5/2) mottles and many, fine, distinct, dark reddish-brown (5YR 3/3) mottles; massive; friable; some dark-gray (10YR 4/1) mottles on peds and in root channels; moderately alkaline; calcareous.

The thickness of the solum ranges from 24 to about 40 inches but is commonly 26 to 36 inches. The depth to carbonates commonly is the same as the thickness of the solum. In some places the C horizon is only mildly alkaline to a depth of 1 foot or more.

The Ap horizon typically is 7 to 10 inches thick, but in some places where surface deposition has occurred, this horizon is as much as 12 inches thick. It generally is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) but ranges to brown (10YR 4/3) or gray (10YR 5/1) in a few places.

The B horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or light brownish gray (10YR 6/2). It is mottled with faint and distinct, grayish-brown (2.5Y 5/2), dark-gray (10YR 4/1), dark-brown (10YR 4/3 or 7.5YR 4/4), and yellowish-brown (10YR 5/4 or 5/6) mottles. The B horizon generally is silt loam or loam but ranges to light silty clay loam or light clay loam. Lenses of sandy loam, loamy sand, or sand occur in the lower part of the B horizon in some places.

The C horizon commonly is grayish brown (10YR 5/2), light brownish gray (10YR 6/2), or dark gray (10YR 4/1). The upper layers are either neutral or mildly alkaline and calcareous, and they are silt loam, loam, light silty clay loam, or light clay loam. In some places the horizon is stratified, and strata of coarser material are common. These strata range from sandy loam to sand or sand and gravel. Silty clay or clay commonly is at depths of 4 to 10 feet.

Shoals soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Sloan soils and the well-drained Genesee soils. They are adjacent to those soils in many places. They are grayer throughout than Genesee soils and lack the dark color in the surface layer of Sloan soils. They have a lighter surface layer than well drained Ross soils and moderately well drained Medway soils.

In this county the Shoals soils are more alkaline than typical Shoals soils in other survey areas. This slight difference, however, does not greatly affect the use or behavior of these soils.

Shoals silt loam (Sh).—This nearly level soil is in low areas on the flood plains of the Maumee River and its tributaries and in low areas along most of the principal drainageways in the county.

Included with this soil in mapping are areas of soils that have a silty clay loam surface layer. Also included are small areas of dark-colored, very poorly drained Sloan soils in low spots and along the boundary between those soils and this Shoals soil. A few acres of well-drained Genesee soils, generally on slight rises, also are included.

Flooding and a seasonally high water table are major limitations to most uses. If the soil is artificially drained, it can be used for summer crops. Capability unit IIw-1.

Sloan Series

The Sloan series consists of dark-colored, very poorly drained soils in level to depressional areas on flood plains. These soils formed in loamy sediment on the flood plains along the Maumee River and its tributaries and along other streams in the county. Sloan soils are flooded during periods of high water, primarily in winter, but flooding can occur during any season of the year.

In a representative profile of a Sloan soil that is in pasture, the surface layer is very dark grayish-brown silty clay loam about 12 inches thick. The subsoil, between depths of 12 and 43 inches, is grayish-brown silty clay loam that is distinctly mottled with dark brown, reddish brown, and yellowish brown. The underlying material, between depths of 43 and 72 inches, is mottled, grayish-brown silt loam.

Sloan soils have moderate permeability. They have a seasonally high water table for long periods in winter and spring. Unless adequately drained, they are slow to dry out in spring. Sloan soils have a high available moisture capacity and a deep root zone. The root zone typically is mildly alkaline in reaction.

Sloan soils are used mostly for cultivated crops and pasture. Some areas are wooded.

Representative profile of Sloan silty clay loam, in permanent pasture in Liberty Township (NW¼NE¼NE¼SE¼ sec. 32, T. 6 N., R. 7 E.):

A11—0 to 3 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) silty clay loam; moderate, medium, granular structure; friable; many roots; mildly alkaline; abrupt, smooth boundary.

A12—3 to 7 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) silty clay loam; weak, very fine, subangular blocky structure parting to moderate, medium, granular structure; soft; many roots; mildly alkaline; clear, smooth boundary.

A13—7 to 12 inches, very dark grayish-brown (10YR 3/2, 3/2 rubbed) silty clay loam; few, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine, subangular blocky structure; soft; common roots; mildly alkaline; gradual, smooth boundary.

B21g—12 to 18 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, fine, angular blocky structure; friable; common roots; many gray (10YR 5/1) mottles on peds; dark grayish-brown (10YR 4/2) coatings in vertical root channels; mildly alkaline; gradual, smooth boundary.

B22g—18 to 30 inches, grayish-brown (2.5YR 5/2) silty clay loam; common, medium, distinct, dark-brown (7.5YR 4/4) and reddish-brown (5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few roots; common gray (10YR 5/1) mottles on faces of peds; mildly alkaline; gradual, smooth boundary.

B23g—30 to 43 inches, grayish-brown (2.5YR 5/2) light silty clay loam; common, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, coarse, angular blocky structure; friable; few roots; common gray (10YR 5/1) mottles on surface of peds; mildly alkaline; gradual, wavy boundary.

Cg—43 to 72 inches, grayish-brown (2.5YR 5/2) silt loam; common, fine, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; massive and has some vertical faces; friable; continuous gray (10YR 5/1) coatings or mottles on vertical faces; moderately alkaline and weakly calcareous.

The solum ranges from about 30 to 55 inches in thickness but commonly is 36 to 45 inches thick. The depth to carbonates commonly is the same as the thickness of the solum, but in some places the C horizon is noncalcareous for 1 foot or more. The reaction of the upper part of the solum is slightly acid to mildly alkaline. The lower part of the solum is normally neutral to mildly alkaline.

The dark-colored A horizon is thicker than 10 inches, generally ranging from 10 inches to about 13 inches in thickness. Colors commonly are very dark grayish brown (10YR 3/2) to very dark gray (10YR 3/1), but they range to very dark brown (10YR 2/2) in some places.

The B horizon is grayish brown (2.5YR 5/2), olive gray (5YR 5/2), gray (10YR 5/1), and dark gray (10YR 4/1). It is distinctly mottled with dark brown (7.5YR 4/4), reddish brown (5YR 4/4), and yellowish brown (10YR 5/4). Textures of the B horizon include silty clay loam, silt loam, and clay loam. The average sand content of the B horizon is more than 15 percent fine sand or coarser. Lenses of sandy loam, loamy sand, or sand occur in the lower part of the B horizon in some places.

The C horizon commonly is grayish brown (2.5YR 5/2), light brownish gray (10YR 6/2), or dark gray (10YR 4/1). The upper part of this horizon is either neutral or mildly alkaline and calcareous and consists of silt loam, loam, or light silty clay loam. In many places the C horizon is stratified and strata of coarser textured material are common. These strata range from sandy loam to sand or sand and gravel.

Sloan soils are the very poorly drained members of a drainage sequence that includes the somewhat poorly drained Shoals soils and the well-drained Genesee soils. They are adjacent to those soils in many places. The Sloan soils are more gray and mottled than Medway and Ross soils, which are also dark colored but are better drained. Sloan soils are less clayey in the B horizon than the very poorly drained Wabasha soils. They are more clayey than the very poorly drained Cohoctah soils.

Sloan silty clay loam (So).—This nearly level soil is in fairly wide, elongated strips on flood plains of the Maumee River and its tributaries and of other principal drainageways in the county. Along the tributaries it generally occupies the whole flood plain.

Included with this soil in mapping are some areas of lighter colored Shoals soils. These commonly are 1 acre to 3 acres in size and are along the boundary between Shoals soils and this Sloan soil. Some areas have a silt loam surface layer, and some areas are calcareous within a depth of 20 inches. Areas of moderately well drained Medway and well drained Ross soils are included in some mapped places, but these are not very common.

Flooding and very poor natural drainage are the major limitations to the use of this soil. Both are limitations that restrict the use of this soil for farming and most other purposes. Capability unit IIIw-1.

Spinks Series

The Spinks series consists of deep, gently sloping to moderately steep, sandy soils that are principally in Harrison and Liberty Townships. These well-drained soils formed in sandy material on beach ridges and dunes.

In a representative profile of a Spinks soil that is cultivated, the plow layer is dark grayish-brown fine sand about 6 inches thick. Next is yellowish-brown fine sand that extends from a depth of 6 inches to a depth of 100 inches. At various depths throughout this material are thin bands of dark-brown loamy sand. These thin bands have a higher content of clay than the adjacent yellowish-brown fine sand. The substratum, between depths of 100 and 153 inches, consists of layers of calcareous fine sand.

Spinks soils have moderately rapid permeability. The bands of loamy sand tend to slow the downward movement of water. Spinks soils have a very low available moisture capacity and a deep root zone. The root zone is medium acid to neutral.

Spinks soils are used mostly for cultivated crops and for trees. Some areas are mined for sand, which is used as fill material by builders and highway contractors.

Representative profile of Spinks fine sand, 6 to 12 percent slopes, in a sand pit in a previously cultivated field in Harrison Township (SE¼SE¼NW¼NE¼ sec. 13, T. 5 N., R. 7 E.; laboratory data No. HN–86):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) fine sand; very weak, medium, granular structure; loose; many roots; slightly acid; abrupt, smooth boundary.

A2&Bt—6 to 100 inches, yellowish-brown (10YR 5/4) sand; single grain; loose; common roots to a depth of 55 inches, few roots below 55 inches; Bt part has thin lamallae of dark-brown (7.5YR 4/4) loamy sand, ⅛ to ½ inch thick, at depths of 23, 28, 33, 39, 42, 44, 52, 55, 61, 66, 73, 79, 81, 92, and 96 inches; massive; friable; sand grains are coated, and there is clay bridging between grains; most lamellae are continuous but some are not; their boundaries are variable; some are abrupt and smooth, some abrupt and wavy, and some abrupt and irregular; the lowermost lamella, at a depth of 96 inches, is 3 to 5 inches thick; slightly acid; abrupt, irregular boundary.

C1—100 to 114 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; moderately alkaline and calcareous; diffuse, wavy boundary.

C2—114 to 153 inches, pale-brown (10YR 6/3) fine sand; few, medium, distinct, yellowish-brown (10YR 5/6) and light olive-brown (2.5YR 5/6) mottles; single grain; loose; moderately alkaline; calcareous.

The solum ranges from about 60 to 100 inches in thickness. Depth to carbonates commonly is 6 to 48 inches below the solum.

The Ap horizon generally is dark grayish brown (10YR 4/2) but ranges to dark brown (10YR 4/3).

The A2 horizon commonly is yellowish brown (10YR 5/4) or brown (10YR 5/3). The dominant texture in this horizon is fine sand, but loamy fine sand and sand occur in some places.

The colors of the Bt lamellae are typically dark brown (7.5YR 4/4) or strong brown (7.5YR 5/6). These lamellae are commonly loamy sand or loamy fine sand. In some profiles, however, individual bands are of fine sandy loam. The lamellae commonly are about ⅛ inch thick but range to 5 inches in thickness. The minimum depth to the first band is about 20 inches in some places, but it commonly is 24 to 28 inches. The cumulative thickness of the banding or lamellae (Bt) exceeds 6 inches.

The C horizon typically is light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) and contains few to common, yellowish-brown (10YR 5/6) and light olive-brown (2.5YR 5/6) mottles in the middle or lower layers. The texture of this horizon generally is fine sand, but in some places there are layers of sand. The underlying material is silty clay or clay, which occurs at a depth ranging from about 5 to 35 feet.

Spinks soils are the well drained members of a drainage sequence that commonly includes the moderately well drained Ottokee soils, the somewhat poorly drained Tedrow soils, and the very poorly drained Granby soils. They are adjacent to those soils in many places. Spinks soils are also adjacent to Oakville soils in some areas, but they differ from Oakville soils in having bands in the B horizon above a depth of 72 inches. They differ from Arkport and Galen soils in having less clay in the solum and a higher content of sand.

Spinks fine sand, 2 to 6 percent slopes (SpB).—This soil is on sand ridges or dunes on uplands. It is slightly less droughty than the more sloping Spinks soils. It has a low content of organic matter, and it dries quickly in spring.

Included with this soil in mapping are small areas, ½ acre to 4 acres in size, of moderately well drained Ottokee soils. These inclusions are in the more nearly level parts of mapped areas. Also included are small areas of the wetter Tedrow soils. These somewhat poorly drained soils are mostly nearly level. Areas of Oakville soils are inclusions in some places. Oakville soils lack the dark-brown or reddish bands that are typical of Spinks soils.

Droughtiness is the major limitation to farming. Soil blowing occurs during periods of high winds and is a concern because it causes loss of soil and organic matter. It is also important because blowing sand is abrasive to young plants. Slope and moderately rapid permeability are limitations for some nonfarm uses. Capability unit IIIs–1.

Spinks fine sand, 6 to 12 percent slopes (SpC).—This soil lies on sand ridges or dunes on uplands. A profile of this soil is described as representative for the series. The soil is more droughty than the gently sloping Spinks soil. It has a low content of organic matter because organic matter is continually removed by soil blowing of the surface soil.

Included with this soil in mapping are small areas, 1 acre to 3 acres in size, of gently sloping soils and some areas of the wetter Tedrow and Ottokee soils.

Soil blowing is the major hazard to farming. It is an important concern because soil and organic matter are lost through soil blowing and the abrasive action of blowing sand damages young plants. This soil is also very droughty. Slope and moderately rapid permeability are limitations to many nonfarm uses. Capability unit IIIe–3.

Spinks fine sand, 12 to 18 percent slopes (SpD).—This soil is mainly on sand dunes or ridges on uplands. A few areas are on slope breaks along drainageways. This is the most droughty Spinks soil and is one of the most droughty soils in the county. Included with it in mapping are small areas, 1 acre to 4 acres in size, of less sloping Spinks soils.

Soil blowing is the major hazard to farming. It is a very severe hazard because it removes surface soil and organic matter. It also is an important concern also because it damages plant seedlings. Slope and droughtiness are dominant limitations for many nonfarm uses. Capability unit IVe–1.

Tedrow Series

The Tedrow series consists of deep, nearly level, somewhat poorly drained soils on low rises on uplands, mainly in Liberty and Washington Townships. These soils formed in deep, calcareous sands.

In a representative profile of a Tedrow soil that is cultivated, the plow layer is dark grayish-brown loamy fine sand about 8 inches thick. The subsoil, between depths of 8 and 33 inches, is yellowish-brown, brown, and pale-brown loamy fine sand that has common, distinct, yellowish-brown, light brownish-gray, and dark-brown mottles. The underlying material, between depths of 33 and 60 inches, is mottled, pale-olive fine sand.

Tedrow soils have rapid permeability. They are saturated with free water for short periods during winter and spring. These soils have low available moisture capacity and a deep root zone when the water table is low. The root zone is slightly acid to neutral in the upper part.

These soils are used for cultivated crops and for trees. Most of the cultivated acreage has been artificially drained to improve crop growth and to make fieldwork easier.

Representative profile of Tedrow loamy fine sand, 0 to 2 percent slopes, in a cultivated field in Washington Township (W½SE¼NE¼SE¼ sec. 27, T. 6 N., R. 8 E.):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2, 6/2 dry) loamy fine sand; weak, medium, granular structure; very friable; many roots; neutral; abrupt, smooth boundary.

B21—8 to 16 inches, yellowish-brown (10YR 5/4) loamy fine sand; few, fine, faint, dark-brown (10YR 4/3) and pale-brown (10YR 6/3) mottles and few, medium, distinct, yellowish-brown (10YR 5/8) mottles; single grain; very friable; common roots; slightly acid; clear, wavy boundary.

B22—16 to 31 inches, brown (10YR 5/3) loamy fine sand; many, medium, distinct, yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/8) mottles and common, medium, faint, light brownish-gray (10YR 6/2) mottles; single grain; very friable; few roots; slightly acid; clear, wavy boundary.

B3—31 to 33 inches, pale-brown (10YR 6/3) fine sand; many, coarse, distinct, light olive-brown (2.5Y 5/4), yellowish-brown (10YR 5/4), and grayish-brown (10YR 5/2) mottles; single grain; loose; neutral; clear, wavy boundary.

C—33 to 60 inches, pale-olive (5Y 6/3) fine sand; common, medium, faint, gray (5Y 6/1) and light olive-brown (2.5Y 5/4) mottles and many, medium, faint, olive (5Y 5/3) mottles; single grain; loose; moderately alkaline and calcareous.

The thickness of the solum ranges from about 24 to 50 inches but commonly is 30 to 40 inches. The depth to carbonates commonly is the same as the thickness of the solum.

The Ap horizon ranges from 7 to 10 inches in thickness. It normally is very dark grayish brown (10YR 3/2) or dark brown (10YR 4/3).

The B horizon commonly is yellowish brown (10YR 5/4), brown (10YR 5/3), or pale brown (10YR 6/3) and contains faint to distinct mottles of grayish brown (10YR 5/2), light brownish gray (10YR 6/2), light olive brown (2.5Y 5/4), pale brown (10YR 6/3), yellowish brown (10YR 5/4 and 5/6), and strong brown (7.5YR 5/8).

The C horizon commonly is pale olive (5Y 6/3) or light brownish gray (10YR 6/2) and contains gray (5Y 6/1), light olive brown (2.5Y 5/4), and olive (5Y 5/3) mottles. The texture of this horizon typically is fine sand. Silty clay or clay underlies the Tedrow soils at depths ranging from about 4 to 20 feet.

Tedrow soils are the somewhat poorly drained members of a drainage sequence that includes the moderately well drained Ottokee soils, the well drained Oakville soils, and the very poorly drained Granby soils. They are adjacent to those soils in many places. Tedrow soils differ from the somewhat poorly drained Rimer soils because they lack a fine-textured lower part of the B horizon and C horizon.

Tedrow loamy fine sand, 0 to 2 percent slopes (TdA).—This soil is on low sandy ridges or knolls on uplands.

Included with this soil in mapping are small areas of Rimer soils that have a stratified substratum. These inclusions are ½ acre to 3 acres in size. Also included are small areas of soils that have a darker colored surface layer than is typical for Tedrow soils, and soils that are calcareous at shallower depths than is typical for those soils. Also, there are small inclusions of Ottokee soils in many areas on the higher ridges or knolls. Areas of dark-colored, very poorly drained Granby soils are other inclusions in some places.

Seasonal wetness is the major limitation to the use of this soil for cultivated crops. Droughtiness is also a problem in summer, especially after extended periods of dry weather. Soil blowing is a hazard but normally is only slight. Seasonal wetness and rapid permeability are limitations for some nonfarm uses. Capability unit IIw–7.

Tedrow Series, Silty Subsoil Variant

Soils of the Tedrow series, silty subsoil variant, are similar to typical Tedrow soils in most respects, except that within 40 inches of the surface they have a silty subsoil layer instead of a sandy layer.

In a representative profile of a Tedrow, silty subsoil variant, soil that is cultivated, the plow layer is dark grayish-brown loamy fine sand about 9 inches thick. The subsoil, between depths of 9 to 35 inches, is pale-brown and light brownish-gray loamy fine sand that is distinctly mottled with yellowish brown and light brownish gray. The underlying material, between depths of 35 to 60 inches, consists of strata of mottled, grayish-brown silt and fine sand.

Tedrow, silty subsoil variant, soils have rapid permeability in the sandy upper layers and moderately slow permeability in the lower layers. They are seasonally saturated with water for considerable periods. Although typical Tedrow soils commonly have a low available water capacity, soils of this variant have a medium available water capacity because of their silty layers. Their root zone is deep when the water table is low. Their reaction in the upper 24 inches is slightly acid to neutral.

Representative profile of Tedrow loamy fine sand, silty subsoil variant, 0 to 2 percent slopes, in a cultivated field in Liberty Township (NW¼NE¼NW¼ sec. 33, T. 6 N., R. 7 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2, 6/2 dry) loamy fine sand; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B21—9 to 31 inches, pale-brown (10YR 6/3) loamy fine sand; common, medium, distinct, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; very weak, medium, subangular blocky structure; very friable; slightly acid; clear, smooth boundary.

B22—31 to 35 inches, light brownish-gray (10YR 6/2) loamy fine sand; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; single grain; loose; neutral; clear, smooth boundary.

IIC—35 to 50 inches, grayish-brown (2.5Y 5/2) stratified silt and fine sand; many, medium, distinct, light-gray (10YR 6/1) and yellowish-brown (10YR 5/4) mottles; moderate, medium, platy structure; friable; moderately alkaline and calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 22 to 44 inches.

The Ap horizon ranges from 7 to 10 inches in thickness. It normally is very dark grayish brown (10YR 3/2) or dark brown (10YR 4/3).

The B horizon commonly is yellowish brown (10YR 5/4), brown (10YR 5/3), or pale brown (10YR 6/3) and contains faint to distinct mottles of grayish brown (10YR 5/2), light brownish gray (10YR 6/2), light olive brown (2.5Y 5/4), pale brown (10YR 6/3), yellowish brown (10YR 5/4 and 5/6), and strong brown (7.5YR 5/8).

The C horizon is variable in texture but includes layers of silt, silt loam, and fine sand. The layers of silt or silt loam are within a depth of 40 inches.

These soils are typically adjacent to the loamy, somewhat poorly drained Kibbie soils. They are also commonly adjacent to the wetter, dark-colored Colwood soils. These Tedrow soils have a higher content of sand throughout than the Kibbie or Colwood soils.

Tedrow loamy fine sand, silty subsoil variant, 0 to 2 percent slopes (TeA).—This soil is in elongated strips on uplands near drainageways.

Included with this soil in mapping are small areas of loamy, somewhat poorly drained Kibbie soils near the boundaries between those soils and this Tedrow variant. A few areas of wetter, dark-colored Colwood soils are also included.

Seasonal wetness is the major limitation to farming. This soil does not drain so readily as the typical Tedrow soils. Soil blowing is a slight hazard on higher rises in some areas. Seasonal wetness and slow permeability are limitations for some nonfarm uses. Capability unit IIw–7.

Toledo Series

The Toledo series consists of dark-colored, very poorly drained soils in broad upland areas on the lake plain both north and south of the Maumee River. These nearly level soils formed in lacustrine silty clay sediment.

In a representative profile, the surface layer is very dark grayish-brown silty clay loam about 7 inches thick. The upper 6 inches of the subsoil is gray silty clay. Between depths of 13 and 47 inches, the subsoil is gray silty clay that is distinctly mottled with dark yellowish brown. The underlying material, between depths of 47 and 78 inches, is dark yellowish-brown and dark grayish-brown calcareous silty clay, silty clay loam, and clay.

Toledo soils have slow permeability. They are saturated with free water for long periods during winter and spring, and they dry out slowly in spring unless they have been artificially drained. These soils have a medium available moisture capacity and a rooting zone that is deep when the water table is low. The root zone is mostly neutral in reaction.

Toledo soils are used mostly for cultivated crops. Many acres of these soils have been artificially drained to improve crop growth and to make fieldwork easier.

Representative profile of Toledo silty clay loam, in a cultivated field in Liberty Township (SE¼SE¼NE¼NW¼ sec. 7, T. 5 N., R. 7 E.; laboratory data HN–82):

A1—0 to 7 inches, very dark grayish-brown (10YR 3/2) silty clay loam, very dark grayish brown (10YR 3/2) crushed; weak, fine, subangular blocky structure parting to moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B21g—7 to 13 inches, gray (5Y 5/1) silty clay, dark brown (10YR 4/3) crushed; common, fine, distinct, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles; moderate, fine, angular blocky structure; firm; common roots; thin, patchy, dark-gray (10YR 4/1) clay films mottled with dark brown (7.5YR 5/4) around the peds; neutral; clear, smooth boundary.

B22g—13 to 29 inches, gray (5Y 5/1) silty clay, dark yellowish brown (10YR 4/4) crushed; common, fine, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; firm; common roots; moderate, continuous, dark-gray (10YR 4/1) clay films mottled with dark yellowish brown (10YR 4/4) around the peds; neutral; gradual, wavy boundary.

B23g—29 to 47 inches, gray (5Y 5/1) silty clay; dark brown (10YR 4/3) crushed; many, fine and medium, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, subangular and angular blocky structure; very firm; few roots; moderate, continuous, grayish-brown (2.5Y 5/2) clay films that have few, fine and medium, distinct, strong-brown (7.5YR 5/6) mottles around the peds; mildly alkaline; clear, wavy boundary.

C1—47 to 70 inches, dark yellowish-brown (10YR 4/4), stratified silty clay and silty clay loam; massive; firm; mildly alkaline and calcareous.

C2—70 to 78 inches, dark grayish-brown (10YR 4/2) clay; massive; very firm; mildly alkaline and calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from about 30 to 55 inches. In some places the lower few inches of the solum are weakly calcareous.

The dark-colored A horizon commonly is 8 inches thick but ranges from 7 to 10 inches in thickness. It generally is very dark grayish brown (10YR 3/2) but ranges to very dark gray (10YR 3/1) or very dark brown (10YR 2/2) in some places. The texture of the A horizon is silty clay loam or silty clay.

The B horizon generally is grayish brown (10YR or 2.5Y 5/2), olive brown (2.5Y 4/4), olive gray (5Y 5/2), dark gray (5Y 4/1), or gray (5Y 5/1) and contains distinct, dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/4 or 5/6), olive-brown (2.5Y 4/4), light olive-brown (2.5Y 5/4), and reddish-brown (5YR 4/4) mottles. The texture of the B horizon is silty clay that is less than about 12 percent sand.

The C horizon is dark yellowish brown (10YR 4/4), dark brown (10YR 4/3), or yellowish brown (10YR 5/4) and contains few to common, grayish-brown (10YR 5/2), olive-brown (2.5Y 4/4), greenish-gray (5GY 6/1), light greenish-gray (5GY 7/1), and gray (N 5/0) or dark-gray (N 4/0) mottles. The horizon is dominantly silty clay but in places has thin lenses of silty clay loam, silt loam, silt, or fine sand. These lenses typically range from 1 millimeter to 1 inch in thickness, though in some places they are thicker. Clay loam glacial till commonly is at a depth of 5 to 12 feet.

Toledo soils are the very poorly drained members of a drainage sequence that includes the somewhat poorly drained Fulton soils and the moderately well drained Lucas soils. They are adjacent to those soils in many places. Toledo soils differ from very poorly drained Lenawee soils in having a higher content of clay throughout. They have a darker colored A horizon than the Latty or Paulding soils, and they have less clay in the B horizon than Paulding soils. Toledo soils have a lower content of sand and coarse fragments than the Hoytville soils.

Toledo silty clay loam (To).—This nearly level soil is in broad areas on uplands. It has the profile described as representative for the series. This soil drains more readily with tile than Toledo silty clay.

Included with this soil in mapping are areas of Toledo silty clay, 1 acre to 5 acres in size. Areas of very poorly drained Hoytville soils occur in many places. These included soils contain pebbles and stone fragments, which are lacking in the Toledo soils. Also included are small areas of lighter colored, somewhat poorly drained Fulton soils on slight rises along drainageways. These included areas generally are ½ acre to 2 acres in size.

Seasonal wetness is the major limitation to farming. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIIw–2.

Toledo silty clay (Tt).—This nearly level soil is in broad areas on uplands. This soil has a finer textured surface layer than Toledo silty clay loam. As a result, it is harder to till and more likely to be cloddy.

Included with this soil in mapping are areas of Toledo silty clay loam. Small areas of Hoytville soils are included in many places. These included soils contain pebbles and stone fragments, which are lacking in the Toledo soil. Small areas of light-colored Fulton soils commonly occur within most mapped areas on slight rises. These inclusions are numerous near drainageways and generally are ½ acre to 2 acres in size.

Seasonal wetness is the major limitation of this soil for farming. This soil drains more slowly than Toledo silty clay loam. Slow permeability and seasonal wetness are limitations to many nonfarm uses. Capability unit IIIw-2.

Tuscola Series

The Tuscola series consists of deep, gently sloping to sloping, moderately well drained soils on breaks along streams that dissect the lake plain, mainly in Liberty Township. These soils formed in loamy material that is high in content of silt and fine sand and is underlain by stratified silt and fine sand.

In a representative profile of a Tuscola soil that is cultivated, the plow layer is dark-brown loam about 7 inches thick. The upper part of the subsoil is yellowish-brown silt loam that is 4 inches thick. Between depths of 11 and 27 inches, the subsoil is mottled, yellowish-brown silt loam. The mottles are yellowish red in the upper part and brownish yellow and strong brown in the lower part. The subsoil has a slightly higher content of clay than the plow layer. The underlying material, between depths of 27 and 68 inches, consists of stratified, calcareous silt and fine seams of sand.

Tuscola soils have moderate permeability. They are saturated with free water for short periods in winter and spring. They have a high available moisture capacity and a deep root zone. The root zone is mostly medium acid to neutral.

Tuscola soils are used mostly for cultivated crops and pasture; some areas are wooded.

Representative profile of Tuscola loam, 6 to 12 percent slopes, moderately eroded, in a cultivated field in Liberty Township (NW¼SE¼SE¼NE¼ sec. 32, T. 6 N., R. 7 E.):

Ap—0 to 7 inches. dark-brown (10YR 4/3) loam; weak, medium, subangular blocky structure parting to moderate, fine, granular structure; friable; few roots; medium acid; abrupt, smooth boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; few roots; few strong-brown (7.5YR 5/8) nodules of iron oxide; thin, very patchy, dark yellowish-brown (10YR 4/4) clay films on peds; slightly acid; clear, wavy boundary.

B2t—11 to 19 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, distinct, yellowish-red (5YR 4/8 or 5/8) mottles; moderate, medium, angular blocky structure parting to moderate, fine, angular blocky structure; very friable; few roots; thin, patchy, dark yellowish-brown (10YR 4/4) clay films on peds; few dark-brown (7.5YR 3/2) iron-manganese stains; slightly acid; clear, smooth boundary.

B3t—19 to 27 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, faint, brownish-yellow (10YR 6/8) and strong-brown (7.5YR 5/6) mottles; weak, medium, platy structure parting to moderate, very fine, subangular blocky structure; friable; few roots; thin, patchy, dark yellowish-brown (10YR 4/4) clay films on peds; few dark-brown (7.5YR 3/2) iron-manganese stains; neutral; abrupt, smooth boundary.

C—27 to 68 inches, stratified, yellowish-brown (10YR 5/4) silt loam and light olive-brown (2.5Y 5/6) fine seams of sand; moderate, fine, platy structure; firm; few roots; the upper 8 inches has thin, very patchy, dark yellowish-brown (10YR 4/4) clay films on vertical faces of peds and weak, coarse, angular blocky structure; few light-gray (10YR 7/2) lime concretions; light olive-brown (2.5Y 5/4) and olive-yellow (2.5Y 6/6) silt or fine sand coatings on platy faces; mildly alkaline, slight effervescence.

The solum ranges from 27 to 42 inches in thickness. The depth to carbonates commonly is the same as the thickness of the solum, though in some places the upper several inches of the C horizon is mildly alkaline.

The Ap horizon ranges to as much as 12 inches in thickness. This horizon commonly is dark brown (10YR 4/3) and dark grayish brown (10YR 4/2). The profile in uneroded areas has an A2 horizon.

The B horizon is yellowish brown (10YR 5/4), dark yellowish brown (10YR 4/4), and brown (10YR 5/3) and contains few, distinct, yellowish-red (5YR 4/6), brownish-yellow (10YR 6/6), and strong-brown (7.5YR 5/6) mottles. In many places the lowermost few inches of the solum is mottled with light brownish gray (10YR 6/2) or grayish brown (10YR 5/2). Texture of the B horizon commonly is silt loam or loam, but there are layers of light silty clay loam and light clay loam in some places.

The C horizon generally is yellowish brown (10YR 5/4) or grayish brown (10YR 5/2), but it ranges to light brownish gray (10YR 6/2). It is typically stratified with layers of light olive-brown (2.5Y 5/6) fine sand, very fine sand, silt, and silt loam. Thickness of these layers ranges from ⅛ inch to several inches.

Tuscola soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Kibbie soils and the very poorly drained Colwood soils. They are commonly adjacent to the wetter Kibbie soils. They are less commonly adjacent to the dark-colored Colwood soils. In some places the Tuscola soils are adjacent to the moderately well drained Lucas soils. They differ from Lucas soils in having a less clayey solum. They are less clayey throughout than Shinrock soils, and they have a higher content of silt than Rawson or Haney soils. Unlike the Rawson soils, Tuscola soils lack a contrasting finer textured horizon within 40 inches of the surface.

Tuscola loam, 2 to 6 percent slopes, moderately eroded (TuB2).—This soil is in elongated areas on uplands or on slope breaks along drainageways. Tilth is good, and the soil is easy to till even though eroded.

Included with this soil in mapping are small areas of steeper soils. Also included are areas of the wetter Kibbie soils, ½ acre to 2 acres in size, which are mainly in the less sloping parts of mapped areas. Other inclusions are small areas of Lucas soils, which occur in a continuous belt along the lower part of slope breaks.

A moderate hazard of erosion is the major limitation to farming. Lateral seepage of ground water causes some wet spots on some slopes. Slope is the dominant limitation of this soil for some nonfarm uses. Capability unit IIe-1.

Tuscola loam, 6 to 12 percent slopes, moderately eroded (TuC2).—This soil is in areas along drainageways. A profile of this soil is described as representative for the series. The soil is easy to till and is in good tilth, even in eroded areas. Seepage spots occur on some slopes.

Included with this soil in mapping are some areas of Lucas and St. Clair soils that commonly occur in a nearly continuous belt, generally on the lower part of slope breaks. Also included are areas of slightly eroded Tuscola loam that occur in less sloping parts of some mapped areas and some areas of soils that are steeper than 12 percent.

A severe hazard of erosion is the major limitation to farming. Runoff is rapid on this Tuscola soil. Slope is the dominant limitation to many nonfarm uses. Capability unit IIIe–1.

Urban Land

Urban land (Ur) is a miscellaneous land type that consists of industrial areas and areas within cities and towns. Most of these areas are covered with buildings, streets, or parking lots. The original soil in Urban land areas has been disturbed or altered to the extent that no recognizable profile remains. The volume of runoff from surfaced areas of Urban land is very high. Capability unit not assigned.

Vaughnsville Series

The Vaughnsville series consists of deep, nearly level, moderately well drained to somewhat poorly drained soils in elongated strips on the inner, or lake, slope of beach ridges. They extend from the base of the ridge upward to about one-third the distance to the crest. These soils formed in loamy material underlain by calcareous lacustrine clay or clay glacial till. When plowed, Vaughnsville soils are obvious on the landscape because they have a distinctive reddish color.

In a representative profile of a Vaughnsville soil that is cultivated, the plow layer is dark reddish-brown loam about 7 inches thick. The upper 2 inches of the subsoil is also dark reddish brown. The subsoil, between depths of 9 and 30 inches, is dark reddish-brown and grayish-brown clay loam in the upper 13 inches and mottled, yellowish-brown sandy loam in the lower 8 inches. The underlying material, between depths of 30 and 60 inches, consists of calcareous clay loam and clay.

Vaughnsville soils have moderate permeability in the finer textured underlying material. This results in seasonal saturation. Wet spots, caused by seepage from adjacent areas, occur in these soils. The soils have a medium available moisture capacity and a moderately deep root zone when the water table is low. The root zone is neutral to slightly acid in the upper part.

Vaughnsville soils are used mostly for cultivated crops. Some of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Vaughnsville loam, 0 to 2 percent slopes, in a cultivated field in Pleasant Township (NE¼NE¼NE¼NE¼ sec. 18, T. 3 N., R. 6 E.):

Ap—0 to 7 inches, dark reddish-brown (5YR 3/2, 3/3 rubbed) loam; moderate, medium, granular structure; slightly hard; common roots; 3 percent coarse fragments; neutral; abrupt, smooth boundary.

B1t—7 to 9 inches, dark reddish-brown (5YR 3/2) loam; moderate, thick, platy structure; slightly hard; common roots; thin continuous clay bridging of sand grains on faces of peds; 4 percent coarse fragments; neutral; clear, smooth boundary.

B21t—9 to 17 inches, dark reddish-brown (2.5YR 3/4) sandy clay loam; moderate, medium, subangular blocky structure; hard; few roots; thin continuous clay bridging of sand grains on faces of peds; 15 percent coarse fragments; neutral; clear, wavy boundary.

B22t—17 to 22 inches, grayish-brown (2.5YR 5/2) light sandy clay loam; few, fine, distinct, yellowish-brown (10YR 6/6) mottles and many, medium, faint, light olive-brown (2.5Y 5/4) mottles; weak, medium, subangular blocky structure; friable; few roots; thin patchy clay bridging of sand grains on faces of peds; common black (5Y 2/1) iron-manganese concretions; neutral; clear, smooth boundary.

B3—22 to 30 inches, yellowish-brown (10YR 5/4) heavy sandy loam; few, coarse, faint, yellowish-brown (10YR 5/8) mottles; very weak, medium, subangular blocky structure parting to massive; loose; few roots; 25 percent coarse fragments; mildly alkaline; weakly calcareous; abrupt, smooth boundary.

IIC1g—30 to 32 inches, olive-gray (5Y 5/2) clay loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles and many, coarse, faint, grayish-brown (2.5Y 5/2) mottles; massive; friable; coatings on vertical cleavages; moderately alkaline, calcareous; clear, smooth boundary.

IIIC2g—32 to 60 inches, olive-gray (5Y 5/2) clay; many coarse, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/8) mottles; massive; firm; coatings on vertical faces of cleavages; moderately alkaline; calcareous.

The thickness of the solum, and commonly the depth to carbonates, ranges from 25 to 38 inches, but mainly it is about 26 to 32 inches. In some places the lower few inches of the solum is weakly calcareous.

The dark-colored Ap horizon commonly is 6 to 9 inches thick. It generally is dark brown (7.5YR 3/2), dark reddish brown (5YR 3/2, 2/3, or 2.5YR 3/4), or reddish brown (5YR 4/3). In some areas there is an A2 horizon that is loam or sandy loam in texture and reddish in color.

The B horizon generally is dark reddish brown to dark brown in a hue that ranges from 2.5YR to 7.5YR, a value of 3 to 6, and a chroma of 3 or 4 in the upper part. It is dark brown (7.5YR 4/4), brown (10YR 4/3), yellowish brown (10YR 5/4), or grayish brown (2.5Y 5/2) in the lower part. Mottling in the middle and lower parts of the B horizon is faint to distinct, light olive brown (2.5 Y 5/4), dark, yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), or grayish brown (10YR 5/2). Textures generally are sandy clay loam, heavy loam, and heavy sandy loam, but in some places coarser textured layers occur. The average clay content of the horizon is more than 18 percent.

The C horizon commonly is olive gray (5YR 5/2), light olive brown (2.5Y 5/4), or brown (10YR 4/3) and contains distinct, yellowish-brown (10YR 5/6), dark yellowish-brown (10YR 4/4), grayish-brown (2.5Y 5/2), or gray (10YR 5/1) mottles. The IIC horizon typically is lacustrine silty clay or clay loam, and it ranges from 4 inches to about 2 feet in thickness. The IIIC horizon typically is clay or clay loam glacial till.

Vaughnsville soils are adjacent to the well-drained Oshtemo soils in many places. They commonly are adjacent to the moderately well drained Rawson and Haney soils and the somewhat poorly drained Digby and Haskins soils. Vaughnsville soils differ from all those soils, including the Oshtemo, in having redder hues in the A horizon and upper part of the B horizon. This reddish color is caused by the precipitation of iron-oxide compounds from seepage water.

The Vaughnsville soils in this county have a darker A horizon and a thinner solum than the range defined for the series. These differences, however, do not significantly affect the usefulness or behavior of these soils.

Vaughnsville loam, 0 to 2 percent slopes (VaA).—This soil is on the lake side of the beach ridges. It occupies narrow, elongated areas along the lower slopes of the beach ridges.

Included with this soil in mapping are small areas, generally ½ to 1½ acres in size, of somewhat poorly drained Haskins soils and moderately well drained Rawson soils. None of these included soils has reddish colors.

Seasonal wetness is a moderate limitation to farming. Seepage is prolonged in spring unless the soil is artificially drained. Seasonal saturation is a limitation to many nonfarm uses. Capability unit IIw-6.

Wabasha Series

The Wabasha series consists of deep, dark-colored soils that are very poorly drained. These soils formed in clayey alluvium on flood plains along streams in the northern part of the county, mainly in Ridgeville, Liberty, and Washington Townships. They are nearly level and are flooded during periods of high water, mainly in winter, though flooding can occur during any period of the year.

In a representative profile of a Wabasha soil that is cultivated, the plow layer is very dark gray silty clay about 7 inches thick. The subsoil, between depths of 7 and 48 inches, is dark-gray and gray silty clay mottled with dark brown or light olive brown in the upper part and with dark yellowish brown and yellowish brown in the lower part. The underlying material, between depths of 48 and 70 inches, is calcareous, yellowish-brown clay that has some thin seams of sand.

Wabasha soils have slow permeability. They are seasonally saturated with free water for a significant period, and they are slow to dry out in spring unless they have been artificially drained. These soils have a medium to high available moisture capacity. The root zone is deep in summer when the water table is low or in areas that are artificially drained. Reaction in the root zone is mostly mildly alkaline.

Wabasha soils are used for cultivated crops and pasture; a few acres are wooded. Some of the cultivated acreage has been artificially drained to improve crop growth and to make fieldwork easier.

Representative profile of Wabasha silty clay, in a cultivated field in Liberty Township (W½NW¼NW¼NE¼ sec. 22, T. 6 N., R. 7 E.):

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay; moderate, medium, granular structure; friable; common roots; mildly alkaline; abrupt, smooth boundary.

B1g—7 to 16 inches, dark-gray (2.5Y 4/1) silty clay; few, fine, prominent, dark-brown (7.5YR 4/4) mottles; weak, coarse, prismatic structure parting to moderate, medium, angular blocky structure; firm; common roots; mildly alkaline; clear, smooth boundary.

B21g—16 to 22 inches, gray (N 5/0) silty clay; common, fine, faint, olive-gray (5Y 5/2) mottles and prominent dark-brown (7.5YR 4/4) mottles; moderate, coarse, prismatic structure parting to moderate, medium and coarse, angular blocky structure; firm; common roots; dark-gray (10YR 4/1) coatings on faces of peds that have a few, fine, distinct, brown (7.5YR 4/4) mottles; mildly alkaline; clear, smooth boundary.

B22g—22 to 29 inches, gray (5Y 5/1) silty clay; common, fine, faint, grayish-brown (2.5Y 5/2) mottles, distinct light olive-brown (2.5Y 4/4) mottles, and prominent dark-brown (7.5YR 4/4) mottles; moderate, coarse, prismatic structure parting to moderate, medium, angular blocky structure; firm; common roots; dark-gray (10YR 4/1) coatings on faces of peds that have a few reddish-brown (5YR 4/4) mottles; mildly alkaline; gradual, smooth boundary.

B23g—29 to 48 inches, gray (5Y 5/1) silty clay; common, medium, distinct, olive (5Y 5/3) mottles and prominent, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; moderate, coarse, prismatic structure parting to moderate, coarse, angular blocky structure; firm; few fine roots; dark-gray (5Y 4/1) coatings on faces of peds that have a few, fine, prominent, dark-brown (7.5YR 4/4) mottles; mildly alkaline; weakly calcareous in lower part; gradual, wavy boundary.

C—48 to 70 inches, yellowish-brown (10YR 5/4) clay; massive; firm; a few thin strata of sand are present; vertical surfaces of cleavages have gray (5Y 5/1) coatings; moderately alkaline; calcareous.

The thickness of the solum ranges from 40 to 60 inches but most commonly is 42 to 50 inches. The depth to carbonates commonly is the same as the thickness of the solum, but in some places the lower part of the solum is calcareous. The upper part of the solum is neutral to mildly alkaline, and the lower part is mildly alkaline.

The dark-colored Ap horizon commonly is 8 inches thick but ranges from 6 to 10 inches in thickness.

The B horizon is gray (N 5/0, 5Y 5/1, or 10YR 5/1) or dark gray (N 4/1 or 10YR 4/1) and is mottled with faint and distinct, olive (5Y 5/3), olive-gray (5Y 5/2), grayish-brown (2.5Y 5/2), dark-brown (7.5YR 4/4), light olive-brown (2.5Y 5/4), dark yellowish-brown (10YR 4/4), and yellowish-brown (10YR 5/4) mottles.

The C horizon commonly is yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and, in some places, gray (10YR 5/1). The texture in this horizon is silty clay or clay that has thin layers of stratified sand, silt loam, sandy loam, loam, and fine gravel and sand. These layers are calcareous.

The Wabasha soils commonly are adjacent to the very poorly drained Sloan soils, the somewhat poorly drained Shoals soils, and the moderately well drained Medway soils. They are finer textured throughout than those soils. They differ from Toledo soils in having formed in recent alluvium and in being subject to flooding. They have a much higher content of clay throughout than the very poorly drained Cohoctah soils.

Wabasha silty clay (Wa).—This nearly level soil lies in fairly wide, elongated strips on the flood plains of the Maumee River and along some tributaries in Liberty and Ridgeville Townships. It is sticky and cloddy if tilled when wet, and it can be tilled only within a narrow range of moisture content.

Included with this soil in mapping are some areas of soils that have a silty clay loam surface layer and small areas of the lighter colored Shoals soils. A few areas of very poorly drained Sloan soils also are included.

Seasonal wetness and flooding are major limitations to farming. During the growing season flooding is more likely to occur along the tributaries than along the Maumee River. Flooding is a severe threat to most nonfarm uses. Capability unit IIIw-1.

Warners Series

The Warners series consists of dark-colored, mucky, very poorly drained soils in low, depressional areas in northeastern Liberty Township and northwestern Washington Township. These soils formed in mixed mineral and woody and fibrous materials that are underlain by soft marl.

In a representative profile of a Warners soil that is cultivated, the surface layer is black muck about 8 inches thick. The next layer is black sandy clay loam to a depth of 12 inches. The underlying material, between depths of 12 and 31 inches, is soft marl. Below this material is gray fine and very fine sand that extends to a depth of 50 inches or more.

Warners soils have slow permeability in the marly substratum and moderately rapid to rapid permeability in the underlying sandy substratum. They have a high water table for long periods unless they have been artificially drained. They have a medium available moisture capacity and a root zone that typically is shallow. The marl tends to limit root development. The root zone above the marl is neutral in reaction.

These soils are used for cultivated crops in a few places, but most of the acreage is undrained and swampy. Some areas have been drained to improve plant growth and to make fieldwork easier.

Representative profile of Warners muck, in a cultivated field in Liberty Township (NE¼NE¼SE¼SE¼ sec. 24, T. 6 N., R. 7 E.; laboratory data HN–78):

Ap1—0 to 5 inches, black (10YR 2/1) muck; moderate, fine, granular structure; very friable; many roots; neutral; clear, smooth boundary.
Ap2—5 to 8 inches, black (10YR 2/1) muck; weak, fine, subangular blocky structure parting to moderate, medium, granular structure; very friable; many roots; neutral; abrupt, smooth boundary.
IIA1—8 to 12 inches, black (N 2/0) sandy clay loam; few, fine, faint, olive-brown (2.5Y 4/4) mottles; moderate, medium, angular blocky structure; friable; many roots; neutral; gradual, smooth boundary.
IIIC1—12 to 31 inches, light olive-gray (5Y 6/2) silt loam (soft marl); many, medium, distinct, olive-yellow (2.5Y 6/6) and light olive-brown (2.5Y 5/6) mottles; massive; friable; few roots; moderately alkaline; highly calcareous; abrupt, smooth boundary.
IVC2—31 to 50 inches, gray (N 6/0) fine and very fine sand; single grain; loose; moderately alkaline; calcareous.

The depth to marl ranges from 10 to 15 inches. Thickness of the marl ranges from 6 inches to about 2 feet. The depth to carbonates commonly is the same as the depth to the IIIC horizon, but in some places the A horizon is weakly calcareous.

The dark-colored A horizon generally is black (10YR 2/1 or N 2/0) or, in some places, very dark brown (10YR 2/2). The IIA1 horizon is mottled with dark grayish brown (10YR 4/2 to 2.5Y 4/2) and with dark reddish brown (5YR 3/4) in some places. The texture of the IIA1 horizon ranges from sandy clay loam to mucky silty clay loam.

The IIIC horizon ranges from light olive gray (5Y 6/2) to gray (5Y 6/1) and contains many olive-yellow (2.5Y 6/6) and light olive-brown (2.5Y 5/6) mottles. The texture of the marl is silt loam. Underlying the marl, at depths ranging from about 12 to 36 inches, is gray (N 6/0) fine and very fine sand.

Warners soils commonly are adjacent to the somewhat poorly drained Tedrow soils, the moderately well drained Ottokee soils, and the very poorly drained Granby soils. Warner soils, in addition to having marl at a shallow depth, have a higher content of organic matter than those other soils. Warners soils have a lower content of organic matter than the Adrian soils, which are organic soils overlying sand.

The Warners soils in this county have a higher content of organic matter in the surface layer and a thinner mineral layer above the marl than the Warners soils in other survey areas. These differences, however, do not greatly affect the use or behavior of these soils.

Warners muck (Wc).—This soil occupies oval or elongated, swampy, depressional pockets that range in size from about 2 to 10 acres.

Included with this soil in mapping are areas, 1 acre to 5 acres in size, of sandy Granby soils. These commonly occur in a circular belt that surrounds Warners muck. In some places there are inclusions of lighter colored Tedrow soils on low rises and near the edges of the areas mapped as this Warners soil. Spots of Adrian muck also occur in most mapped areas. In addition, some areas of Warners muck have exposed marl.

Excessive soil wetness and soil blowing when the soil is dry are the major limitations to use. Many areas are difficult to drain because of their depressional position on the landscape relative to drainage outlets. A high water table is a major limitation to most nonfarm uses. Capability unit IVw–1.

Wauseon Series

The Wauseon series consists of dark-colored, nearly level, very poorly drained soils in broad areas on uplands, mostly south of the Maumee River. These soils formed in loamy and sandy materials that are underlain by finer textured lacustrine clay or clayey glacial till.

In a representative profile of a Wauseon soil that is cultivated, the plow layer is very dark gray fine sandy loam about 10 inches thick. Next is a layer of very dark gray fine sandy loam about 5 inches thick. The subsoil, between depths of 15 inches and about 40 inches, consists of gray fine sandy loam, gray loamy fine sand, and gray fine sand. It is distinctly mottled with yellowish brown, light olive brown, and light brownish gray in the upper part and with yellowish brown and yellowish red in the middle part. The lower part of the subsoil is unmottled. The underlying material, between depths of 40 and 60 inches or more, is calcareous, dark-gray clay.

Wauseon soils have rapid permeability in the upper part and very slow permeability in the underlying clay material. They are seasonally saturated with free water for significant periods. Where they have been adequately drained, they dry out rather quickly. These soils have a medium available moisture capacity. The root zone is deep if the soil has been drained or in summer when the water table is low. The root zone is slightly acid to neutral in the upper part.

Wauseon soils are almost totally used for cultivated crops. Most of the acreage has been artificially drained to improve plant growth and to make fieldwork easier.

Representative profile of Wauseon fine sandy loam, in a cultivated field in Monroe Township (NW¼SE¼SW¼ NE¼ sec. 1, T. 4 N., R. 7 E.):

Ap—0 to 10 inches, very dark gray (10YR 3/1) fine sandy loam; moderate, fine, granular structure; soft; many roots; slightly acid; clear, smooth boundary.
A1—10 to 15 inches, very dark gray (10YR 3/1) fine sandy loam; few, coarse, faint, black (10YR 2/1) and very dark grayish-brown (2.5Y 3/2) mottles; weak, medium, subangular blocky structure; slightly hard; many roots; neutral; gradual, wavy boundary.
B21g—15 to 27 inches, gray (10YR 5/1) fine sandy loam; common, medium, distinct, light olive-brown (2.5Y 5/4), light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/6) mottles; weak to moderate, medium, angular blocky structure; slightly hard; few roots; neutral; clear, irregular boundary.
B22g—27 to 36 inches, gray (10YR 5/1) loamy fine sand; common, coarse, distinct, yellowish-brown (10YR 5/6), gray (N 6/0), and yellowish-red (5YR 4/6) mottles; weak, medium, angular blocky structure; friable; tongues of material from B21g horizon extend through this horizon; mildly alkaline; abrupt, wavy boundary.
B3g—36 to 40 inches, gray (10YR 5/1) fine sand; single grain; loose; mildly alkaline; slightly calcareous; abrupt, smooth boundary.
IICg—40 to 60 inches, dark-gray (10YR 4/1) clay; massive; very firm; common pebbles and shale fragments; moderately alkaline; calcareous.

The solum ranges from 24 to 40 inches in thickness. The depth to carbonates commonly is the same as the thickness of the solum, but in some places a layer of fine sand that is 3 to 12 inches thick over the substratum is weakly calcareous.

The depth to the fine-textured IIC horizon ranges from 30 to 40 inches.

The dark-colored A horizon is thicker than 10 inches; generally it ranges from 10 to 16 inches in thickness. It is very dark gray (10YR 3/1), very dark brown (10YR 2/2), or black (10YR 2/1).

The B horizon generally is gray (10YR 5/1 or 2.5Y 5/1), grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), or dark gray (5Y 4/1) and contains distinct mottles of light olive brown (2.5Y 5/4), dark grayish brown (2.5Y 4/2), light brownish gray (10YR 6/2), yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6). Texture of the B horizon generally is fine sandy loam but ranges to fine sand.

The C horizon commonly is gray (10YR 5/1) or dark gray (10YR 4/1), but in some places it is brown (10YR 4/3) or dark yellowish brown (10YR 4/4). It commonly is mottled with gray or yellowish brown, but in some places there are few mottles. The texture of the C horizon is silty clay or clay.

Wauseon soils are the very poorly drained members of a drainage sequence that includes the somewhat poorly drained Rimer soils and the moderately well drained Seward soils. In some places they are adjacent to those soils, but commonly they are adjacent to Mermill soils. They differ from Mermill soils in having less clay in the B horizon. They differ from Gilford soils in having a clayey C horizon within 40 inches of the surface. Wauseon soils have a higher content of silt and clay in the B horizon than Granby soils.

Wauseon fine sandy loam (Wf).—This nearly level soil is in moderately broad areas on uplands. A profile of this soil is described as representative for the series. Included with this soil are small areas of lighter colored, somewhat poorly drained Rimer soils on slight rises.

Very poor natural drainage and seasonal wetness are moderate limitations to the use of this soil for farming and for most nonfarm purposes. Capability unit IIw-4.

Wauseon loamy fine sand, stratified substratum (Wg).—This nearly level soil lies either in relatively broad, elongated strips or on more extensive broad flats. Its profile differs from the one described as representative for the series in having a stratified rather than a clayey substratum. The strata range in texture from sand to clay. The uppermost stratum of clay occurs at a depth of 22 to 38 inches. It ranges from ½ inch to 12 inches or more in thickness but commonly is less than 4 inches thick. Contrasting strata are sand, loam, and clay loam in texture. This soil has a higher available water capacity and drains slightly more readily than Wauseon fine sandy loam.

Included with this soil in mapping are small areas of lighter colored Rimer soils that have a stratified substratum. These inclusions are on slight rises, are better drained, and are ½ acre to 2 acres in size.

Seasonal wetness is the major limitation to farming. Some soil blowing can occur when the soil is dry, but it generally is not serious. Very poor natural drainage is a limitation to most nonfarm uses. Capability unit IIw-4.

Formation and Classification of the Soils

This section lists the factors and some of the processes of soil formation and describes how they have affected the formation of soils in Henry County. It also explains the current system of soil classification and places the soil series in some of the higher categories of that system. The soil series in this county and a profile representative of each series are described in the section "Descriptions of the Soils."

Factors of Soil Formation

The characteristics of a soil at any given point depend on five major factors of soil formation. These factors are parent material, climate, plants and animals, relief, and time. Climate and plants and animals have significantly influenced the development of all the soils in Henry County, but each of the two factors has been relatively uniform throughout the county for a long period and has not caused significant differences among the soils. All of the soil materials in the county have been exposed to the soil-forming factors for about the same time, that is, since the retreat of the last glaciers of Wisconsin age. The major differences among soils in Henry County have resulted chiefly from differences in parent material and in relief.

Parent material

Henry County is in the center of the glacial lake plain of northwestern Ohio. The parent materials in which the soils formed are (1) glacial till; (2) clayey lacustrine material; (3) glacial lake beach deposits; (4) stream terrace material from glacial outwash; (5) deltaic sediments in the post glacial lake; and (6) recent alluvium. These materials have greatly affected the textures of the various soils in the county.

About 62 percent of the county (soil associations 1 and 2) consists of fine-textured glacial till. The clay content in the upper 1 to 2 feet of the till ranges from about 38 percent to 50 percent. Clay content deeper in the till drops to about 31 percent in some places. This till plain is generally more nearly level than glacial till plains elsewhere in Ohio. This, plus the indicated clay content of the till, leads to the theory that the glacial till in this area has been beveled or reworked by glacial lake action. The dominant soils that formed in this glacial till material are the Hoytville and Nappanee. In the soils of both series, the clayey B horizon has glacial till pebbles and a sand content that are characteristic of glacial till elsewhere.

The Fulton, Latty, Lenawee, Paulding, Toledo, and similar soils formed in clayey lacustrine material. These soils show some evidence of stratification, and they lack the sand content and pebbles that are characteristic of soils formed in glacial till. The Paulding soils have the highest clay content of this group of soils, but they all are clayey enough that they tend to crack badly in summer during dry periods. Clay contents range from 40 to 50 percent in Toledo soils and from 60 to 70 percent or more in Paulding soils.

The Latty soils are transitional in clay content to both Hoytville and Paulding soils. Stratification is evident in Latty soils, and Paulding soils have a higher content of sand than is typical.

The fluctuating waters of the postglacial lakes caused the formation of sandy and gravelly beach ridges and fairly extensive areas of both sandy and silty depositions. The beach ridges consist dominantly of deep sandy to loamy deposits that have some gravel. Haney, Millgrove, Oakville, Oshtemo, and Spinks soils are sandy or sandy and gravelly soils that formed on these beach ridges (fig. 11). Digby, Haney, and Oshtemo soils also formed in outwash material of similar texture on terraces. The poorly drained Millgrove soils occur both on the ridges and elsewhere in similar material on the lake plain. Haskins, Mermill, and Rawson soils are examples of soils that formed in moderately thick deposits of loamy material. Rimer, Seward, and Wauseon soils formed in sandy materials overlying the clayey lacustrine sediment or glacial till. Part of the profile of all three of these soils was formed in the upper material and part in the lower material. The soils have slow or very slow permeability because of the clayey underlying material.

Northwest of Liberty Center is a fairly large area of soils that formed in silty and fine sandy deltaic materials. Colwood, Kibbie, and Tuscola soils are the dominant soils that formed in this material (fig. 12).

Genesee, Ross, Shoals, and Sloan soils are examples of soils that formed in recent alluvium in the county. They generally reflect the silt, sand, or clay content of the soils on uplands in their respective drainage areas.

Climate

Climate has been mainly responsible for determining the character of the vegetation, because the climate has been relatively uniform for a long enough period so that hardwood trees are the climax vegetation. The climate for a long period has been such that percolating water has leached bases and carbonates from most of the soils to the extent that many of the soils are acid to a moderate depth. Differences in the reaction in the upper 2 feet of most of the soils can be attributed to differences in the content of carbonates in the parent material. The frequency of rainfall has allowed wetting and drying cycles that were favorable to the downward movement of clay minerals. For example, the Del Rey, Lucas, and Rawson soils have horizons of clay accumulation in their subsoil. Freezing and thawing have aided in the development of soil structure in many of the clayey soils in the county. Warm temperatures in summer have favored biological and chemical reactions in the soil.

The climate is relatively uniform throughout the county and has been for a long time. There are, however, areas of contrasting microclimate caused by minor differences in relief, but these differences are small in this county.

Relief

Differences in elevation or relief are small throughout Henry County, but they are sufficient to create zones of microclimate that are important. For example, nearly all of the very poorly drained soils, such as Colwood, Hoytville, Millgrove, Paulding, and Toledo, are nearly level or depressional. These soils have a seasonally high

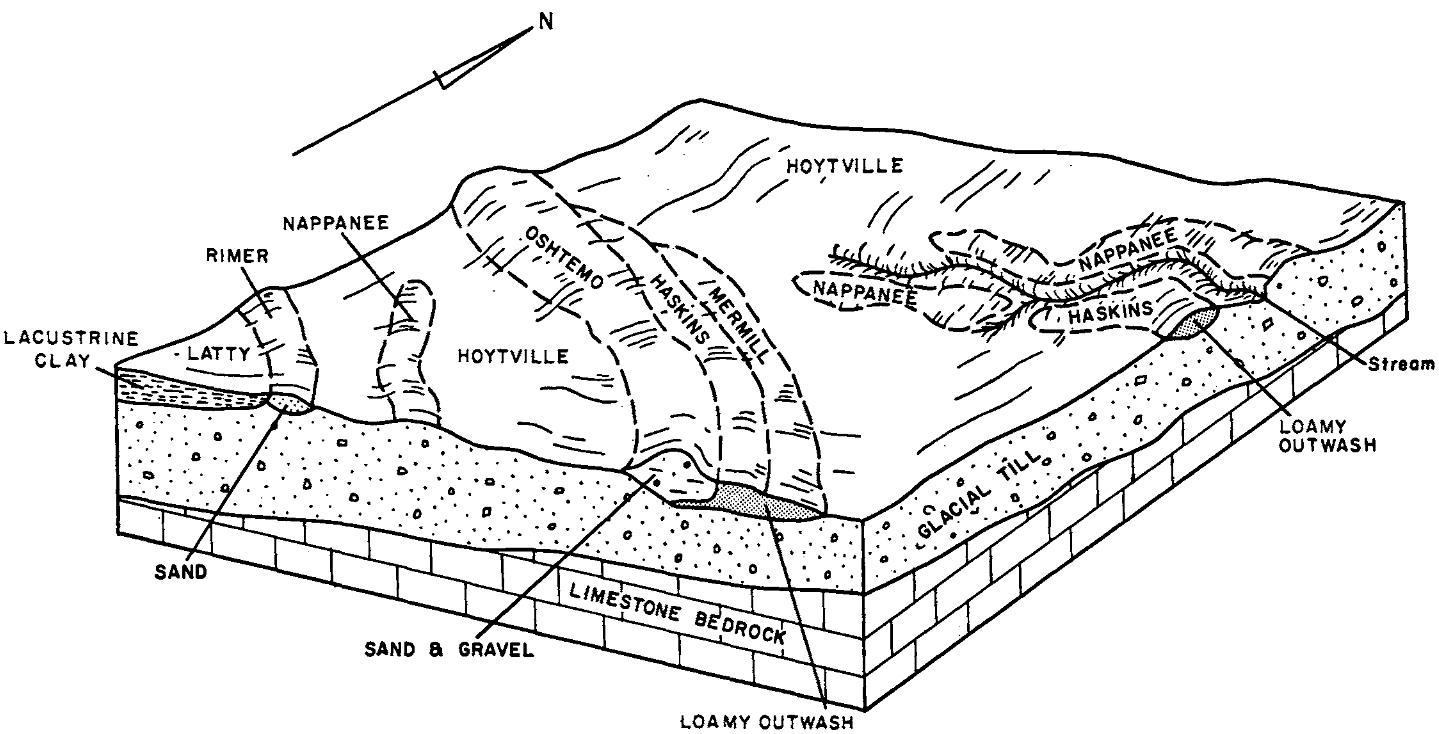

Figure 11.—Relationship of soils to underlying, or parent, material in the southern part of the county.

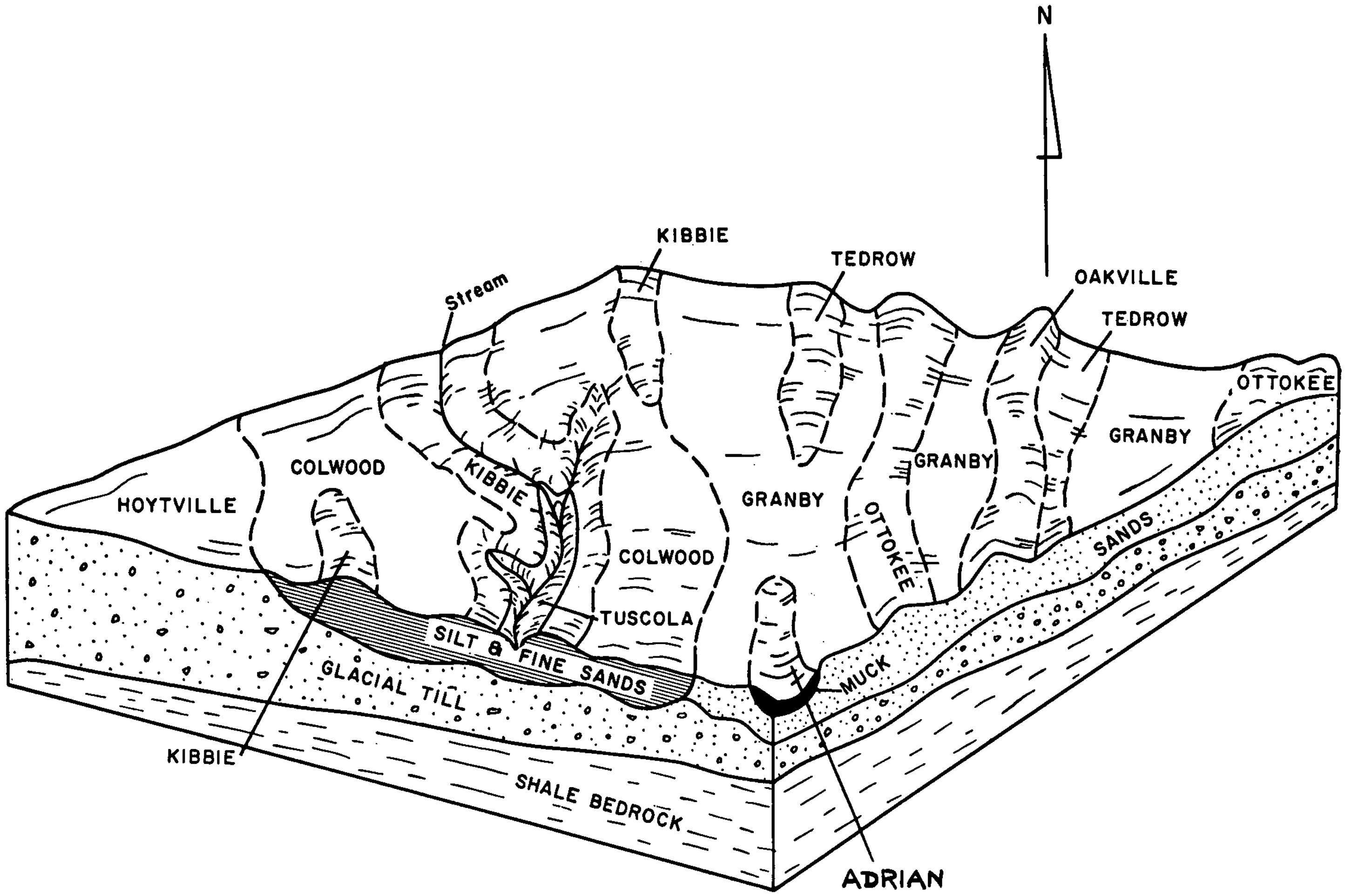

Figure 12.—**Relationship of soils to underlying, or parent, material and relief in the northeastern part of the county.**

water table, slow surface runoff, and in some cases, tend to accumulate runoff water from nearby soils. As a consequence, they are among the wettest soils in the county. The well drained and moderately well drained soils, such as Lucas, St. Clair, and Tuscola, have short slopes where surface runoff is rapid and there is little or no chance for excess water to accumulate. The major differences in the soils, as a result of these microclimates, are characterized by differences in soil colors. The very poorly drained soils are dominantly gray, and the better drained soils are mostly brown or yellowish brown. The gray reflects reducing conditions within the soil, and the brighter colors reflect an oxidizing soil climate. Gray mottles and coatings in the moderately well drained and somewhat poorly drained soils, such as Haskins and Rawson soils, indicate the presence and relative height of a seasonal high water table.

The four general relief positions in the county are beach ridges, uplands, stream terraces, and flood plains. In the first three positions, relief variations affect drainage, runoff, and erosion. On the flood plains, relief mainly affects drainage and susceptibility to flooding.

Steep soils on uplands generally are thinner than the same soils in more nearly level areas. For example, St. Clair soils that have slopes of 25 to 45 percent have thinner layers or horizons than St. Clair soils that have slopes of 6 to 12 percent. Many eroded areas of steep St. Clair and Lucas soils have had much of the solum removed by erosion.

Relief is an important factor in the development of a drainage sequence of soils. A drainage sequence includes two or more soils having different natural drainage that formed in the same kind of parent material. Fulton, Lucas, and Toledo soils make up such a sequence (fig. 13). The moderately well drained Lucas soils have slopes ranging from 2 to 45 percent. The somewhat poorly drained Fulton soils have slopes ranging from 0 to 6

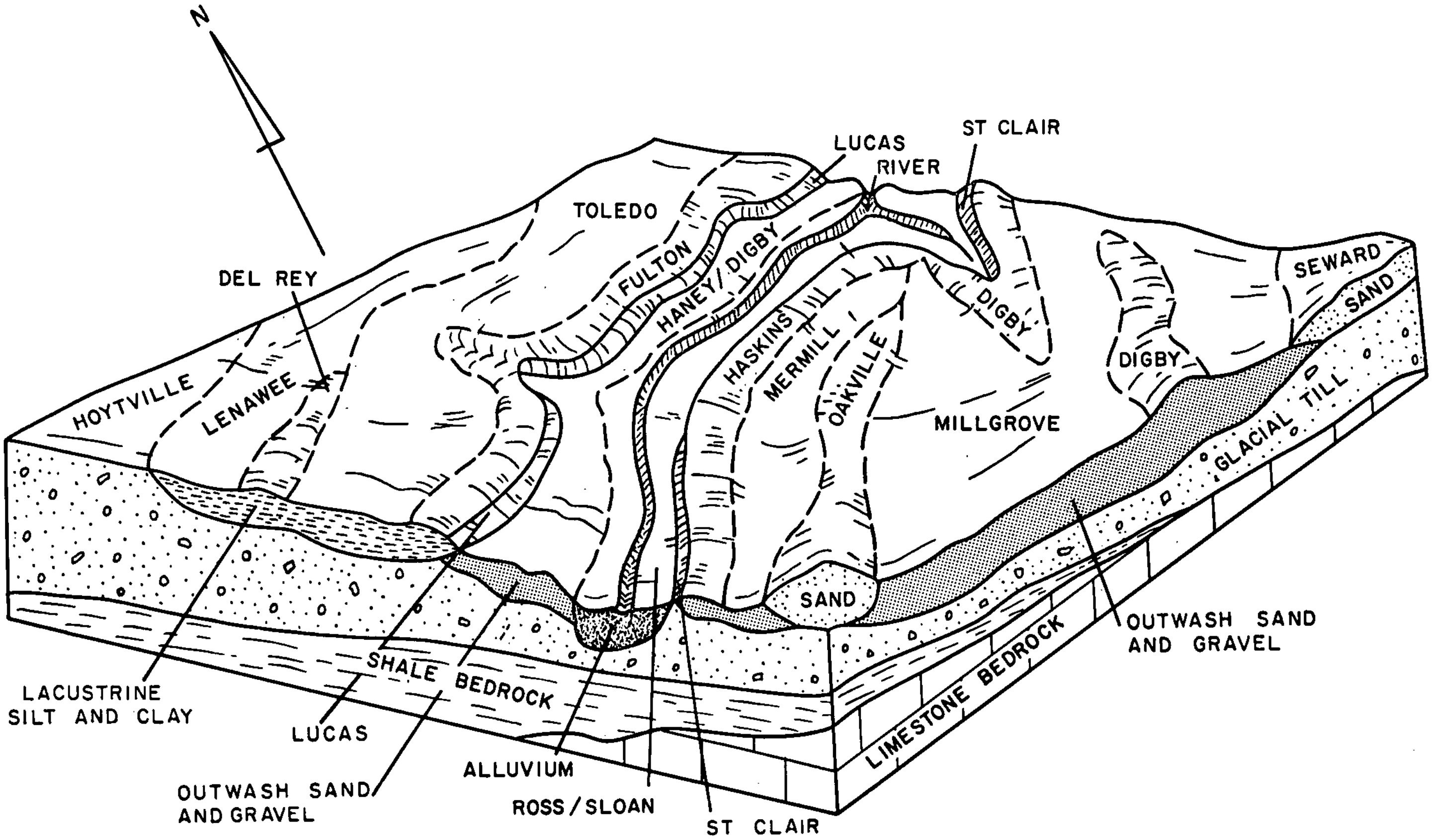

***Figure 13.*—Relationship of soils to relief and underlying material in the central part of the county.**

percent. The very poorly drained Toledo soils have slopes that are less than 2 percent.

Plants and animals

Before the original deciduous swamp forest was cleared from the Henry County landscape, it was an important part of the complex of living organisms that affected soil development. Higher plant forms, such as trees, and micro-organisms, earthworms, and other forms of life that live in or on the soil contribute to the soil morphology. Plants return organic matter to the soil and bring plant nutrients from the lower part of the soil to the upper part. Insects, micro-organisms, and animals add organic matter and cause mixing by burrowing.

The native vegetation of the county can be placed in four groups: (1) Swamp forest covered the flat uplands of the county. Hoytville, Millgrove, Mermill, Latty, and Paulding soils formed under this vegetation. (2) Oak trees were dominant on the better drained soils in the sandy beach-ridge and outwash areas. Oakville, Ottokee, and Oshtemo soils formed under this vegetation. These and other upland soils under oaks are light colored and are slightly to moderately acid. Lower amounts of organic matter are in soils that formed under trees than in those that formed under grass. (3) Water-tolerant grasses, reeds, sedges, and shrubs were in small to moderate-sized, level or depressional areas which were swampy much of the time. The organic-matter buildup from the vegetation in these swamp areas provided the parent material in which the Adrian muck and Warners muck soils developed. (4) Scattered throughout the swamps and oak forests were occasional grassy openings in which grasses grew. In these areas large amounts of organic matter were added to the soil and the surface layer became darker than is typical. Soils having this darker surface layer likely formed in the grassy openings.

Most areas of the original forest have been cleared and used for cropland. Man's influence has appreciably changed the characteristics of the soils in areas affected by erosion or altered by construction work. In addition, man can greatly modify soil characteristics. For example, extensive drainage projects have lowered the water table in many areas; the additions of lime and fertilizer have changed the soil chemistry; and tillage operations have influenced the structure of the surface layer. These and many other activities of man will, in the long run, influence the future development of the soils so affected.

Time

All soils require time for the development of distinct horizons and other characteristics. The length of time a parent material has been in place and exposed to the active forces of vegetation and climate is an important factor in soil formation. The influence of time, however, is greatly modified by other soil-forming factors, namely relief and parent material.

The glacial till that now forms the land surface of approximately 60 percent of Henry County has been exposed to the other soil-forming factors since the retreat of the last glacier approximately 13,000 years ago, or since the recession of the various glacial lake levels 9,000 to 12,000 years ago. The sandy and gravelly beach-ridge deposits and finer textured lacustrine deposits also occurred during the same period. Essentially, most of the parent materials of the soils, excepting the recent alluvium, have had an equal period of time for soil formation. The obvious differences among the soils, therefore, resulted from differences in rates of soil formation caused by differences of parent material, topography, or other soil-forming factors. On the flood plains, soils such as Shoals, Sloan, and Genesee are periodically flooded and the deposition of new sediments prevents the development of distinct profiles. Profile development is also slight in the Oakville, Ottokee, and other sandy soils. The quartz sands are very resistant to physical and chemical change.

From the standpoint of geological age, the soils of Henry County have been developing for a relatively short time. This accounts for the shallowness of leaching and a slightly acid to neutral reaction common in many of the soils.

Processes of Soil Formation

The factors of soil formation discussed in previous sections largely control or influence four soil forming processes. These are additions, losses, transfers, and alterations. Some of the processes promote differences within a soil, others retard or preclude differences. The differentiation of horizons in the soils of Henry County results from one or more of these processes. They have taken place in some soils or are beginning to take place in others, but the degree of their expression varies from soil to soil.

Additions.—The most obvious addition is the accumulation of organic matter in the surface layer of the soils. Others are the addition of bases in organic matter and in ground water, addition of bases contained in lime and fertilizer, and deposition through erosion. The dark-colored surface layer in the Hoytville, Toledo, Millgrove, and Granby soils illustrates the addition of organic matter. All the soils in the county have some organic matter accumulation, but in areas where the accumulation was originally thin, plowing and cultivating has largely destroyed or incorporated it with other horizons. The Nappanee, St. Clair, Fulton, and Lucas soils, for example, show a limited addition of organic matter. Digby, Haskins, Rimer, and Tedrow soils have a somewhat higher content of organic matter than other similar soils.

Plant nutrients are recycled from soil to plant and back to the soil again in the form of litter or organic material. This process occurs in all the soils. Soils that are seasonally waterlogged, such as Hoytville, Toledo, Millgrove, and Colwood soils, continually accumulate bases through additions from the ground water. Generally, the additions of bases are greater than the losses in these soils. Soils such as Genesee, Medway, Ross, and Shoal soils periodically receive additions of soil materials deposited by floodwater. The applications of lime and fertilizer on cropland and areas of pasture counteract losses of plant nutrients that normally occur. Where applications are heavy, nutrient gains may exceed nutrient losses.

Losses.—Soil losses occur from removal of bases by leaching, removal of plant nutrients by crops, actual losses through erosion, and from volatilization. One of the most significant losses in Henry County is the removal of carbonates by leaching. Most finer textured, light-colored soils on uplands have carbonates removed to a depth of 20 to 35 inches. This comprises a considerable loss of carbonates because the glacial till or lacustrine clays ranged from 15 to 25 percent calcium carbonate prior to weathering. The coarser textured soils generally are leached to greater depths, ranging from 4 to 9 feet. These are soils of the Ottokee, Oakville, and Spinks series. Carbonate loss precedes other chemical changes in the solum, and the total removal is slower in those materials that are high in content of carbonate. Other minerals are subject to the same chemical weathering and are also lost through leaching, but at slower rates. Alteration of other minerals produces iron oxides. These oxides are leached from Oshtemo soils on the beach ridges and precipitated and concentrated in a strip along the base of the beach ridge by percolating ground water. This causes the characteristic dark reddish-brown color of the Vaughnsville soils. The presence of ferric oxides in the soils results in bright mottles and bright colors.

Transfers.—The most significant transfers in the soils of Henry County involve transfers of colloidal material from the surface layer or A horizon to greater depths. The primary minerals are transformed to silicate clay minerals, largely by the processes of hydrolysis and base substitution. Most of the clay remains in the soil profile, but much of the fine clay is transferred from the A horizon to horizons at greater depths in the profile. It is carried downward by percolating water. Seasonal drying or precipitation causes the fine clays to be deposited as clay films on the surfaces of soil peds, and in cracks and root and earthworm channels. Clay films are observable in Del Rey, Haskins, Nappanee, Fulton, and other soils.

Illite (hydrous mica) is dominant in the clay fraction of 13 of the soils in Henry County. Mixed clays with no one dominant clay mineral are in 29 of the soils. The mixed clays contain illite, montmorillonite, vermiculite, and some kaolinite. Kaolinite clay, however, is a product of fairly intense weathering, and because Henry County soils have not been weathered to this degree, only minor amounts of this clay occur in the soils. The translocation and development in place of these silicate clay minerals has had a strong influence on the development of horizons in about half of the soils in Henry County. Various sesquioxides have also been transferred from the surface layer to lower layers by this weathering process.

Alterations.—The reduction and solution of ferrous iron has taken place in the very poorly drained and somewhat poorly drained soils. This reduction of iron, called gleying, is evident in Hoytville, Toledo, Millgrove, Colwood, and Latty soils because of a recurring water table. Gray-colored soil indicates a condition favorable to the reduction process. Reduced iron is soluble, but in Henry County it has commonly been moved only a short distance, either stopping in the horizon where is originated or in an underlying one. Part of this iron may be reoxidized and segregated to form the commonly observed bright-colored (yellow and red) mottles. Mottling observed in all but the well-drained soils is caused by this alteration of iron in the soil. It is the result of a fluctuating water table. Accumulations of iron and manganese are common in somewhat poorly drained and very poorly drained soils. They occur as dark-brown or black blotches on ped surfaces or as small, shotlike concretions.

Classification of Soils

A soil classification system is essential to the orderly study of the soils and to the efficient application of accumulated knowledge in the field of soil science. Several systems have been used to classify soils in the past (*16*). The system currently in use in the United States is considered briefly in this section as it applies to the soils of Henry County. The comprehensive system of soil classification presently used was placed into general use by the Soil Conservation Service in 1965. Readers interested in details of the classification system should search the latest literature (*13*, *18*).

The current system of classification has six categories. These categories are the order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. These properties are chosen so that the soils of similar genesis, or mode of origin, are grouped together. The categories of the comprehensive soil classification system used in Henry County are briefly defined in the following paragraphs.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. Properties used to differentiate soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, the Entisols and Histosols, occur in many different climates. Table 9 shows that five soil orders are represented in Henry County. They are Entisols, Inceptisols, Mollisols, Alfisols, and Histosols.

Entisols are mineral soils that lack distinctive horizons other than a surface layer in which organic matter has accumulated.

Inceptisols are mineral soils in which horizons have started to develop, but these soils do not have an accumulation of illuvial clay or a thick, dark-colored surface layer.

Mollisols are mineral soils that have a thick, dark-colored surface layer 10 inches or more in thickness and a base saturation of more than 50 percent.

Alfisols are mineral soils that have horizons of clay accumulation and a base saturation of more than 35 percent within 50 inches below the top of the layer of clay accumulation.

Histosols are organic soils, more commonly known as muck soils. These soils contain at least 30 percent organic matter in a surface layer that is at least 16 inches thick.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that produce classes having the greatest genetic similarity. The soil properties used to separate suborders are mainly those that indicate the presence or absence of a seasonal high water table or other differences resulting from effects of climate or vegetation. An example is Aqualfs, which denotes Alfisols that have characteristics of wetness.

GREAT GROUP.—Suborders are separated into groups according to the presence or absence of genetic horizons and the arrangement of these horizons. The horizons used to make separations are those in which clay, iron, or humus has accumulated or those that have pans that interfere with the growth of roots or the movement of water. The great group is not shown separately in table 9, because it is the last word in the name of the subgroup. An example is Ochraqualfs. Ochra indicates a light-colored surface horizon and aqualfs denotes wetness.

SUBGROUP.—Great groups are subdivided into subgroups, one representing the central or typic segment of a group and the others called intergrades that have properties of one great group and also one or more properties of another great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Aeric Ochraqualfs.

FAMILY.—Families are established within subgroups primarily on the basis of properties important to the growth of plants or to the behavior of soils where used for engineering. Among the properties considered important are texture, reaction, soil temperature, mineralogy, permeability, thickness of horizons, and consistence. Not all of these properties are used in naming families in Henry County.

SERIES.—The concept of the series is discussed in the section "How This Survey Was Made." Series is the lowest category in the classification system and is most specifically defined in terms of individual soil properties. Forty-three soil series are recognized and mapped in Henry County.

Some of the soils in this county do not fit in a series that has been recognized in the classification system, but recognition of a separate series would not serve a useful purpose. Such soils are named for the series they most strongly resemble, because they differ from that series in ways too small to be of consequence in interpreting their usefulness or behavior. Soil scientists designate such soils as taxadjuncts to the series for which they were named. In this survey, soils named in the Kibbie, Lenawee, Medway, Rimer, Vaughnsville, and Warners series are taxadjuncts to those series.

TABLE 9.—*Soil series classified according to the current system of classification* [1]

Soil series	Family	Subgroup	Order
Adrian	Sandy or sandy-skeletal, mixed, euic mesic	Terric Medisaprists	Histosols.
Arkport	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Cohoctah	Coarse-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Colwood	Fine-loamy, mixed, mesic	Typic Haplaquolls	Mollisols.
Del Rey	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Digby	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Fulton	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Fulton, sandy subsoil variant.	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Galen	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Gilford	Coarse-loamy, mixed, mesic	Typic Haplaquolls	Mollisols.
Granby	Sandy, mixed, mesic	Typic Haplaquolls	Mollisols.
Haney	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Haskins	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Hoytville	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols.
Hoytville, thin solum variant.	Fine, illitic, mesic	Mollic Haplaquepts	Inceptisols.
Kibbie [2]	Fine-loamy, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Latty	Fine, illitic, nonacid, mesic	Typic Haplaquepts	Inceptisols.
Lenawee [3]	Fine, illitic, nonacid, mesic (fine-loamy, mixed)	Mollic Haplaquepts	Inceptisols.
Lucas	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Medway [4]	Fine-loamy, mixed, mesic	Fluvaquentic Hapludolls	Mollisols.
Mermill	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols.
Millgrove	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Nappanee	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Oakville [5]	Mixed, mesic	Typic Udipsamments (Spodic)	Entisols.
Oshtemo	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Ottokee	Mixed, mesic	Alfic Udipsamments	Entisols.
Paulding	Very fine, illitic, nonacid, mesic	Typic Haplaquepts	Inceptisols.
Rawson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Rimer	Loamy, mixed, mesic	Aquic Arenic Hapludalfs	Alfisols.
Roselms	Very fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Ross	Fine-loamy, mixed, mesic	Cumulic Hapludolls	Mollisols.
St. Clair	Fine, illitic, mesic	Typic Hapludalfs (Aquic)	Alfisols.
Seward	Loamy, mixed, mesic	Arenic Hapludalfs	Alfisols.
Shinrock	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols.
Shoals [6]	Fine-loamy, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Sloan	Fine-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Spinks	Sandy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Tedrow	Mixed, mesic	Aquic Udipsamments	Entisols.
Tedrow, silty subsoil variant.	Mixed, mesic	Aquic Udipsamments	Entisols.
Toledo	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols.
Tuscola	Fine-loamy, mixed, mesic	Typic Hapludalfs (Aquic)	Alfisols.
Vaughnsville [7]	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Wabasha	Fine, illitic, nonacid, mesic	Mollic Fluvaquents	Entisols.
Warners [8]	Fine-silty, carbonatic, mesic	Fluvaquents Haplaquolls	Mollisols.
Wauseon	Coarse-loamy over clayey, mixed, mesic	Typic Haplaquolls	Mollisols.

[1] Placement of some series in the current system of classification may change as more precise information becomes available. The classification in this table was made in April 1971.

[2] Taxadjuncts that have a lighter colored A horizon and grayer ped surfaces in the B horizon than the range defined for the Kibbie series.

[3] Taxadjuncts that have a Bt horizon and generally a thicker solum than the range defined for the Lenawee series.

[4] Taxadjuncts that have a dark-colored A horizon that is thicker than in the range defined for the Medway series and a solum that commonly is thicker.

[5] Taxadjuncts that have a thicker B horizon than that in the range defined for the Oakville series.

[6] Taxadjuncts that are more alkaline in the A horizon than is provided in the range defined for the Shoals series.

[7] Taxadjuncts that have a darker colored A horizon and thinner solum than the range defined for the Vaughnsville series.

[8] Taxadjuncts that have a higher organic-matter content in the surface layer and a thinner mineral soil layer above the marl than the range defined for the Warners series.

Laboratory Data

Table 10 lists the results of laboratory analyses made of selected soils in Henry County. Profile descriptions for these soils are given in the section "Descriptions of the Soils." The data given in table 10 were obtained by laboratory analysis at the Agronomy Department, Ohio Agricultural Research and Development Center, Columbus, Ohio.

Published and unpublished mechanical analysis data are available for all except the following soil series represented in Henry County or their variants: Galen, Rawson, Rimer, and Shinrock. Published mechanical analysis data are available in the published soil surveys of Paulding County, Allen County, and Wood County. Unpublished mechanical analysis data are on file at the Agronomy Department, Ohio Agricultural Research and Development Center; the Ohio Department of Natural Resources, Division of Lands and Soil; and the State Office of the Soil Conservation Service. All of these agencies are in Columbus, Ohio.

The following paragraphs outline some of the procedures used to obtain the data presented in table 10.

Particle-size distribution data were obtained by the pipette method outlined by Steele and Bradfield (*14*), but by using sodium hexametaphosphate as the dispersing agent and a 10-gram soil sample. The sands were determined by sieving. The fine silt and coarse clay (20 microns to 0.2 micron) were determined by sedimentation, and the fine clay (less than 0.2 micron) was determined by sedimentation in a centrifuge. Coarse silt was obtained by substracting sand, fine silt, and clay from the total sample. The percentage of organic matter was determined by a dry combustion method (*10*). A wet oxidation procedure was used to determine organic matter in Adrian muck (*9*). Exchangeable bases were extracted with a neutral solution of Ammonium acetate. The exchangeable potassium (K) in this solution was determined with a flame photometer (*9*). Exchangeable calcium (Ca) and magnesium (Mg) in this solution were determined by the EDTA titration method (*3*). Exchangeable hydrogen (H), which included titratable aluminum (Al), was determined by the triethanolamine method (*9*), and cation exchange capacities by the summation of exchangeable cations. The calcium carbonate equivalent was determined titrimetrically by the procedure of Hutchison and MacLenna by C. S. Piper (*10*). All pH measurements were made by using a 1:1 soil-water ratio.

Additional Facts About the County

The information in this section will help those unfamiliar with the county. The section discusses history, climate, geology, natural resources, industry, transportation, and farming.

History

Henry County was organized in 1820, 18 years after Ohio was admitted to the Union as a State. The county, named for Patrick Henry, originally embraced all of what is now Fulton County and also part of Lucas and Defiance Counties. Napoleon was named the county seat in 1834.

Settlement by the white man was later than that on lands farther north, south, and west, partly because of Indian opposition but more because of the nearly impassable "Black Swamp" that covered all of the county south of the Maumee River (*8*). Early settlers located on land along the streams and creeks. Little progress was made in settling the rest of the county until methods of draining the swamp were developed about the time of the Civil War. At first the wet areas were drained by open ditches and wooden drains, but later clay and concrete tile lines replaced the wooden drains.

Climate [3]

Data on climate in Henry County shown in tables 11 and 12 are fairly representative for the entire county. In 8 of 10 years, the average temperature is 23.1 to 31.8° F. in winter (December–February), 45.5 to 51.5° in spring, 69.1 to 73.9° in summer, and 50.5 to 55.5° in fall.

As is characteristic of continental climates, precipitation in Henry County varies widely from year to year, but it generally is abundant and well distributed throughout the year. Showers and thundershowers account for most of the rainfall during the growing season. Thunderstorms occur on about 40 days each year and are most frequent from May through August. As is typical for much of Ohio, most precipitation during winter is in the form of rain.

Except for small grain and hay, crops are generally planted during the period from mid-April through mid-June. During a 10-year period, rainfall of more than 1.2 inches per week can be expected eight times in April, 11 times in May, and 12 times in June. Rains of this magnitude delay fieldwork and may cause loss of soil because this is the time of year when the vegetative cover is most sparse.

Evaporation is greatest in the warm months, and this is most critical to farming. When evaporation greatly exceeds precipitation for prolonged periods, a drought may occur. During the period 1929 to 1968, extended periods of moderate to extreme drought as determined from the Palmer Drought Index have occurred in northwestern Ohio in the growing seasons of 1930, 1931, 1932, 1934, 1935, 1936, 1941, 1952, 1953, 1954, 1963, 1964, and 1965. The longest continuing, moderate to extreme drought was from October 1962 through July 1965, a period of 34 months.

[3] By MARVIN E. MILLER, climatologist for Ohio, National Weather Service, U.S. Department of Commerce.

TABLE 10.—*Laboratory*

Soil, sample number, and location	Depth from surface	Particle-size distribution: Very coarse sand (2 to 1 mm.)	Coarse sand (1 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.)	Total sand (2.0 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)
	In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Granby loamy fine sand, HN-89. Location: SE¼ SW¼ SW¼ SW¼ sec. 24, T. 6 N., R. 8 E., Washington Township.	0-10	0.1	1.1	4.4	49.9	29.9	85.4	8.6
	10-14	.2	1.5	4.9	48.3	31.5	86.4	7.7
	14-20	.2	1.5	4.9	48.3	31.5	86.4	7.7
	20-28	.3	2.0	7.2	55.9	28.4	93.7	3.2
	28-34	.0	.8	7.6	84.4	5.2	98.0	.1
	34-36	.0	21.6	21.5	46.7	7.0	96.7	1.8
	36-46	.0	.9	4.2	57.5	32.5	95.1	2.8
	46-50	.1	.6	2.9	65.5	27.2	96.3	1.6
	50-60	.0	.4	2.5	64.5	29.3	96.7	1.6
Oakville fine sand, HN-76. Location: SW¼ SE¼ NW¼ SE¼ sec. 23, T. 6 N., R. 8 E., Washington Township.	0-3	.5	1.6	4.1	60.9	24.9	92.0	4.5
	3-8	.1	1.1	3.8	60.8	25.8	91.6	4.3
	8-9	.2	1.2	3.2	59.3	27.2	91.1	5.1
	9-12	.1	1.0	3.3	61.7	28.0	94.1	2.2
	12-22	.0	.8	2.8	63.9	28.6	96.1	1.4
	22-32	.1	1.0	3.4	63.5	28.8	96.8	1.3
	32-41	.1	.6	2.8	62.6	30.3	96.4	1.4
	41-49	.0	.2	2.1	62.2	32.8	97.3	.6
	49-57	.0	.4	2.3	64.9	29.2	96.8	.8
	57-69	.0	.2	1.6	64.1	31.8	97.7	.9
	69-81	.0	.2	1.6	62.9	32.4	97.1	1.2
	81-89	.1	2.0	6.6	54.6	32.5	95.8	2.1
	89-100	.2	1.3	4.0	57.0	33.2	95.7	1.7
Ottokee fine sand, HN-87. Location: SW¼NW¼NE¼SE¼ sec. 13, T. 6 N., R. 8 E., Washington Township.	0-4	1.8	1.5	3.9	51.3	28.0	86.5	8.9
	4-14	.1	.9	3.6	53.4	29.6	87.6	7.1
	14-24	.1	.9	3.9	58.4	28.8	92.2	3.7
	24-32	.1	.8	3.4	59.5	31.3	95.1	2.6
	32-47	.1	1.0	3.9	57.4	34.4	96.8	2.1
	47-49	.2	1.2	4.3	53.9	28.5	88.0	3.1
	49-67	.2	2.1	3.2	56.7	33.0	95.2	2.7
	67-77	.0	.4	1.6	60.3	34.1	96.4	1.7
	77-81	.0	.6	1.9	33.0	58.9	94.4	3.4
Spinks fine sand, HN-86. Location: NE¼SE¼NW¼NE¼ sec. 13, T. 5 N., R. 7 E., Harrison Township.	0-6	1.2	4.3	20.6	52.1	12.2	90.3	5.8
	10-20	.6	5.8	17.5	54.5	17.3	95.7	2.2
	34-42	.2	4.1	17.6	56.7	17.8	96.5	1.2
	52-62	.3	4.6	20.4	55.3	16.1	96.7	1.3
	72-84	.3	4.5	18.9	53.6	18.7	96.1	1.9
	100-114	.2	2.8	12.5	59.7	20.6	95.9	1.6
	130-150	.1	3.3	17.1	57.9	17.5	95.9	1.6
	(1)	.3	5.0	21.0	47.5	13.2	86.9	2.5
Toledo silty clay, HN-74. Location: SW¼NW¼SE¼NE¼ sec. 14, T. 5 N., R. 8 E., Damascus Township.	0-7	.2	.6	.8	2.2	2.2	6.0	46.3
	7-13	.2	.5	.8	2.0	2.0	5.5	46.8
	13-19	.1	.5	.7	1.9	2.0	5.2	45.7
	19-24	.1	.5	.7	2.1	2.1	5.6	45.4
	24-32	.1	.4	.6	1.8	1.9	4.8	45.5
	32-39	.3	.9	.9	2.0	1.9	6.0	44.0
	39-48	.1	.5	.7	1.6	1.8	4.7	44.7
	48-53	.6	1.1	1.2	2.8	2.9	8.6	40.9
	53-68	1.3	2.0	1.8	4.2	3.9	13.2	36.8
Toledo silty clay loam, HN-82. Location: SE¼SE¼NE¼NW¼ sec. 7, T. 6 N., R. 7 E., Liberty Township.	0-7	.5	.8	1.5	4.3	4.4	11.5	50.6
	7-13	.2	1.0	.3	3.6	3.4	9.7	47.0
	13-18	.3	.9	1.3	3.6	3.4	9.5	44.0
	18-23	.3	.8	1.4	3.8	3.6	9.9	47.1
	23-29	.3	.8	1.3	3.6	3.6	9.6	47.1
	29-35	.3	.8	1.4	4.0	3.8	10.3	46.3
	35-41	.2	.8	1.4	3.8	4.1	10.3	47.9
	41-47	.2	.8	1.4	3.5	3.9	9.8	47.7
	47-70	.7	1.3	1.2	3.0	3.1	9.3	42.4
	70-78	1.5	1.6	1.5	3.7	3.6	11.9	37.6

[1] Samples of Bt bands in the A2&Bt horizon between depths of 46 and 96 inches.

analyses of selected soils

Clay (less than 0.002 mm.)	Texture	Reaction	Organic-matter content	$CaCO_3$ equivalent	Exchangeable cations (milliequivalents per 100 grams of soil						Base saturation
					H	Ca	Mg	K	Sum of exchange-able cations	Sum of bases	
Pct.		pH	Pct.	Pct.						Pct.	Pct.
6.0	Loamy fine sand	6.2	6.6		6.2	13.1	1.4	0.05	20.8	14.6	70
5.9	Loamy fine sand	6.5	2.0		2.6	6.1	.8	.05	9.6	7.0	73
5.9	Loamy fine sand	6.5	2.0		2.6	6.1	.8	.05	9.6	7.0	73
3.1	Fine sand	6.9	.4		.3	2.1	.4	.05	2.9	2.6	90
1.9	Fine sand	7.1			.2	1.0	.3	.05	1.6	1.4	88
1.5	Sand	7.3									
2.1	Fine sand	8.0		10.5							
2.1	Fine sand	8.1		12.7							
1.7	Fine sand	8.0		13.5							
3.5	Fine sand	4.8	1.3		5.8	.5	.3	.05	6.7	.9	13
4.1	Fine sand	5.2	.9		4.8	.5	.4	.10	5.8	1.0	17
3.8	Fine sand	5.7	1.4		4.5	1.8	.5	.08	6.9	2.4	35
3.7	Fine sand	5.7	.4		3.4	.7	.2	.05	4.4	1.0	23
2.5	Fine sand	6.0	.2		2.2	.5	.2	.08	3.0	.8	27
1.9	Fine sand	6.0	.2		1.4	.6	.2	.09	2.3	.9	39
2.2	Fine sand	5.9			1.5	.9	.3	.26	3.0	1.5	50
2.1	Fine sand	6.0			1.0	.7	.2	.05	2.0	1.0	50
2.4	Fine sand	6.1			1.1	1.0	.3	.05	2.5	1.4	56
1.4	Fine sand	6.0			1.0	.7	.2	.10	2.0	1.0	50
1.7	Fine sand	5.9			1.1	.6	.2	.20	2.1	1.0	48
2.1	Fine sand	5.7			1.1	.9	.3	.05	2.4	1.3	54
2.6	Fine sand	5.4			1.8	.7	.3	.05	2.9	1.1	38
4.6	Loamy fine sand	4.4	2.3		14.1	.4	.4	.10	15.0	.9	6
5.3	Loamy fine sand	5.1	.5		5.9	.8	.3	.09	7.1	1.2	17
4.1	Fine sand	5.2	.5		3.2	.4	.1	.08	3.8	.6	16
2.3	Fine sand	5.3	.4		2.4	.4	.3	.05	3.2	.8	25
1.1	Fine sand	5.6	.4		1.6	.4	.2	.05	2.3	.7	30
8.9	Loamy fine sand	5.3			3.7	1.3	1.3	.10	6.4	2.7	42
2.1	Fine sand	5.6			.7	.6	.5	.05	1.9	1.2	63
1.9	Fine sand	6.8			.5						
2.2	Very fine sand	7.5		2.1							
3.9	Fine sand	6.2	2.3		3.8	3.3	.6	.22	7.9	4.1	52
2.1	Fine sand	6.1	.2		1.4	.6	.3	.06	2.4	1.0	42
2.3	Fine sand	6.3	.1		1.0	.9	.2	.08	2.2	1.2	55
2.0	Fine sand	6.2	.2		.3	.8	.3	.08	1.5	1.2	80
2.0	Fine sand	6.1			.6	.8	.3	.08	1.8	1.2	67
2.5	Fine sand	8.1		9.1							
10.6	Fine sand	6.2			2.0	3.1	.7	.15	6.0	4.0	67
2.5	Fine sand	8.1		10.3							
47.7	Silty clay	5.9	5.2		9.4	19.1	3.6	.73	32.8	23.4	71
47.7	Silty clay	6.3	2.4		7.2	20.9	4.2	.60	32.0	24.8	78
49.1	Silty clay	6.8	1.3		3.8	19.0	4.1	.50	27.4	23.6	86
49.0	Silty clay	7.0	1.1		3.4	17.7	4.3	.47	25.9	22.5	87
49.7	Silty clay	7.2	.8		2.8	16.1	4.2	.52	23.6	20.8	88
50.0	Silty clay	7.3	.8	.3	4.1	15.1	3.9	.46	23.6	19.5	83
50.6	Silty clay	7.5		.3							
50.5	Silty clay	7.6		9.9							
50.0	Clay	7.7		19.4							
37.9	Silty clay loam	6.1	4.5		8.5	18.8	3.3	.46	31.1	22.6	73
43.3	Silty clay	6.5	1.6		6.2	17.2	3.6	.38	27.4	21.2	77
46.5	Silty clay	6.8	1.2		5.3	16.9	3.9	.43	26.5	21.2	80
43.0	Silty clay	7.0	.8		2.7	15.3	3.8	.46	22.3	19.6	88
43.3	Silty clay	7.1			4.0	14.7	3.9	.46	23.1	19.1	83
43.4	Silty clay	7.2			2.3	14.2	3.9	.43	20.8	18.5	89
41.8	Silty clay	7.4									
42.5	Silty clay	7.4									
48.3	Silty clay	7.7		11.2							
50.5	Clay	7.9		21.5							

TABLE 11.—*Temperature and precipitation*

[All data for Napoleon]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Average snowfall	Average number of days with 1.0 inch or more of snow on ground
	°F.	°F.	°F.	°F.	In.	In.	In.	In.	
January	35	18	53	−4	2.47	.82	4.51	8.0	10
February	36	19	56	−1	2.01	.66	3.68	7.3	7
March	47	27	69	9	3.01	1.30	5.01	4.6	3
April	60	37	80	22	3.29	1.64	5.21	.8	1
May	72	48	87	32	3.66	1.70	5.97	0	0
June	82	57	94	43	3.84	1.65	6.43	0	0
July	86	61	96	49	3.40	1.45	5.71	0	0
August	84	59	94	45	3.06	1.35	5.09	0	0
September	77	53	92	35	3.10	1.07	5.60	0	0
October	65	42	82	25	2.47	.77	4.61	0	0
November	50	32	69	15	2.34	.93	4.03	1.9	1
December	37	22	57	0	2.36	.83	4.21	7.0	4
Year	61	39	[1] 98	[2] −8	35.01	27.59	42.93	29.6	26

[1] Average of the highest recorded from 1894 through 1965.
[2] Average of the lowest recorded from 1894 through 1965.

TABLE 12.—*Probabilities of last freezing temperatures in spring and first in fall*

[Based on records obtained at Napoleon]

Probability	Dates for given probability and temperature				
	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower	36° F. or lower
Spring:					
1 year in 10 later than	April 8	April 20	April 29	May 17	May 26
2 years in 10 later than	April 3	April 16	April 25	May 12	May 22
5 years in 10 later than	March 23	April 4	April 16	May 1	May 14
Fall:					
1 year in 10 earlier than	November 1	October 19	October 6	September 25	September 15
2 years in 10 earlier than	November 6	October 24	October 11	September 30	September 20
5 years in 10 earlier than	November 12	November 5	October 23	October 9	September 28

Soil moisture goes through a seasonal cycle each year that is almost independent of the amount of precipitation received. It reaches its lowest point in October and is replenished in winter and early in spring when precipitation exceeds water lost by evaporation. Since the water needs of all crops reach a maximum in July and August and rainfall is almost always insufficient to meet those needs, there is a progressive drying of all soils.

Average dates of the last freezing temperatures in spring and the first in fall are shown in table 12. It is important to remember that light frost may form when the outside temperature is as high as 36° F. This is because most thermometers are placed about 5 feet above the ground, and the colder air sinks to ground level and is then below the thermometer itself. Since the terrain of Henry County ranges only 100 feet in altitude (650 to 750 feet above mean sea level), the length of the growing season is relatively constant throughout the county. If the growing season is considered the number of days between the last freezing temperature of 32° in spring and the first in fall, this season averages 161 days in length.

Cloudiness is greatest in winter and least in summer. This seasonal variation is most clearly illustrated by the percentage of possible sunshine, which is about 70 percent in July and 40 percent in December. In summer the wind near the ground blows most frequently from the southwest and averages 8 miles per hour. In winter the average windspeed is nearly 11 miles per hour, and the prevailing direction is west-southwest. Damaging winds of

35 to 80 miles per hour are usually associated with migrating thunderstorms. Since 1885, five tornadoes have been reported in Henry County.

Local flooding of the lowlands along the Maumee River occurs almost every year, but general floods of a serious character are much less frequent. Flood stage in this area is 10 feet, but major floods occur when the depth of the river reaches 15 or 16 feet. Since 1912, major floods have occurred in 1913, 1936, 1943, 1950, and 1959.

Geology

Henry County lies entirely within the lake plain formed by the glacial lakes that were dammed up by retreating glaciers. This flat plain was covered by four ancient lakes—Lakes Maumee, Whittlesey, Arkona, and Warren. These lakes formed sandy ridges along their shores and offshore bars. The shorelines of Lakes Maumee, Whittlesey, and Arkona are marked by only one or two beach ridges. The water level of Lake Warren, however, fluctuated, and several shorelines were formed. This resulted in the creation of the numerous ridges and offshore bars that occur in the northeastern part of Henry County (*4*, *7*).

Before the glacial lakes formed, the county was glaciated. Glacial ice sheets moved southward across Henry County and the western part of Ohio. The last ice sheet, the Wisconsin, covered and obliterated observable evidence of earlier glaciers. The thickness of the ice-deposited material, called glacial drift or till, ranges from about 15 feet, near Paugh Quarry at the Wood County line, to about 125 feet, northwest of Ridgeville Corners in Ridgeville Township. The average thickness of the glacial till is about 50 feet over much of the county.

Within the areas covered by glacial Lake Warren and Lake Maumee (soil associations 3, 4, 5, 7, and 10 on general soil map) are both lacustrine and outwash deposits. These deposits, ranging from sands to silty clay or clay, are from 2 to 30 feet thick over the glacial till.

This mantle of glacial drift and lacustrine materials has buried the bedrock, which consists of calcareous sedimentary limestone and shale. Geologists classify Henry County bedrock into two systems of the Paleozoic Age (*4*). The Silurian System includes dolomite limestone of the Tymochtee and Bass Island Groups. These occur in the southeastern corner of the county, underlying practically all of Bartlow Township and the southeast corner of Richfield and Marion Townships (*15*).

Dolomite, limestone and dolomite, and shale of the Devonian System underlie the rest of the county. The Antrim or Ohio shale, which provides a very poor water supply for wells, occurs in the northwestern part of the county. It lies north of a northeast-southwest line that extends between Florida and Colton.

The only known exposures of bedrock in the county are in the Maumee River bed and at two or three abandoned quarries along the Maumee River banks or near the mouth of its tributaries.

Natural Resources

One of the most valuable natural resources in Henry County is the soils. The county has many kinds of soils that range from some that are well suited to farming to some that are not suited to farming.

Other resource materials are of minor to moderate importance. Gravel deposits, rather limited in size, occur at some locations on the beach ridges and stream terraces. Presently, the largest supply of gravel comes from dredging the Maumee River. Extensive deposits of sand occur in the northeastern part of the county. These sands are used as fill material, and possibly could be used in the manufacture of glass. Clay from the upper 2 or 3 feet of many of the clayey soils is used to manufacture clay drainage tile.

Industry

Food-processing industries located in Napoleon provide employment for many workers. One of these industries is the largest in the county. Other plants in Napoleon and surrounding communities in the county manufacture automotive parts, automatic screw machines, coil-handling and press-feeding equipment, plastic products, fertilizer, carbonated products, drainage tile, alfalfa meal, windmills, stock watering tanks, and other machinery. Many persons who live in Henry County work in Toledo or at plants at Defiance and Wauseon.

Crops grown in the county supply grain elevators that, in most towns, are within easy reach of all farms.

Transportation

Early transportation was provided by the Miami-Erie Canal, which was completed in 1843. It was operated until the turn of the century but was profitable only until the railroads were built. Most of the railroads were built between 1850 and 1900. Operating today and serving several of the communities are lines of the Norfolk and Western; the Baltimore and Ohio; and the Detroit, Toledo, and Ironton railroads.

Two Federal highways are major traffic arteries across the county. These are U.S. Highways No. 6 and No. 24. Parts of these roads have been relocated and constructed as limited access roads during the period 1965 to 1967. Several State highways provide good traffic links between the communities of the county. Most county and township roads are blacktopped, though some of the township roads are less than two lanes wide.

Three pipelines traverse the area. Two of the lines cross the northwest corner of the county.

Farming

This subsection discusses land use and gives data on farms and the acreage used for principal crops in the county. The statistics are from the U.S. Census of Agriculture.

In 1969, Henry County had 266,064 acres in farms. Of this acreage, 238,297 acres was cropland. There were 1,695 farms in the county in 1969. About 77 percent of these were operated by owners or part owners, and the rest were operated by tenants. The average farm in the county is about 157 acres in size.

The acreage of principal crops grown in the county varied from year to year during the period 1959–1964.

Corn average decreased almost 5,000 acres to 72,547 acres in 1964. Soybean acreage stayed about the same at 65,000 acres. In 1964, alfalfa was grown for hay or alfalfa meal on 10,494 acres. Clover hay was produced on 3,188 acres. Some clover seed was harvested from some of this acreage. A total of 2,974 acres of tomatoes was produced for processors, and 3,574 acres of sugar beets was produced for beet sugar refineries. Wheat acreage increased from 8,023 acres in 1959 to almost 35,000 acres in 1964.

Table 13 shows the number of livestock in the county in 1959 and 1964.

TABLE 13.—*Number of livestock*

Livestock	1959	1964
All cattle	22, 469	19, 474
Milk cows and heifers	4, 365	3, 826
Sheep and lambs	5, 689	3, 615
Hogs and pigs	22, 982	20, 592
Chickens	351, 593	469, 991

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Glossary

Acidity. See Reaction.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. In this survey it is rated to a root-restricting zone or to a depth of 60 inches, as follows:

Very low	Less than 3 inches.	High	9 to 12 inches.
Low	3 to 6 inches.	Very high	More than 12 inches.
Medium	6 to 9 inches.		

Beach ridge. Ridge that was formed by wave or wind action on the beach of an ancient glacial lake and that remains after the glacial lake dried up.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) 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.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains, cemented together.

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 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.

Erosion. The wearing away of land surface by wind (soil blowing), running water, and other geological agents.

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

Glacial lake (geology). Extinct lake, the bed of which now is dry land. This bed has a relatively flat surface formed by lacustrine sediments not greatly modified by weathering.

Glacial outwash (geology). Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from melted ice; the deposits are stratified and occur in the forms of kames, eskers, deltas, and outwash plains.

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 material beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Lacustrine deposits (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Marl. An earthy, unconsolidated deposit formed by fresh-water lakes that consists chiefly of calcium carbonate mixed with various amounts of clay or other impurities.

Natural soil drainage. Refers to the condition of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drained, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the breaking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottling below a depth of 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all of the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Organic matter. A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

Parent material. The disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate such as a crumb, prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. In this survey, terms used to describe permeability and their value in inches of soil per hour are as follows:

Very slow	Less than 0.63.	Moderately rapid	2.0 to 6.3.
Slow	0.63 to 0.2.	Rapid	6.3 to 12.
Moderately slow	0.2 to 0.63.	Very rapid	12 or more.
Moderate	0.63 to 2.0.		

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 and alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Root zone. The part of the soil that is penetrated, or can be penetrated, by plant roots. The three classes of root zones and their depth from the surface used in this county are *moderately deep*, 20 to 36 inches; *deep*, 36 to 60 inches; and *very deep*, more than 60 inches.

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

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a 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.

Stratified. Composed of or arranged in strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The primary forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically the B horizon.

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.

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

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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 the high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishment of a new series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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 yields, table 1, page 16.
Potential productivity of trees, table 2, page 18.
Wildlife habitat and kinds of wildlife, table 3, page 19.
Engineering uses of soils, tables 4, 5, and 6, pages 22 through 47.
Nonfarm uses of soils, table 7, page 50.
Acreage and extent of soils, table 8, page 69.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
Ad	Adrian muck	68	IVw-1	14
ArB	Arkport fine sand, 2 to 6 percent slopes	70	IIe-2	10
ArC	Arkport fine sand, 6 to 12 percent slopes	70	IIIe-3	12
Ca	Clay pits	71	-----	--
Ch	Cohoctah fine sandy loam	71	IIIw-1	12
Cn	Colwood loam	72	IIw-3	10
Co	Colwood silt loam	72	IIw-3	10
Cu	Cut and fill land	73	-----	--
DeA	Del Rey loam, 0 to 2 percent slopes	73	IIw-6	11
DfA	Del Rey silt loam, 0 to 2 percent slopes	74	IIw-6	11
DuA	Digby fine sandy loam, 0 to 2 percent slopes	74	IIw-6	11
DyA	Digby loam, 0 to 2 percent slopes	74	IIw-6	11
FsA	Fulton loam, 0 to 2 percent slopes	75	IIIw-3	13
FsB	Fulton loam, 2 to 6 percent slopes	75	IIIw-3	13
FuA	Fulton silty clay loam, 0 to 2 percent slopes	76	IIIw-3	13
FuB	Fulton silty clay loam, 2 to 6 percent slopes	76	IIIw-3	13
FvA	Fulton loam, sandy subsoil variant, 0 to 2 percent slopes	77	IIIw-3	13
GaA	Galen fine sand, 0 to 2 percent slopes	77	IIs-1	12
GaB	Galen fine sand, 2 to 6 percent slopes	78	IIe-2	10
Gm	Genesee loam	78	IIw-2	10
Go	Gilford fine sandy loam	79	IIw-4	11
Gr	Granby loamy fine sand	80	IIIw-4	13
Gv	Gravel pits	80	-----	--
HaA	Haney fine sandy loam, 0 to 2 percent slopes	81	I-1	9
HaB	Haney fine sandy loam, 2 to 6 percent slopes	81	IIe-1	10
HdA	Haney loam, 0 to 2 percent slopes	81	I-1	9
HdB	Haney loam, 2 to 6 percent slopes	81	IIe-1	10
HeC	Haney and Rawson loams, 6 to 12 percent slopes	81	IIIe-1	12
HkA	Haskins fine sandy loam, 0 to 2 percent slopes	82	IIw-6	11
HlA	Haskins loam, 0 to 2 percent slopes	82	IIw-6	11
HnA	Haskins fine sandy loam, stratified substratum, 0 to 2 percent slopes	83	IIw-6	11
Ho	Hoytville clay loam	84	IIw-5	11
Hv	Hoytville clay	84	IIw-5	11
Hw	Hoytville clay, thin solum variant	84	IIw-5	11
KfA	Kibbie fine sandy loam, 0 to 2 percent slopes	85	IIw-6	11
KlA	Kibbie loam, 0 to 2 percent slopes	85	IIw-6	11
La	Latty clay	86	IIIw-5	13
Le	Lenawee loam	87	IIw-3	10
Lf	Lenawee silty clay loam	87	IIw-3	10
LwB2	Lucas silty clay loam, 2 to 6 percent slopes, moderately eroded	88	IIIe-2	12
LwC2	Lucas silty clay loam, 6 to 12 percent slopes, moderately eroded	88	IVe-2	14
LxC3	Lucas silty clay, 6 to 12 percent slopes, severely eroded	88	VIe-1	15
LxE3	Lucas silty clay, 12 to 45 percent slopes, severely eroded	88	VIIe-1	15
Md	Medway silt loam	89	IIw-2	10
Me	Mermill loam	90	IIw-3	10
Mf	Mermill clay loam	90	IIw-3	10
Mg	Mermill loam, stratified substratum	90	IIw-3	10
Mh	Millgrove loam	91	IIw-3	10
Mk	Millgrove clay loam	91	IIw-3	10
NaA	Nappanee loam, 0 to 2 percent slopes	92	IIIw-3	13
NaB	Nappanee loam, 2 to 6 percent slopes	93	IIIw-3	13
NtA	Nappanee silty clay loam, 0 to 2 percent slopes	93	IIIw-3	13
NtB	Nappanee silty clay loam, 2 to 6 percent slopes	93	IIIw-3	13
NtB2	Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded	93	IIIw-3	13
OaC	Oakville fine sand, 2 to 12 percent slopes	94	IVs-1	14
OsB	Oshtemo sandy loam, 2 to 6 percent slopes	95	IIIs-1	14
OtB	Ottokee fine sand, 1 to 5 percent slopes	96	IIIs-1	14
Pa	Paulding clay	96	IIIw-5	13
RaB	Rawson sandy loam, 2 to 6 percent slopes	97	IIe-1	10
RdB	Rawson loam, 2 to 6 percent slopes	97	IIe-1	10
ReB	Rawson fine sandy loam, stratified substratum, 2 to 6 percent slopes	98	IIe-1	10
RfA	Rimer loamy fine sand, 0 to 2 percent slopes	99	IIw-7	11
RmA	Rimer loamy fine sand, stratified substratum, 0 to 2 percent slopes	99	IIw-7	11
RoA	Roselms silty clay loam, 0 to 2 percent slopes	100	IIIw-3	13
Rs	Ross loam	100	IIw-2	10
SbB2	St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded	101	IIIe-2	12
SbC2	St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded	101	IVe-2	14
ScC3	St. Clair silty clay, 6 to 12 percent slopes, severely eroded	102	VIe-1	15
ScD3	St. Clair silty clay, 12 to 18 percent slopes, severely eroded	102	VIIe-1	15
ScE3	St. Clair silty clay, 18 to 25 percent slopes, severely eroded	102	VIIe-1	15
ScF3	St. Clair silty clay, 25 to 45 percent slopes, severely eroded	102	VIIe-1	15
SdB	Seward loamy fine sand, 2 to 6 percent slopes	103	IIe-2	10
SdC	Seward loamy fine sand, 6 to 12 percent slopes	103	IIIe-3	12
SdD	Seward loamy fine sand, 12 to 18 percent slopes	103	IVe-1	14
SeB	Seward loamy fine sand, stratified substratum, 2 to 6 percent slopes	103	IIe-2	10
SeC	Seward loamy fine sand, stratified substratum, 6 to 12 percent slopes	104	IIIe-3	12
SfA	Shinrock silt loam, sandy subsoil variant, 0 to 2 percent slopes	105	IIs-2	12
Sh	Shoals silt loam	105	IIw-1	10
So	Sloan silty clay loam	106	IIIw-1	12
SpB	Spinks fine sand, 2 to 6 percent slopes	107	IIIs-1	14
SpC	Spinks fine sand, 6 to 12 percent slopes	107	IIIe-3	12
SpD	Spinks fine sand, 12 to 18 percent slopes	107	IVe-1	14
TdA	Tedrow loamy fine sand, 0 to 2 percent slopes	108	IIw-7	11
TeA	Tedrow loamy fine sand, silty subsoil variant, 0 to 2 percent slopes	109	IIw-7	11
To	Toledo silty clay loam	109	IIIw-2	13
Tt	Toledo silty clay	109	IIIw-2	13
TuB2	Tuscola loam, 2 to 6 percent slopes, moderately eroded	110	IIe-1	10
TuC2	Tuscola loam, 6 to 12 percent slopes, moderately eroded	110	IIIe-1	12
Ur	Urban land	111	-----	--
VaA	Vaughnsville loam, 0 to 2 percent slopes	111	IIw-6	11
Wa	Wabasha silty clay	112	IIIw-1	12
Wc	Warners muck	113	IVw-1	14
Wf	Wauseon fine sandy loam	114	IIw-4	11
Wg	Wauseon loamy fine sand, stratified substratum	114	IIw-4	11

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