SOIL SURVEY

Hancock 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 October 1973

Major fieldwork for this soil survey was done in the period 1959-64. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. 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 Hancock 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 Cartigraphic 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 Hancock County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

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

Finding and Using Information

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

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

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

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Soils and Land Use Planning."

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

U.S. GOVERNMENT PRINTING OFFICE: 1973

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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SOIL SURVEY OF HANCOCK COUNTY, OHIO

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HANCOCK COUNTY is in the northwestern part of Ohio (fig. 1). The county has a total land area of approximately 340,480 acres or 532 square miles. Findlay, the county seat, is near the center of the county.

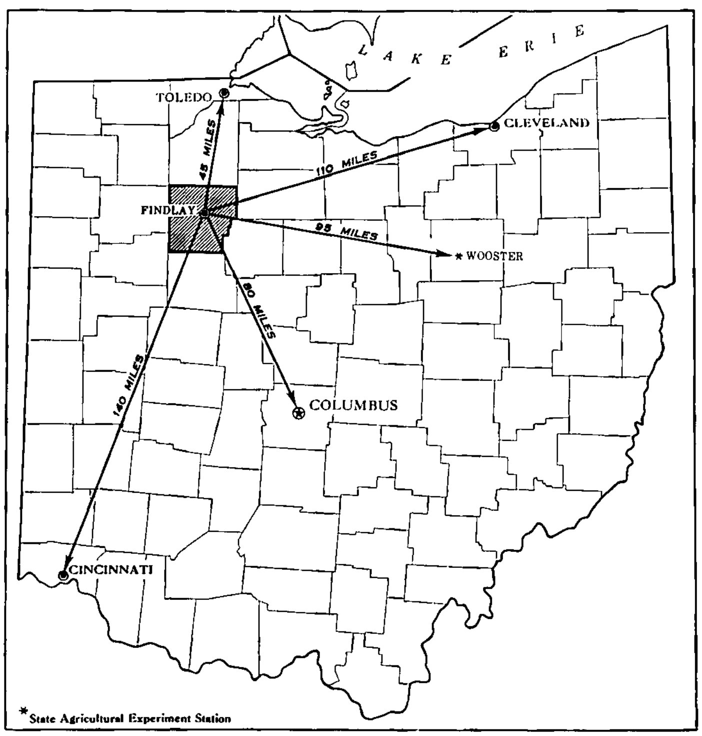

***Figure 1.*—Location of Hancock County in Ohio.**

The northern part of the county lies within the level to nearly level Glacial Lake Plain physiographic area. The broad, nearly level Findlay Basin area in Blanchard and Liberty Townships is also a part of the Glacial Lake Plain. Most of the county has gently sloping glacial moraine topography. The glacial till deposits are moderately fine or fine textured and calcareous and are of late Wisconsin age. The elevation ranges from 720 feet above sea level in Pleasant Township to about 950 feet above sea level in Orange Township.

Hancock County is mainly agricultural. Several large industries in the county provide many off-the-farm jobs. Most industry is in the city of Findlay. Cash-grain farming predominates, and corn, soybeans, and wheat are the principal crops. Sugar beets and tomatoes are commonly grown special crops. About 95 percent of the land area in the county is used for farming.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Hancock County, where they are located, and how they can be used. They went into the county knowing they were likely to 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 (*18*).[1]

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. Fulton and Nappanee, for example, are the names of two soil series.

[1] Italic numbers in parentheses refer to Literature Cited, p. 93.

All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Nappanee loam, 0 to 2 percent slopes, is one of several phases within the Nappanee 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 in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in 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 other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. The places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Clay pits is a land type in Hancock County.

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

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

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

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Hancock County. A soil association is a landscape that has a distinctive 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, stoniness, drainage, and other characteristics that affect their management.

The names of the soil associations in this county may not be the same as those in adjacent counties. The names of the soil associations reflect the percentages of the major soils in the association. The percentage of individual soils in associations made up of the same soils may vary.

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

1. Hoytville association

Deep, very poorly drained soils that have a clay subsoil; on the lake plain

This association is mainly an intensively cultivated lake plain broken in places by drainageways and stringers of sandy beach ridges. It is in the northwestern corner and along the northern border of the county. The southern boundary is the north edge of the Defiance end moraine, and small, scattered areas are on that moraine. The only wooded areas are small, scattered farm woodlots and fringes of woods along some of the drainageways. The woodlots are slowly being cleared and drained for farming.

This association makes up about 11 percent of the county. It is about 75 percent Hoytville soils and 25 percent minor soils.

Hoytville soils are very poorly drained and dark colored. They formed in heavy clay loam glacial till modified by water during postglacial times.

Among the minor soils are Nappanee, Rimer, Seward, Millgrove, and Mermill soils. Nappanee, Rimer, and Seward soils are somewhat poorly drained and moderately well drained, and they are lighter colored than the Hoytville soils. They are on low knolls or rises on the nearly level plain. The Millgrove and Mermill soils are very poorly drained, dark-colored soils.

The major limitation to soil use in this association is a seasonally high water table. Undrained areas are wet and swampy for long periods during winter and spring. They dry out slowly, and in most years planting is late. Most areas, however, are artificially drained by open ditches and tile. Artificial drainage is a necessity for optimum crop production.

Drained areas of this association are very well suited to farming and are important to crop production in the county and State. Cash-grain crops, such as corn and soybeans, are the major crops, but tomatoes and sugar beets are also important.

The dominant soils are not well suited to building sites and septic tank disposal fields, because of a seasonal high water table and slow permeability.

2. *Mermill-Millgrove-Digby association*

Deep, very poorly drained and somewhat poorly drained soils that have a subsoil of sandy clay loam to clay loam; on outwash plains and beach ridges

This soil association is characterized by soils that formed mainly in loamy water-deposited materials that overlie sandy and gravelly outwash materials or glacial till. These soils occur in three general locations in the county and the relative proportion of the soils differs in each location.

This association makes up about 9 percent of the county. It is about 30 percent Mermill soils, 20 percent Millgrove soils, 15 percent Digby soils, and 35 percent minor soils.

Among the minor soils are Belmore, Haney, Haskins, Rimer, and Vaughnsville soils.

In the northern part of the county, the association is characterized by fairly prominent, long, narrow beach ridges. The somewhat poorly drained Digby soils, well drained Belmore soils, and moderately well drained Haney soils occupy these ridges. Dark-colored, nearly level, very poorly drained Mermill soils and Millgrove soils are adjacent to the ridges on either side. The Mermill soils are on the lake plain where thin beach deposits overlie glacial till. The Millgrove soils are on outwash plains and on the lake plain adjacent to the beach ridges. In the central part of the county, along the Blanchard River, the dominant soils are Digby and Millgrove soil. Here beach ridges are not distinct, and most areas of these soils are on low terraces. South of the Blanchard River, the scattered areas of this association are predominantly Millgrove and Mermill soils. These areas have no ridges, as in the northern part of the county, but rather are nearly level or depressional drainageways that have been filled with outwash materials. These areas are very poorly drained. Adjacent to these areas are small areas of better drained Digby soils and Haney soils.

The major limitation of the dominant soils in this association is a seasonal high water table.

These soils are well suited to crop production if they are artificially drained. They drain easily with tile, and most areas are drained and farmed intensively. The beach ridges are used for early season truck crops and orchards.

A seasonal high water table is a limitation of these soils for building sites and for the disposal of septic tank effluent.

The beach ridge areas of this association, north of the Blanchard River, are widely used for roads and building sites because of their elevated position on an otherwise nearly level landscape.

3. *Millsdale-Milton-Randolph association*

Very poorly drained to well-drained soils that have a subsoil of clay to heavy clay loam and are 20 to 40 inches deep to limestone bedrock; on the glacial till plain

This association occupies scattered areas south of the Blanchard River. One area lies in the southwest part of Findlay, and another area is in Biglick Township adjacent to the Linwood-Adrian association. Many smaller areas occur throughout the southern half of the county and commonly are adjacent to streams. This association consists of very poorly drained, somewhat poorly drained, and well-drained soils that are underlain by limestone bedrock at a depth of 20 to 40 inches.

This association makes up about 2 percent of the county. It is about 40 percent Millsdale soils, 15 percent Milton soils, 15 percent Randolph soils, and 30 percent minor soils.

The Millsdale soils are dark colored, and they are very poorly drained. Much of the acreage of Millsdale soils is adjacent to streams and is subject to flooding. The Milton soils are lighter colored than the Millsdale soils, and they are well drained. The Randolph soils are somewhat poorly drained.

Among the minor soils are Dunbridge, Ritchey, Joliet, and Romeo soils. These minor soils range from moderately deep to very shallow to limestone bedrock.

A major limitation to the use of this association for many purposes is the limited depth to limestone bedrock. Excessive seasonal wetness is a major limitation to the use of the Millsdale and Randolph soils. Tile drainage of these soils is difficult because of limited and variable depth to bedrock.

If Millsdale soils are drained, they are well suited to crops. To some extent all of the major soils in this association are used for cash-grain farming, but many areas are in pasture or woodland.

4. *Blount-Pewamo association*

Deep, somewhat poorly drained and very poorly drained soils that have a subsoil of clay to heavy silty clay loam; on the glacial till plain

This association is characterized by undulating upland topography. The dominant soils in this association formed in clay loam glacial till.

This association makes up about 63 percent of the county. It is about 50 percent Blount soils, 32 percent Pewamo soils, and 18 percent minor soils.

The Blount soils are nearly level to gently sloping and somewhat poorly drained. The Pewamo soils are dark colored and very poorly drained.

Among the minor soils are Morley and Mermill soils and, to a lesser extent, Rawson and Haskins soils. The Morley soils are moderately well drained, and the Mermill soils are very poorly drained.

The major limitation to the use of the major soils in this association is excessive wetness. Blount and Pewamo soils have a seasonally high water table and require artificial drainage for optimum crop production. Because of the fairly long, gentle slopes of the Blount soils, sheet erosion is common in this association. Farm management of the soils in this association is complicated by the pattern of the soils. Both drainage and erosion control practices may be necessary in the same field.

If they are drained, the Blount and Pewamo soils are well suited to crops and are important to farming.

Among the major limitations to nonfarm uses of the soils in this association are seasonal wetness and slow or moderately slow permeability. These soil properties are limitations for building sites and for septic tank disposal fields.

5. *Sloan-Eel-Shoals association*

Deep, very poorly drained to moderately well drained soils that have a subsoil of loam to light silty clay loam; on flood plains

This association is made up of soils on stream flood plains. These soils are all nearly level and subject to flooding.

This association makes up about 4 percent of the county. It is about 60 percent Sloan soils, 20 percent Eel soils, 10 percent Shoals soils, and 10 percent minor soils.

The Sloan soils are dark colored, and they are very poorly drained. The Eel soils are moderately well drained, and the Shoals soils are somewhat poorly drained.

The dominant minor soil is well-drained Genesee.

The major limitation to soil use in this association is the hazard of flooding. The Sloan soils and Shoals soils have a seasonally high water table, and artificial drainage permits more timely tillage. The Eel soils seldom require drainage for farming.

Because of possible damage to winter and spring grains by flooding, the crops that are suited to these soils are limited. Corn and soybeans generally are the cash-crops grown in this association. Many areas are in pasture or woodland.

For most nonfarm uses, the major limitation of the soils in this association is the hazard of flooding.

6. *Linwood-Adrian association*

Very poorly drained organic soils that are 16 to 42 inches deep over mineral material; in low areas

This association is one area in Biglick Township in the east-central part of the county. This area is low lying and adjacent to an upland area underlain by limestone. This is the only area of organic soils in the county, and the soils are distinctive and highly contrasting to other soils in the county.

This association makes up less than 1 percent of the county. It is about 65 percent Linwood soils, 30 percent Adrian soils, and 5 percent minor soils.

The Linwood and Adrian soils have a moderately thick layer of organic materials underlain by mineral materials. Linwood soil is underlain by loamy mineral material, and Adrian soil is underlain by sand. Linwood and Adrian soils are very poorly drained.

The minor soils in this association are Millgrove and Mermill soils. These soils are adjacent to or surrounded by Linwood and Adrian soils but lack the organic layer of the Linwood and Adrian soils. Millgrove and Mermill soils formed where the underlying, mineral materials had not been covered with organic deposits.

The organic soils have a high water table, and unless they are drained, they are swampy much of the year. Drained areas are subject to subsidence and are subject to damage by fire if they become too dry. Most of this association has been cleared and artificially drained and is cultivated. The cultivated areas are subject to soil blowing. Corn is the major crop grown on the soils in this association. Linwood and Adrian soils are well suited to special crops, and the use of these soils for this type of crop can be expanded.

Linwood and Adrian soils are too soft and unstable for building sites. For most nonfarm uses, the high water table is a limitation.

7. *Lenawee association*

Deep, very poorly drained soils that have a subsoil of heavy clay loam to silty clay loam; on the lake plain in the Findlay Basin

This association is west of Findlay in the Findlay Basin. It is a relatively treeless, nearly level area of dark-colored soils and is similar to the Hoytville association in appearance.

This association makes up about 5 percent of the county. It is about 58 percent Lenawee soils and 42 percent minor soils.

Lenawee soils are dark colored and very poorly drained. They formed in postglacial sediments.

Among the minor soils are Colwood, Kibbie, and Tuscola soils. Colwood soils are dark colored and very poorly drained. The Kibbie and Tuscola soils are lighter colored and better drained than Colwood soils. Kibbie and Tuscola soils are on slight rises and ridges in areas that are otherwise nearly level.

The major limitation to soil use in this association is a seasonally high water table. Much of the association is drained by surface ditches and tile. Most of the acreage is used for cash-grain farming, but many acres of sugar beets and tomatoes are also grown. Lenawee soils are well suited to farming and are important to farming in the county.

A seasonally high water table is the major limitation of the soils in this association for building sites, septic tank disposal fields, and many other nonfarm uses.

Use and Management of the Soils

This section explains the system of capability grouping used by the Soil Conservation Service and discusses the management of the soils in Hancock County by capability units. Estimated yields of the principal crops are given. Also discussed is the management of soils for special crops, woodland and windbreaks, and wildlife. The properties and features affecting engineering and the limitations affecting land use planning are enumerated, mainly in tables.

General Management Practices

There are wide variations in the use and management of the soils of Hancock County. Field crops, pasture, and special crops are grown. Specific information on suitable crop varieties, drainage, erosion control, and other management practices can be obtained from the nearest office of the Soil Conservation Service and from the Ohio Agricultural Extension Service.

Management for cultivated crops

This section discusses only the cultivated crops that are commonly grown. Among the field crops commonly grown are corn, soybeans, wheat, oats, and other small grain. Some of the practices needed in the management of field crops are discussed in the following paragraphs.

Maintenance of adequate fertility levels.—Many of the soils in the county, particularly those that are not dark colored, are naturally acid and are below optimum in supplies of plant nutrients. Such soils include Morley, Nappanee, and Seward soils. The soils should be tested, and lime and fertilizer should be applied according to the results of soil tests, the variety of crop to be grown, and the expected yield level.

Utilization of crop residue.—Many of the soils in the county are below optimum levels of organic-matter content. This is particularly true of the lighter colored soils, such as Blount, Belmore, and Milton soils. The surface layer of most of the lighter colored soils contains 1 to 3 percent organic matter, but that of the dark-colored soils contains 3 to 7 percent organic matter. All crop residue should be incorporated into the soil. Row crops, such as soybeans, that produce small amounts of crop residue should be supplemented with cover or sod crops.

Drainage.—More than 90 percent of the soils in Hancock County are affected by seasonal wetness. Nearly all soils described as somewhat poorly or very poorly drained retain excess water on the surface or in the soil a long time after periods of wet weather. A wet soil warms up slowly in spring, and as a result, tillage and crop growth are delayed.

The well drained and moderately well drained soils, generally, do not need to be drained artificially. Such soils are those in the Morley, Belmore, Haney, and Tuscola series. These soils commonly occur as small, narrow areas that are adjacent to soils needing drainage; therefore, it is impractical to treat them separately when a drainage system is being planned. Artificial drainage of wet spots within large areas of these soils makes some fields more usable and productive.

Landforming by grading or smoothing and surface drains and subsurface drains are used to help remove excess water from the somewhat poorly and very poorly drained soils. Surface drains are broad, shallow ditches that are generally farmed in the same way as the rest of the field. They are placed in low areas or in a systematic pattern across the slope. They are commonly used to intercept surface water at field or farm boundaries. Subsurface drains are mostly lines of buried tile. Both surface drains and subsurface drains empty into a ditch, and the outlet ditch provides some further subsurface drainage. Grade changing structures are needed to control erosion where water enters the outlet ditches.

Some light-colored soils of the uplands, such as those in the Blount and Nappanee series, require either random or systematic surface drains to remove excess water. The dark-colored soils are mostly very poorly drained and must be drained artificially to produce crops. Many of them require a combination of surface and subsurface drains. If both kinds of drains are needed, but only one kind is installed, the system cannot be as effective as it should be.

Although excess water needs to be removed from many soils in the county, water must also be conserved for the growth of the crops. The soils described as well drained or moderately well drained are likely to be too dry during part of a dry growing season. The Belmore and Haney soils, especially, are likely to contain too little moisture during dry weather. A good program of soil management helps to conserve soil moisture.

Control of erosion.—Control of erosion is a management problem on soils in the county that have slopes exceeding 2 percent. Soil blowing is a hazard on a few of the sandier soils, and erosion is a hazard on approximately 6 percent of the soils suitable for cultivation. Erosion control measures currently used are terrace and waterway systems, diversions, contour tillage, minimum tillage, utilization of crop residue, and maintenance of close-growing crops for vegetative cover.

Tillage.—Tillage should be performed at optimum soil moisture content if at all possible. Many of the soils in the county are easily compacted if tilled when too wet. Minimum tillage on all soils helps to maintain good soil structure and good tilth.

Management for pasture

The hay and pasture crops commonly grown are alfalfa, ladino clover, red clover, timothy, orchardgrass, and bromegrass.

Some of the pasture in the county is on soils that are subject to erosion. These soils are generally eroded, are low in fertility, and commonly have poor tilth. Most pasture areas are on soils where drainage is a limitation. Soils that require artificial drainage for maximum row crop production also require drainage for maximum pasture production. Some of the practices needed in the management of pasture are discussed in the following paragraphs.

Control of erosion.—This is important because many of the soils used for pasture are already eroded. Control of erosion is particularly important during seeding and the growth of seedlings. Mulch seeding or use of a nurse crop can help to control further erosion.

Drainage.—Artificial drainage, where needed, must be as well established in pasture as in areas that are used for row crops.

Lime and fertilizer.—Lime and fertilizer should be applied in adequate amounts based on the results of soil tests and on the needs of the crop grown.

Compaction.—Soil compaction caused by grazing livestock on wet soil is a major factor in the decline of livestock raising in the county. Using the soil for growing hay and other pasture crops for harvest increases forage production and reduces soil compaction. Tilling the soil within a narrow range of moisture content also helps to reduce soil compaction.

Management for special crops

Sugar beets and tomatoes.—Sugar beets and tomatoes are the dominant special crops grown in the county. They are well suited to drained areas of the deep, dark-colored Hoytville, Pewamo, Toledo, and other soils that are naturally very poorly drained. These soils have high organic-matter content and high available moisture capacity. The major limitation of these soils is soil compaction and the resultant decline in tilth. Good tilth and physical condition are essential if these soils are to produce good yields of sugar beets or tomatoes.

Truck crops.—A very small acreage of truck crops is grown in the county. Among these crops are sweet corn, cucumbers, and cabbage. They are suited to loamy soils that warm up early in spring, for example the well drained Belmore and moderately well drained Haney soils. These soils have some moisture storage limitations, but they are well suited to irrigation.

A high level of soil management is needed for successful special crop production. Additional information regarding management practices for special crops can be obtained from the Agricultural Extension Service or from field representatives of the various commercial canneries or sugar companies operating in the northwestern part of the State.

Irrigation

A suitable source of water should be found and the legal right to its use determined before irrigation of crops or pasture is begun. The Ohio Department of Natural Resources has jurisdiction over the use of water in flowing streams and can supply information concerning the use of water for irrigation.

For a soil to be suitable for irrigation, the surface layer should be porous or absorb water readily. The surface layer and subsoil should both have good water-holding capacity. Water and air in the subsoil and underlying material should be able to move freely so that waterlogging is prevented. A permeable soil allows water to drain freely, by gravity, and it warms early in spring. Among the soils in Hancock County that are suited to irrigation are the Belmore, Haney, Eel, Genesee, Seward, Tuscola, and Rawson soils. Irrigation is more likely to be needed on these soils than on other soils in the county.

Nearly every year there are dry periods when irrigation is beneficial to crops in Hancock County. Irrigation is more effective on soils that are high in fertility and that are in good physical condition than on other soils.

Supplemental irrigation should not be considered until all the soil limitations have been treated. Sufficient lime and fertilizer should be applied according to the results of soil tests so that the fertility is raised to a high level. A cropping sequence suitable for maintaining the physical condition of the soil is essential. The management practices used should be those that return adequate amounts of crop residue to the soil. If internal or surface drainage is less than optimum, provisions should be made for correcting the deficiencies.

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 used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to cranberries, horticultural crops, or other crops requiring special management.

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

In the capability system, the 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 habitat. (None in this county)
- Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat.
- Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat. (None in this county)
- Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in this county)

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

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

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIw-2. 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 each of the capability units in Hancock County is described. The names of the soil series represented are mentioned in the description of each capability unit, but the listing of the series name does not necessarily indicate that all the soils of a series are in the capability unit. The capability classification of each soil is given in the "Guide to Mapping Units," but Clay pits, Cut and fill land, Gravel pits, and Quarry, all of which are land types, are not given a capability classification.

These descriptions stress optimum management only. Suggestions for use and management of the soils are given, and features that limit the use of the soils for field crops or pasture are pointed out. One or two soils have been included in some capability units, even though they have some properties that differ from those of the rest of the soils in the unit. Generally, the acreage is so low that a separate description of these soils is not justified. The available moisture capacity ratings apply to the normal root zone of the commonly grown field crops, for example, corn and small grain. Additional information concerning erosion control, drainage, choice of crop varieties, and other management practices can be obtained from local offices of the Soil Conservation Service or the Ohio Agricultural Extension Service.

CAPABILITY UNIT I-1

This unit consists of nearly level, moderately well drained soils of the Celina, Haney, Rawson, and Tuscola series. These soils have a loam, silt loam, sandy loam, or fine sandy loam surface layer. The organic-matter content is medium to low, and the nutrient storage capacity is medium. Permeability is moderate, moderately slow, or slow. Celina, Haney, and Rawson soils have medium available moisture capacity. Tuscola soils have a high available moisture capacity. These soils are medium acid to very strongly acid in the upper part of the subsoil. Erosion is not a hazard on these soils.

The soils of this unit are suited to most crops commonly grown in the county. Small areas of these soils are used for truck crops. The soils can be cultivated continuously if optimum management is used. Tilth is generally not a limitation. Surface crusting is most likely to occur on Celina silt loam. All the soils in this unit tend to be slightly droughty, but this is of little consequence during normal years. Artificial drainage is generally not required. These soils have a seasonal high water table for relatively short periods of time in winter and early in spring, but generally this does not delay planting in spring.

These soils are suited to but are seldom used for improved permanent pasture.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, well-drained soils of the Belmore series. These soils are on loamy and gravelly beach ridges. They have a loam or sandy loam surface layer. The organic-matter content is generally low in the surface layer. The nutrient storage capacity is low to moderate, and plant nutrients tend to leach rapidly from these soils. These soils have moderately rapid permeability and medium available moisture capacity. They are medium acid in the upper part of the subsoil. Soil blowing is a hazard on Belmore sandy loam if the soil is bare in spring. The surface of Belmore sandy loam dries more readily than that of Belmore loam.

The soils of this unit are suited to most field crops grown in the county. They can be cultivated frequently if erosion is controlled. The hazard of erosion is moderate if the soils are cultivated. Poor tilth is generally not a limitation if normal management is practiced. These soils are more droughty in summer than are many other soils in the county.

These soils are seldom used for permanent pasture, but they are suited to improved pasture plants.

CAPABILITY UNIT IIe-2

This unit consists of gently sloping, moderately well drained soils in the Haney and Tuscola series. The Haney soils are on low beach ridges or outwash gravel deposits. The Tuscola soils formed in water-deposited silt and very fine sand. They lack pebbles throughout the profile. The soils in this unit have a loam, sandy loam, or fine sandy loam surface layer. The organic-matter content is low to medium in the upper soil horizons. The nutrient storage capacity is low to medium. They have moderate permeability and medium to high available moisture capacity. The surface runoff is slow to medium. These soils are very strongly acid to slightly acid in the upper part of the subsoil. The Haney soils are subject to soil blowing if they are bare in spring. The hazard of water erosion on these soils is moderate.

These soils are suited to most field crops grown in the county. They can be cultivated frequently if erosion is controlled. Artificial drainage is generally not needed on these soils. Poor tilth is not a limitation if normal management is practiced. The Haney soils tend to be droughty during prolonged dry seasons. The soils that have a fine sandy loam or sandy loam surface layer dry more quickly than those that have a loam surface layer.

These soils are seldom used for pasture, but they are well suited to the pasture plants grown in the county.

CAPABILITY UNIT IIe-3

This unit consists of gently sloping, moderately well drained soils in the Rawson and Seward series. These soils have a loam or loamy fine sand surface layer. The organic-matter content is low to medium in the upper soil horizons. The nutrient storage capacity of these soils is low to medium. Permeability is moderate or rapid in the upper part of the soil and is slow in the underlying soil material. The available moisture capacity of the Rawson soil is medium; it is lower for the Seward soil. These soils are strongly acid in the upper part of the subsoil. They have contrasting finer textured material at a depth of less than 20 to 40 inches. They are subject to water erosion if they are cultivated and not protected. The Seward soil is subject to soil blowing in spring and early in summer.

These soils are suited to most crops grown in the county. They can be cultivated frequently if erosion is controlled. Poor tilth is not a limitation if normal management is practiced. Droughtiness is a limitation during prolonged dry seasons. Artificial drainage is generally not required on these soils. They do, however, have a seasonal high perched water table for short periods. These soils can be drained by tile if wetness is a limitation.

These soils are seldom used for pasture, but they are suited to improved pasture plants.

CAPABILITY UNIT IIe-4

This unit consists of gently sloping, moderately well drained soils in the Morley and Shinrock series. These soils occupy high areas on the till plains and glacial moraines and along drainageways. They have a loam or silt loam surface layer and a fine-textured clayey subsoil. Organic-matter content is low to medium in the upper soil horizons. Nutrient storage capacity is medium. Permeability is moderately slow or slow, and available moisture capacity is medium. The upper part of the subsoil is strongly acid or medium acid. Surface runoff is medium. These soils are subject to a moderate hazard of erosion, and because they generally have short slopes, it is difficult to apply erosion control practices.

These soils are suited to most field crops grown in the county. They can be cultivated frequently if erosion is controlled and if good tilth is maintained. The maintenance of good tilth is difficult on the soils that have a silt loam surface layer. Artificial drainage is generally not required on these soils, but some areas have tile drainage because they are adjacent to less well drained soils.

These soils are suited to permanent pasture, but they are seldom used for that purpose except in areas that are adjacent to streams. Most areas of these soils are cultivated.

CAPABILITY UNIT IIe-5

The only soil in this unit is well-drained Milton silt loam, 2 to 6 percent slopes. It is moderately deep to bedrock. It generally has low to medium organic-matter content, medium nutrient storage capacity, moderately slow permeability, and medium to low available moisture capacity. Reaction is medium acid to neutral in the upper part of the subsoil. The rooting zone is restricted by the moderate depth to limestone bedrock.

This soil is suited to most field crops grown in the county. It can be cultivated frequently if optimum management is practiced; otherwise, good tilth and erosion control are difficult to maintain. Areas of this soil tend to be droughty where the depth to limestone is less than 30 inches.

Most areas of this soil are cultivated, but this soil is also well suited to permanent pasture and meadow or hay crops.

CAPABILITY UNIT IIw-1

The only soil in this unit is nearly level, deep, somewhat poorly drained Shoals silt loam. This soil is on flood plains where flooding is a hazard. Organic-matter content and nutrient storage capacity are medium. Permeability is moderate, and available moisture capacity is high. Reaction is slightly acid. Flooding commonly occurs between January and June. A seasonal high water table is a limitation. It can delay tillage in spring even though the soil is not flooded.

Summer row crops can generally be grown on areas that are artificially drained. Winter grains are not generally grown because of the danger of flooding. Undrained areas are generally too wet to cultivate. These soils can be drained by tile, but adequate outlets are difficult to establish in some areas. Standing water in low areas can be removed by shallow surface drains, and small areas that pond can be eliminated by land smoothing. Diversion terraces along the base of slopes help divert runoff from higher areas.

These soils are commonly used for permanent pasture. Forage production is good into midsummer because this soil has high available moisture capacity.

CAPABILITY UNIT IIw-2

This unit consists of nearly level to gently sloping, somewhat poorly drained soils in the Rimer series. These soils formed in sandy material and underlying finer textured glacial till or lacustrine material. They have a loamy fine sand surface layer, and finer textured underlying material is at a depth of 20 to 40 inches. Organic-matter content in the sandy surface layer is low. Nutrient storage capacity is low. Permeability is rapid in the upper 20 to 40 inches. Available moisture capacity is low. The sandy part of the soil is strongly acid. A seasonal high perched water table forms above the underlying till or lacustrine material during wet periods, and seep areas are common.

These soils are suited to most field crops grown in the county. They can be cultivated continuously if optimum management is practiced. Artificial drainage improves the timeliness of farm operations and increases crop production. Soil blowing occurs during dry periods if the soil is bare of vegetation.

Most areas of these soils are cultivated; however, these soils are well suited to forage production.

CAPABILITY UNIT IIw-3

This unit consists of nearly level or gently sloping, dominantly somewhat poorly drained soils in the Crosby, Digby, Haskins, Kibbie, and Vaughnsville series. These soils are on uplands. They formed in a variety of materials including glacial till, sandy outwash, and beach ridge deposits. They have a silt loam to fine sandy loam surface layer. Permeability is moderate to slow, and available moisture capacity is medium to high. These soils have a seasonal high water table. The Vaughnsville soil is especially subject to seepage. The Crosby silt loam and Kibbie silt loam are subject to surface crusting. Crosby and Kibbie soils are medium to strongly acid, and Vaughnsville soil is slightly acid to neutral in the upper part of the subsoil.

These soils are suited to most field crops grown in the county. They can be cultivated continuously if optimum management is practiced. Artificial drainage improves the timeliness of farming operations. These soils can be drained by tile. Erosion is a hazard on the gently sloping soils in this unit if they are cultivated and not protected.

These soils are suited to but are seldom used for improved permanent pasture. Most areas of these soils are cultivated.

CAPABILITY UNIT IIw-4

This unit consists of nearly level or gently sloping, somewhat poorly drained soils in the Blount series. These soils formed in clay loam glacial till. They have a loam or silt loam surface layer and a clayey subsoil. Permeability is slow, and available moisture capacity is medium. Nutrient storage capacity is medium. Blount soils are very strongly acid in the upper part of the subsoil. They have a seasonal high water table in winter, early in spring, and during prolonged wet periods. The soils in this unit that have a silt loam surface layer are generally low in organic-matter content and are subject to surface crusting. Some nearly level areas of these soils are subject to ponding for short periods. The gently sloping areas of soils are subject to erosion.

These soils are suited to most field crops grown in the county. They can be cultivated continuously if optimum management is practiced. Less than optimum management commonly results in excessive soil losses on the gently sloping soils. Artificial drainage of these soils helps to improve timeliness of tillage operations. Surface drains and land smoothing can be used to supplement tile drains by eliminating small pockets and removing excess surface water.

Most areas of these soils are cultivated. These soils are seldom used for permanent pasture.

CAPABILITY UNIT IIw-5

This unit consists of level or nearly level, very poorly drained soils in the Colwood, Lenawee, Mermill, and Millgrove series. These soils have a seasonal high water table for long periods of time unless they are artificially drained. They have a dark-colored surface layer ranging from silty clay loam to fine sandy loam in texture. Organic-matter content is high in the upper soil horizons. Nutrient storage capacity is medium to high. Permeability is moderate to very slow, and available moisture capacity is high. Reaction is medium acid to neutral.

If these soils are drained, they are suited to most field crops grown in the county. They can be cultivated continuously if optimum management is practiced. They are also well suited to special crops. The soils in this unit are too wet to be farmed unless they are artificially drained. Runoff from adjacent higher ground causes ponding in some places. Surface drains and tile drains help to remove surface water and to drain ponded areas. The soils having a clay loam or silty clay loam plow layer have a narrow moisture range at which tillage operations should be done. These soils are more subject to puddling and cloddiness than those that have a coarser textured plow layer. Surface crusting is not a serious limitation on these soils.

Most areas of these soils are used for cultivated crops. They are seldom used for permanent pasture.

CAPABILITY UNIT IIw-6

This unit consists of level or nearly level, very poorly drained, organic soils in the Linwood and Adrian series. These soils are dark colored and strongly acid to medium acid. Below the organic material, at a depth of 16 to 42 inches, is sandy or loamy mineral material. Linwood and Adrian soils are swampy in their natural state. They are in low areas and receive runoff from higher adjacent soils. These soils must be artificially drained if they are used for crops. Adrian muck is more difficult to drain than Linwood muck. Water table levels are generally high, and in some places drainage outlets are difficult to obtain. The subsidence of the muck caused by drainage can be controlled by carefully regulating the water table level. If the surface soil is dry, it is subject to soil blowing and damage by fire. In places these muck soils have trace element deficiencies.

These soils are well suited to row crops and special vegetable crops. Weed control is a problem, and proper weed control practices are essential for the successful production of some crops. Tile and open ditches can be used to drain these soils, but because the soils are in low areas, lift pumps are sometimes required.

Most areas of these soils are cultivated. These soils are not well suited to permanent pasture or to meadow crops.

CAPABILITY UNIT IIw-7

This unit consists of nearly level, very poorly drained soils in the Hoytville and Pewamo series. These soils occupy areas on the lake plain and till plain. The Hoytville soils generally occupy broad level areas. The areas of Pewamo soils vary greatly in size. The surface layer or plow layer of these soils is dark-colored clay loam, silty clay loam, or clay. They have moderately slow or slow permeability, high available moisture capacity, and are slightly acid to neutral. Ponding of surface water in low-lying areas is common.

If these soils are artificially drained, they are suited to most field crops commonly grown in the county and to sugar beets and tomatoes. Water movement in the Hoytville soils is slower than in the Pewamo soils. Tile drains work well, but a system of shallow surface drains to supplement the tile drains helps to remove excess water during wet periods. Land smoothing to eliminate pockets of standing water helps assure uniform crop growth and timeliness of tillage operations. The maintenance of good tilth is a serious problem on the soils that have a clay surface layer. They can be tilled only within a narrow range of moisture content and become very cloddy if tilled when wet.

Most of the acreage is drained and cultivated. These soils are seldom used for permanent pasture.

CAPABILITY UNIT IIw-8

This unit consists of well drained or moderately well drained soils in the Eel and Genesee series. These soils are on flood plains. They have a loam or silt loam surface layer that is easy to till. Organic-matter content is medium, and nutrient storage capacity is high. Permeability is moderate, and available moisture capacity is high. Reaction is slightly acid to mildly alkaline. Flooding is a hazard. Seasonal flooding is the major limitation to farming these soils. Most flooding is in winter or early in spring, but flooding can occur at any time of the year. The planting of summer crops is seldom delayed by wetness.

These soils are very well suited to row crops commonly grown in the county, and they can be grown continuously if optimum management is practiced. Summer row crops are grown, but small grains are not commonly grown because they grow during the periods of most frequent flooding.

These soils are suited to permanent pasture or planted forage crops that can tolerate flooding. Areas that flood frequently are better suited to permanent grass or trees than they are to cultivated crops.

CAPABILITY UNIT IIs-1

This unit consists of nearly level, moderately well drained or well drained soils in the Belmore and Seward series. The Belmore soils are on loamy and gravelly beach ridges. The material underlying the Belmore soils is stratified sand and gravel mixed with some finer textured sediment. The Seward soil is on the lake plain or close to the beach ridges on the till plain. It formed in sandy material over clay loam glacial till or fine-textured lacustrine material. The Belmore and Seward soils in this unit have a loam to loamy fine sand surface layer that has low organic-matter content. To a depth of 20 to 32 inches, the Seward soil is sandy and generally is free of pebbles. The Belmore soils have moderately rapid permeability and medium available moisture capacity. The Seward soil has rapid permeability in the upper part of the profile and slow permeability in the lower part of the subsoil. It has lower available moisture capacity than the Belmore soils. Both soils are strongly acid to medium acid. Soil blowing is a hazard on these soils if they are bare of vegetation, and it is a particular hazard on Seward loamy fine sand early in spring.

These soils are suited to most field crops grown in the county. Summer crops, however, are more likely to be damaged by drought on these soils than on most other soils in the county. Plant nutrients in these soils are subject to rapid leaching. Seasonal droughtiness is the major limitation to the use of these soils for crops. A temporary perched water table can occur in the Seward soils early in spring or during prolonged wet periods, but tillage and planting are seldom delayed. Poor tilth is not a limitation.

Most areas of these soils are cultivated. Legume or grass meadows grow well early in the season when moisture is plentiful. These soils are suited to permanent pasture.

CAPABILITY UNIT IIs-2

The only soil in this unit is Milton silt loam, 0 to 2 percent slopes. This soil is well drained. It formed in 20 to 40 inches of glacial till overlying limestone bedrock. Variable amounts of limestone and igneous rock fragments are on the surface and throughout the profile. This soil has a silt loam surface layer and a clayey subsoil. The nutrient storage capacity is medium. Permeability is moderately slow, and available moisture capacity is moderate to low. Reaction is medium acid to neutral. This soil is droughty during prolonged dry periods, particularly where the limestone bedrock is near the surface.

The soil is suited to most field crops grown in the county and can be cultivated continuously if optimum management is practiced. Late-season crops that require large amounts of moisture are likely to be damaged by a water shortage in summer unless rains are timely. This soil is well suited to small grain.

Most areas are cultivated. This soil is well suited to improved pasture, but forage growth is reduced during dry periods in summer.

CAPABILITY UNIT IIIe-1

The only soil in this unit is shallow, well-drained Ritchey silt loam, 1 to 5 percent slopes. It has a silt loam surface layer. The nutrient storage capacity is medium, and organic-matter content is low. It has moderately slow permeability and low to very low available moisture capacity. It is medium acid in the upper part of the subsoil. The depth to the limestone bedrock ranges from 10 to 20 inches. Variable amounts of limestone fragments are on the surface and in the soil. Surface crusting is likely and can hinder the emergence of seedlings.

This soil is suited to most field crops commonly grown in the county, but it is especially well suited to winter grains. The most serious limitation to its use for crops is the hazard of erosion. Summer crops that require large amounts of moisture are likely to be damaged by a water shortage unless rainfall is timely.

Most areas are cultivated. This soil is well suited to use for pasture. Legume and grass meadows grow well early in spring and summer, but forage growth is reduced during prolonged dry periods.

CAPABILITY UNIT IIIe-2

This unit consists of gently sloping to sloping, moderately well drained or somewhat poorly drained soils in the Morley and Blount series. The somewhat poorly drained Blount soil has been placed in this unit because it is moderately eroded and small in acreage. The soils in this unit formed in clay loam glacial till. They have a thin silt loam surface layer and a clayey subsoil. Permeability is slow, and available moisture capacity is medium. Reaction is strongly acid to very strongly acid in the upper part of the rooting zone. These soils are severely erodible if cultivated, because surface runoff is rapid. Maintaining good tilth is a problem, because most of the soils are moderately eroded.

These soils are suited to field crops commonly grown in the county. Row crops can be grown if optimum management is practiced. A severe hazard of erosion is the dominant limitation to the use of these soils for crops. The soils have a perched water table during prolonged wet periods. A random system of tile drains helps to remove excess water. If it is not drained, the Blount soil tends to stay wet longer than the Morley soils.

Most areas of these soils are cultivated. The soils are suited to improved pasture and can be either harvested for hay or pastured. Care should be taken during wet periods to avoid trampling the pasture and compacting the soil.

CAPABILITY UNIT IIIe-3

The only soil in this unit is well-drained Belmore loam, 6 to 12 percent slopes. The surface layer is generally low in organic-matter content. This soil has moderately rapid permeability and tends to warm up rapidly in spring. It is medium acid unless it has been limed. Because of slope, the hazard of erosion is severe if the soil is cultivated. Tilth is generally good.

This soil is suited to the field crops commonly grown in the county, but it is likely to be too droughty in summer for crops that require large amounts of moisture. It can be cultivated frequently if erosion is controlled. Less than optimum management generally results in excessive soil losses and a soil that is less suited to crops.

Most areas of this soil are cultivated. This soil can be used for pasture or hay crops, but growth is likely to be restricted during dry periods.

CAPABILITY UNIT IIIw-1

This unit consists of very poorly drained soils in the Sloan series. These soils are on flood plains where flooding is a hazard. They have a dark-colored loam or silty clay loam surface layer. The organic-matter content is high in the surface layer. Permeability is moderate, and available moisture capacity is high. The nutrient storage capacity is medium to high. Reaction is slightly acid. Surface water tends to concentrate in old stream channels and scoured areas. The water table is seasonally high.

Where flooding is infrequent, row crops can be grown regularly or even continuously if the soils are adequately drained. Poor tilth is a limitation, unless optimum management is practiced, particularly on Sloan silty clay loam. Small grain generally is not grown because of the risk of damage from winter flooding. Standing water in low areas can be removed by shallow surface drains, and wetness in small ponded areas can be eliminated by land smoothing. Diversion terraces along the base of slopes help to intercept runoff from higher areas. These soils can be tile drained, but in many places adequate outlets are lacking. Unless drained, the soils are ordinarily too wet for crop production.

These soils are commonly used for permanent pasture. Forage production is good because the soils have high available moisture capacity. Areas that flood frequently are better suited to permanent grass or trees than to cultivated crops.

CAPABILITY UNIT IIIw-2

This unit consists of level or nearly level, very poorly drained soils in the Millsdale and Toledo series. These soils have a seasonally high water table. The Toledo soil formed in fine-textured lake-laid sediment. The Millsdale soils formed in glacial till material underlain by limestone bedrock at a depth of 20 to 40 inches. These soils have a very dark colored loam, silt loam, or silty clay loam surface layer. The organic-matter content is high in the upper soil horizons. The nutrient storage capacity is medium to high. Reaction is slightly acid to neutral. Permeability is moderately slow or slow, and available moisture capacity is high. Some areas of the Millsdale soils are subject to minor flooding.

These soils are suited to most field crops commonly grown in the county. They can be continuously cultivated if optimum management is practiced. Crusting is not generally a limitation, but these soils can be cloddy if they are tilled when wet. Winter grains are not commonly grown on the areas of Millsdale soil that are subject to flooding.

These soils are generally too wet for good crop production unless they are drained. Tile drains are difficult to install in the Millsdale soils because of the limited and variable depth to limestone bedrock, but tile can be used to drain the rest. Land smoothing and surface drains can eliminate the wetness in small areas where water tends to pond. Diversion terraces along the base of slopes help to intercept the runoff from higher areas. Most areas of these soils are drained and cultivated.

CAPABILITY UNIT IIIw-3

This unit consists of nearly level or gently sloping, somewhat poorly drained soils in the Fulton, Nappanee, and Randolph series. These soils have a loam or silt loam surface layer and a clayey subsoil. The Randolph soils are underlain by limestone bedrock at a depth of 20 to 40 inches. The organic-matter content is low to medium in the surface layer. The nutrient storage capacity is medium to high. Permeability is moderately slow or slow, and available moisture capacity is medium. These soils are generally strongly acid unless they have been limed. They have a seasonally high water table. The soils that have a silt loam surface layer are especially susceptible to surface crusting.

If these soils are drained, they are suited to most field crops commonly grown in the county. They can be cultivated often if optimum management is practiced. Less than optimum management commonly results in poor tilth and lower crop production. Artificial drainage helps to lower the seasonally high water table in these soils. Tile drains work well but are difficult to install in the Randolph soils because of the underlying limestone bedrock. All of the soils drain rather slowly, and surface drainage helps to remove excess water. Erosion is a hazard on the gently sloping soils if they are cultivated.

Most areas of these soils are cultivated. If these soils are properly managed, they are well suited to improved pasture. Care should be taken during wet periods to avoid trampling of the pasture and resultant compaction of the soil.

CAPABILITY UNIT IIIw-4

The only soil in this unit is very poorly drained Granby loamy fine sand. The dark-colored plow layer of this soil is sandy and has a high organic-matter content. The nutrient storage capacity is generally medium to low. Permeability is rapid, available moisture capacity is low, and reaction is medium acid to neutral. This soil has a high water table for long periods unless it is artificially drained.

Drained areas of this soil are suited to most field crops commonly grown in the county. Special crops such as tomatoes and sugar beets are also grown. The soil is well suited to crops despite a low available moisture capacity, because it occupies areas where seepage from adjacent areas tends to accumulate. It can be cultivated continuously if optimum management is practiced. Drained areas dry out and warm up rapidly in spring. Tile drains can be used in this soil, but sand tends to flow or pipe into the tile and plug it.

Drained areas of this soil are seldom used for pasture, but legume-grass meadows grow well. Undrained areas are suited to permanent pasture but are seasonally too wet for good pasture.

CAPABILITY UNIT IIIs-1

This unit consists of nearly level to gently sloping soils in the Ottokee and Dunbridge series. The Ottokee soil is moderately well drained, and the Dunbridge soil is well drained. These soils formed in sandy deposits. They occur in the central part of the county, along the edge of the Findlay Basin, and in Biglick Township. They have a loamy fine sand surface layer. The organic-matter content is low in the Ottokee soil and medium in the Dunbridge soil. The nutrient storage capacity is low. Permeability is rapid, and available moisture capacity is low. The soils are droughty during prolonged dry periods and are subject to soil blowing in winter and early in spring.

Water erosion is a hazard in the gently sloping areas. Tilth is not a limitation on these sandy soils.

These soils are suited to most field crops grown in the county, but early crops are better suited than late crops because of the hazard of summer drought. These soils can be cultivated frequently if optimum management is practiced. Deep-rooted legumes in legume-grass meadows grow satisfactorily. Prolonged dry periods reduce late cuttings.

CAPABILITY UNIT IVe-1

This unit consists of gently sloping to moderately steep, somewhat poorly drained or moderately well drained soils in the Morley and Nappanee series. These soils generally occur as small areas associated with less steep areas. They have been grouped together because they have a thin silt loam surface layer and a clayey subsoil. Some of the clayey subsoil has been mixed with the plow layer because of erosion. These soils have slow permeability and medium available moisture capacity. They are strongly acid in the upper part of the subsoil. The hazard of erosion is very severe if these soils are cultivated. Short slopes make it difficult to establish erosion control practices. Good tilth is difficult to maintain. The Nappanee soil stays wet longer in spring than the Morley soil.

These soils are suited to most field crops grown in the county. The slope and location of the soils make it difficult to plan a satisfactory cropping sequence on a field basis. They can be used for cultivated crops occasionally but are better suited to long-term grasses or legumes. Erosion is difficult to control if the soils are cultivated more frequently. Drainage is generally not required, but these soils do have a temporary perched water table during prolonged wet periods.

Most areas of these soils are farmed and are well suited to permanent pasture. They are suited to improved pasture if optimum management is practiced. Care should be taken during wet periods to avoid trampling the pasture and compacting the soil.

CAPABILITY UNIT IVw-1

The only soil in this unit is nearly level, poorly drained Joliet silty clay loam. This soil occupies low-lying upland areas where limestone bedrock is near the surface. Variable amounts of limestone and igneous rock fragments are on the surface and throughout the soil profile. The soil has a dark-colored silty clay loam surface layer that is high in organic-matter content. Nutrient storage capacity is medium. Permeability is moderate, available moisture capacity is very low, and reaction is neutral.

The major limitations to the use of this soil for farming are shallowness to bedrock and poor natural drainage. This soil is not well suited to most row crops because of shallowness and seasonal wetness. It can be cultivated occasionally but is better suited to pasture or hay crops. Artificial drainage can help to dry this soil, but tile drains are difficult to install because of the shallowness to limestone bedrock. Standing water in low areas can be removed by shallow surface drains, and wetness in small ponded areas can be eliminated by land smoothing. Diversion terraces along the bases of slopes help to intercept water from higher areas.

Many areas of this soil are in permanent pasture. Forage production is limited because of very low available moisture during prolonged dry periods. Legumes seeded with grass produce greater amounts of forage than grass alone.

CAPABILITY UNIT VIs-1

The only soil in this unit is well-drained Romeo silt loam, 0 to 10 percent slopes. This soil is mainly in Biglick Township and Liberty Township. It has a dark-colored silt loam surface layer. Depth to bedrock is less than 10 inches, but bedrock outcrops are not common. The organic-matter content is medium, and nutrient storage capacity is low. Permeability is moderate, available moisture capacity is very low, and reaction is slightly acid to mildly alkaline.

The soil has limited use for farming. Rock fragments on the surface and throughout the soil interfere with tillage. The very shallow depth to bedrock also limits the use of tillage equipment even if the soil could be cleared of limestone fragments.

Many areas of this soil have been cleared for pasture, but in general, permanent pasture on this soil is of poor quality. Reseeding to improve the pasture and applying lime and fertilizer according to needs shown by soil tests greatly increase forage production.

Estimated Yields

Table 1 shows the predicted yields for each soil in the county based on yields for the 5-year period 1958-63. Expected yields of the principal crops are shown for two levels of management.

Optimum management includes the following: Increasing the water-intake rate and the water-holding capacity of the soils; removing excess water; controlling erosion; plowing, preparing the seedbed, and using appropriate tillage practices that are suited to the soil and the crop; controlling weeds and insect pests; applying lime and fertilizer according to the results of soil tests; conducting all farming operations at the proper time; and choosing improved crop varieties. Irrigation is not included in this management.

Under improved management, the level of management prevailing in the county, one or more of the practices for optimum management is lacking or is not applied adequately.

Yields shown in table 1 are assumed to be the average that can be expected over a 5-year period. Weather causes unpredictable variations in yields; therefore, yields for a particular soil may be higher or lower than the figures shown for any one year. The yields indicated are intended as only a guide to the relative productivity of the soils and an indication of how the soils respond to optimum management.

Predicted yields shown in columns A are those that can be expected using the improved level of management common to the area.

In columns B are estimates of yields obtained under an optimum level of management based on the best information available.

Hay yields shown in columns A are based on red clover and timothy mixtures. Yields in columns B are based on yields of the better suited legumes and grasses.

Special crops, such as tomatoes and sugar beets, are only rated at the optimum level of management. Yields that could be expected at an improved level of management will not ordinarily bring profitable returns.

Table 1.—*Estimated average acre yields of principal crops under two levels of management*

[Yields in columns A are those to be expected under present improved management; yields in columns B are those to be expected under optimum management. Dashes indicate that the crop is not well suited to the soil or that it is not commonly grown. Clay pits, Cut and fill land, Gravel pits, and Quarry are not listed, because they are not suited to crops]

Soil	Corn		Soybeans		Wheat		Oats		Hay [1]		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*	*Tons*	*Tons*	*Tons*
Adrian muck [4]	75	105	32	40	----	----	----	----	----	----	----	----
Belmore loam, 0 to 2 percent slopes	60	90	25	35	30	38	60	75	2.5	4.0	----	11.5
Belmore loam, 2 to 6 percent slopes	60	85	25	35	30	38	50	70	2.5	4.0	----	11.2
Belmore loam, 6 to 12 percent slopes	60	80	25	35	30	36	45	65	2.5	4.0	----	9.5
Belmore sandy loam, 0 to 2 percent slopes	60	85	25	38	30	36	45	65	2.5	4.0	----	11.2
Belmore sandy loam, 2 to 6 percent slopes	60	85	25	35	30	38	55	70	2.5	4.0	----	10.5
Blount loam, 0 to 2 percent slopes	80	115	30	40	35	45	60	78	3.0	5.0	16.0	9.5
Blount loam, 2 to 6 percent slopes	75	115	30	40	35	45	60	76	3.0	5.0	15.5	9.0
Blount silt loam, 0 to 2 percent slopes	75	115	30	40	35	45	60	78	3.0	5.0	16.0	9.5
Blount silt loam, 2 to 6 percent slopes	75	115	30	40	35	45	60	76	3.0	5.0	15.5	9.0
Blount silt loam, 2 to 6 percent slopes, moderately eroded	70	100	25	35	35	45	60	75	3.0	5.0	15.0	----
Celina silt loam, limestone substratum, 0 to 2 percent slopes	85	120	30	40	37	45	60	80	3.5	5.0	15.8	9.3
Colwood loam	85	120	30	40	30	50	60	86	3.5	5.0	28.0	22.8
Crosby silt loam, limestone substratum, 0 to 2 percent slopes	90	115	30	40	35	45	55	75	3.0	5.0	15.9	9.4
Digby loam, 0 to 2 percent slopes	80	120	30	40	35	42	60	75	2.5	4.5	20.0	12.5
Digby loam, 2 to 6 percent slopes	80	120	30	40	35	40	60	75	2.5	4.5	18.0	12.2
Digby sandy loam, 0 to 2 percent slopes	70	110	30	40	35	40	60	73	2.5	4.5	18.0	12.2
Dunbridge loamy fine sand, 2 to 6 percent slopes	60	80	20	25	30	35	45	65	1.5	3.0	----	----
Eel loam [4]	80	115	28	40	35	45	55	76	2.0	4.0	21.0	11.9
Eel silt loam [4]	80	115	28	40	35	45	55	76	2.0	4.0	21.0	11.9
Fulton silt loam, 0 to 2 percent slopes	75	105	25	35	30	40	50	75	2.0	3.5	16.0	9.5
Fulton silt loam, 2 to 6 percent slopes	75	105	25	35	30	40	50	75	2.0	3.5	15.0	9.0
Genesee silt loam [4]	80	115	30	40	37	45	60	80	2.5	4.5	21.0	12.5
Granby loamy fine sand	50	80	20	28	26	35	50	70	2.5	4.5	27.0	21.5
Haney loam, 0 to 2 percent slopes	85	115	28	35	38	45	65	80	2.0	4.0	19.0	12.0
Haney loam, 2 to 6 percent slopes	85	115	28	35	38	45	65	80	2.0	4.0	19.0	11.2
Haney sandy loam, 0 to 2 percent slopes	80	100	28	35	38	45	65	80	2.0	4.0	18.0	11.9
Haney sandy loam, 2 to 6 percent slopes	75	95	28	35	38	45	65	80	2.0	4.0	18.0	11.0
Haskins fine sandy loam, 0 to 2 percent slopes	90	120	30	40	40	50	65	80	3.5	4.5	19.5	11.3
Haskins fine sandy loam, 2 to 6 percent slopes	80	100	30	40	40	50	65	80	3.5	4.5	19.0	11.0
Haskins loam, 0 to 2 percent slopes	90	120	30	40	40	50	65	80	3.5	4.5	20.0	11.9
Haskins loam, 2 to 6 percent slopes	80	100	30	40	40	50	65	80	3.5	4.5	20.0	11.2
Hoytville clay	80	115	33	40	37	47	60	80	2.5	5.0	27.0	21.5
Hoytville clay loam	80	115	33	40	37	47	60	80	2.5	5.0	27.5	21.7
Joliet silty clay loam	50	75	20	25	25	35	40	60	1.5	3.0	----	----
Kibbie fine sandy loam, 0 to 2 percent slopes	80	110	27	36	35	45	55	75	2.0	4.0	19.0	11.5
Kibbie fine sandy loam, 2 to 6 percent slopes	80	110	26	35	35	45	55	75	2.0	4.0	18.0	11.0
Kibbie loam, 0 to 2 percent slopes	80	115	30	40	35	45	55	75	2.0	4.0	19.5	11.5
Kibbie loam, 2 to 6 percent slopes	80	110	27	35	35	45	55	75	2.0	4.0	19.0	11.0
Kibbie silt loam, 0 to 2 percent slopes	80	115	30	40	35	45	55	75	2.0	4.0	19.6	11.5
Kibbie silt loam, 2 to 6 percent slopes	80	110	27	35	35	45	55	75	2.0	4.0	19.1	11.0
Lenawee loam	90	130	30	40	30	45	60	85	3.0	5.0	27.5	21.2
Lenawee silty clay loam	90	130	30	40	28	45	60	85	3.0	5.0	27.2	21.0
Linwood muck	90	115	32	40	----	----	----	----	----	----	----	----
Mermill clay loam	95	130	32	40	39	46	64	84	3.0	5.0	26.0	22.4
Mermill loam	95	130	33	40	39	46	65	85	3.0	5.0	26.0	22.5
Millgrove clay loam	95	130	33	40	40	47	65	84	3.0	5.0	27.2	21.9
Millgrove fine sandy loam	95	130	33	40	40	47	65	85	3.0	5.0	26.9	21.6
Millgrove loam	95	130	33	40	40	47	65	85	3.0	5.0	27.0	21.8
Millsdale loam [4]	65	100	27	37	30	45	50	80	3.0	4.5	13.5	9.4
Millsdale silt loam [4]	65	100	27	37	30	45	50	80	3.0	4.5	13.6	9.3
Millsdale silty clay loam [4]	65	100	28	38	30	45	50	80	3.0	4.5	14.0	9.2
Milton silt loam, 0 to 2 percent slopes	60	90	22	32	28	40	45	75	2.5	4.0	----	9.5
Milton silt loam, 2 to 6 percent slopes	60	90	22	31	28	40	45	75	2.5	4.0	----	----
Morley loam, 2 to 6 percent slopes	70	95	20	32	26	38	48	78	3.0	4.0	15.5	9.0
Morley silt loam, 2 to 6 percent slopes	70	95	20	32	26	38	48	78	3.0	4.0	15.5	9.0
Morley silt loam, 2 to 6 percent slopes, moderately eroded	70	90	20	31	26	38	48	78	3.0	4.0	----	----
Morley silt loam, 6 to 12 percent slopes	65	90	20	31	26	38	48	78	3.0	4.0	----	----
Morley silt loam, 6 to 12 percent slopes, moderately eroded	60	80	19	29	22	34	45	72	2.5	3.5	----	----
Morley silt loam, 12 to 18 percent slopes, moderately eroded	55	75	18	26	20	31	36	65	2.5	3.5	----	----
Nappanee loam, 0 to 2 percent slopes	70	100	25	33	35	43	50	70	2.0	3.5	15.0	9.5
Nappanee loam, 2 to 6 percent slopes	70	100	22	29	30	40	50	70	2.0	3.5	14.0	----
Nappanee silt loam, 0 to 2 percent slopes	70	100	25	33	30	40	50	70	2.0	3.5	15.0	9.4

Footnotes at end of table.

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

Soil	Corn		Soybeans		Wheat		Oats		Hay [1]		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*	*Tons*	*Tons*	*Tons*
Nappanee silt loam, 2 to 6 percent slopes	70	100	22	29	30	40	50	70	2.0	3.5	14.0	--------
Nappanee silt loam, 4 to 10 percent slopes, moderately eroded	65	90	21	27	28	33	45	65	2.0	3.5	13.0	--------
Ottokee loamy fine sand, 0 to 4 percent slopes	60	95	23	32	30	40	50	75	2.0	3.5	--------	9.5
Pewamo clay	95	130	30	42	35	46	50	80	3.0	4.5	27.0	20.9
Pewamo silty clay loam	95	130	30	42	35	46	50	80	3.0	4.5	27.2	21.0
Randolph loam, 0 to 2 percent slopes	80	105	24	32	26	35	40	72	2.5	4.0	12.0	9.6
Randolph silt loam, 0 to 2 percent slopes	80	105	24	32	26	35	40	72	2.5	4.0	12.0	9.6
Randolph silt loam, 2 to 6 percent slopes	75	100	23	30	26	35	40	70	2.5	4.0	11.5	9.2
Rawson loam, 0 to 2 percent slopes	85	120	22	35	35	45	55	80	3.5	5.0	19.0	11.0
Rawson loam, 2 to 6 percent slopes	80	110	22	34	35	45	55	80	3.5	5.0	18.0	10.0
Rimer loamy fine sand, 0 to 2 percent slopes	70	100	22	33	26	35	40	70	3.0	4.0	--------	9.5
Rimer loamy fine sand, 2 to 6 percent slopes	70	100	22	33	26	35	40	70	3.0	4.0	--------	--------
Ritchey silt loam, 1 to 5 percent slopes	48	62	17	22	24	33	38	68	1.5	3.0	--------	--------
Romeo silt loam, 0 to 10 percent slopes	----	----	----	----	----	----	----	----	1.5	2.0	--------	--------
Seward loamy fine sand, 0 to 2 percent slopes	60	82	23	33	28	35	40	72	1.7	3.5	--------	9.0
Seward loamy fine sand, 2 to 6 percent slopes	60	80	23	32	28	35	40	70	1.7	3.3	--------	--------
Shinrock silt loam, 2 to 6 percent slopes	90	105	30	36	30	45	60	80	3.0	4.5	15.0	9.0
Shoals silt loam [4]	80	105	26	35	35	40	50	72	2.5	4.5	15.0	11.9
Sloan loam [4]	80	110	35	42	40	45	65	78	3.0	4.5	25.5	20.8
Sloan silty clay loam [4]	80	105	35	40	40	45	65	78	3.0	4.5	25.0	20.2
Toledo silty clay loam	95	130	33	38	40	50	60	80	3.0	5.0	26.0	20.8
Tuscola fine sandy loam, 0 to 2 percent slopes	75	105	24	38	28	46	46	80	3.0	4.5	19.5	12.0
Tuscola fine sandy loam, 2 to 6 percent slopes	75	105	23	37	28	46	46	78	3.0	4.5	18.5	11.0
Tuscola loam, 2 to 6 percent slopes	75	105	24	38	28	46	46	80	3.0	4.5	18.6	11.1
Vaughnsville loam, 1 to 4 percent slopes	75	100	28	32	33	38	60	75	2.0	3.8	18.5	11.0

[1] Pasture yields are not given, but cow-acre-days of pasture can easily be estimated by the following procedure: convert tons of hay to pounds (multiply by 2,000) and divide the total pounds by 40.

[2] Soils not rated if yield is less than 12 tons.

[3] Soils not rated if yield is less than 9 tons.

[4] Subject to flooding, but yields are given on the assumption that no flooding occurs.

Estimates of yields are based on interviews with farmers; yields in demonstration plots; on direct observations by the county agent, the district conservationist of the Soil Conservation Service, the soil survey party chief of the Division of Lands and Soil; and on results obtained in field trials and experiments at the Ohio Agricultural Research and Development Center.

Woodland and Windbreaks

The dominant natural vegetation at the time of early settlement in Hancock County consisted of deciduous forest species. Swamp forest occupied the Hoytville and Lenawee soil associations, but a mixture of many kinds of hardwood trees occupied the rest of the associations. Prairie vegetation was dominant in the small, irregularly shaped openings of the woodland.

Most of the original woodland has been cleared, and the soils are now used for crops. About 7 percent of the acreage remains in woodland. Most stands are 3 to 10 acres in size. On farms, they commonly occupy areas that are odd in shape or that are not used for crops because they are difficult to drain. At present, there remain only a few woodland stands that are of good composition and quality. These are stands that have been preserved through the years for sentimental and esthetic reasons. Most of the woodlots have been selectively harvested over the years, and improvement of these timber stands is needed.

The soils in the county differ in their suitability to tree species. Potential productivity for some of the soil series is indicated in table 2, which gives the site index and the average yearly growth rates for upland oaks. Site index is the average height, in feet, of the dominant and codominant trees in a stand at 50 years of age. Information pertaining directly to the soils in Hancock County is limited, but woodland trees on the same kinds of soils in other counties had been measured and the data correlated to establish site indexes. In general, the site index shown for each of the soil series in table 2 is for upland oaks, but on plots of Granby soils it is for pin oak, and on some plots of Hoytville soils, it is for ash. The potential annual growth rates are based on data published in the USDA Technical Bulletin 560 (*13*); they are for trees grown in an arbitrary 80-year rotation.

Windbreaks have an increasing importance in the county as woodlands gradually disappear, particularly because of the nearly level topography. As more of the woodlands are cleared, the need for slowing wind velocity near the ground is greater.

Field windbreaks are effective in helping to control soil blowing. Soils on the beach ridges tend to blow in spring before a thick plant cover is established. Windbreaks also help to slow drying winds in summer and help to distribute snow more evenly in winter.

Austrian pine is suited to many kinds of soils and makes an effective windbreak. Arborvitae is suited to the dark-colored, poorly drained soils, such as Pewamo and Hoytville. It also makes an excellent windbreak either as a single row or on the windward side of a multirow windbreak. Red pine and white pine are suited to well drained and moderately well drained soils, such as Belmore, Haney, and Morley.

TABLE 2.—*Potential productivity of upland oaks on specified soils*

[Site indexes and estimated yearly growth rates based on data published by USDA (*13*)]

Soil series	Number of plots sampled	Site index	Estimated average yearly growth rate per acre
			Board feet [1]
Blount	3	65–75	265
Celina	2	85–95	420
Crosby	2	65–75	265
Granby	2	[2] 87	396
Hoytville	6	67–77	280
	4	[3] 72–82	
Morley	2	75–85	340
Ottokee	7	65–75	265
Seward	1	63	217

[1] According to International ¼-inch rule.
[2] This site index is for pin oak.
[3] This site index is for ash.

Windbreaks have an added value in the relatively treeless areas of the county. They provide a welcome esthetic effect and cover for wildlife.

Wildlife

Soil interpretations for wildlife habitat can serve as an aid in selecting the more suitable sites for various kinds of habitat management, as indicators of the level of management intensity needed to obtain satisfactory results, and as a means of showing why it may not be feasible to manage a particular area for a given kind of wildlife. These interpretations may also serve in broad-scale planning of wildlife management areas, parks, and nature areas or for acquiring wildlife lands.

The soil areas shown on the soil survey maps are rated without regard to positional relationships with adjoining mapped areas. The size, shape, or location of the outlined areas does not affect the rating. Certain influences on habitats, such as elevation and aspect, must be appraised onsite.

The dominant game species now in the county are pheasant, rabbit, squirrel, raccoon, and deer. The Blount-Pewamo association has the best combination of food and cover for rabbits. The Sloan-Eel-Shoals association provides good cover and water for rabbits, but mortality is high because of damage to nesting areas by flooding. The Hoytville and Lenawee associations have the largest populations of pheasants. Deer, once common in the county, are now rarely seen. They are concentrated in the southern part of the county in the Blount-Pewamo association. Their numbers depend upon the number and size of woodland areas.

The Blanchard River offers a fair sanctuary for migratory waterfowl. Fishing in this river is good to fair upstream from Findlay and fair to poor downstream from Findlay. Most of the soil associations in the county contribute large amounts of silt and clay to the river. Home and industrial pollution have contributed to reduced game fish and panfish populations in the streams of the county.

Food supplies for wildlife, especially feed grains, are in good supply on all the soil associations except the Millsdale-Milton-Randolph soil association. Wildlife cover is generally lacking in all areas that are intensively tilled. Drainage ditches are common throughout the county, and they provide water and cover for wildlife in many areas.

In table 3, the soils of Hancock County are rated for their relative suitability for the creation, improvement, or maintenance of eight wildlife habitat elements (*1*). These ratings are based upon limitations imposed by the characteristics or behavior of the soil. Four levels of suitability are recognized—well suited, suited, poorly suited, and unsuited. The ratings of suitability given in table 3 are defined in the following paragraphs.

Well suited means that there are few or no soil limitations for the particular element of habitat.

Suited means that habitat elements can be created, improved, or maintained, but there are moderate soil limitations that affect habitat management.

Poorly suited means that habitat elements can be created, improved, or maintained on these soils, but there are severe soil limitations.

Unsuited means that habitat elements cannot be created, improved, or maintained, or that it is impractical to attempt to do so under the prevailing soil conditions.

The elements of wildlife habitat rated in table 3 are described in the following paragraphs.

GRAIN AND SEED CROPS.—Among the grain and seed crops important to wildlife are corn, soybeans, oats, barley, rye, and wheat.

GRASSES AND LEGUMES.—Alfalfa, Ladino clover, red clover, fescue, bromegrass, bluegrass, and timothy are good plants for wildlife food and cover.

WILD HERBACEOUS UPLAND PLANTS.—These plants are important to wildlife; they include foxtail, ragweed, panicgrass, wild oats, native lespedezas, and herbs.

HARDWOOD WOODY PLANTS.—Such trees and shrubs include sumac, wild grape, dogwood, persimmon, multiflora rose, blackhaw, sweetgum, wild cherry, and such trees as oaks, hickory, and walnut. The soils are rated on the basis of producing good growth and large crops of fruit or seeds.

CONIFEROUS WOODY PLANTS.—Plants in this catagory include eastern redcedar, Virginia pine, Scotch pine, and Austrian pine. The soils are rated on the basis that delayed growth and canopy closure are the most desirable for wildlife.

WETLAND FOOD AND COVER PLANTS.—Important plants of this kind include cattails, sedges, reeds, barnyard grass, duckweed, and various willows.

SHALLOW WATER DEVELOPMENTS.—These developments include impoundments, excavations, and areas where the depth of water controlled is generally less than 5 feet.

PONDS.—These include larger excavations where at least one-fourth of the water areas have an average depth of 8 feet, and where the ponds have water of suitable quality for the production of fish or wildlife.

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

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grass and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants
Adrian: Ad	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited
Belmore: BlA, BlB, BmA, BmB, BmC.	Well suited	Well suited	Well suited	Well suited	Poorly suited
Blount:					
BnA, BoA	Suited	Suited	Well suited	Well suited	Poorly suited
BnB, BoB, BoB2	Suited	Suited	Well suited	Well suited	Poorly suited
Celina: CeA	Well suited	Well suited	Well suited	Well suited	Poorly suited
Clay pits: Cl	Unsuited	Unsuited	Poorly suited	Poorly suited	Well suited
Colwood: Co	Unsuited	Poorly suited	Suited	Well suited	Well suited
Crosby: CrA	Suited	Suited	Well suited	Well suited	Poorly suited
Cut and fill land: Cu	Unsuited	Unsuited	Poorly suited	Poorly suited	Well suited
Digby:					
DgA, DmA	Suited	Suited	Well suited	Well suited	Suited
DmB	Suited	Suited	Well suited	Well suited	Suited
Dunbridge: DuB	Suited	Well suited	Well suited	Well suited	Poorly suited
Eel: Ea, Em	Well suited	Well suited	Well suited	Well suited	Poorly suited
Fulton:					
FtA	Suited	Suited	Suited	Well suited	Poorly suited
FtB	Suited	Suited	Suited	Well suited	Poorly suited
Genesee: Gn	Well suited	Well suited	Well suited	Well suited	Poorly suited
Granby: Go	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Gravel pits: Gp	Unsuited	Unsuited	Unsuited	Unsuited	Well suited
Haney:					
HaA, HdA	Well suited	Well suited	Well suited	Well suited	Poorly suited
HaB, HdB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Haskins:					
HkA, HnA	Suited	Suited	Well suited	Well suited	Poorly suited
HkB, HnB	Suited	Suited	Well suited	Well suited	Poorly suited
Hoytville: Ho, Hv	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Joliet: Jo	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited
Kibbie:					
KfA, KlA, KsA	Suited	Suited	Well suited	Well suited	Poorly suited
KfB, KlB, KsB	Suited	Suited	Well suited	Well suited	Poorly suited
Lenawee: Le, Ln	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Linwood: Lw	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited
Mermill: Me, Mf	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Millgrove: Mg, Mh, Mk	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Millsdale: Mm, Mn, Mo	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Milton: MrA, MrB	Suited	Well suited	Well suited	Well suited	Poorly suited
Morley:					
MsB, MyB, MyB2	Well suited	Well suited	Well suited	Well suited	Poorly suited
MyC, MyC2	Suited	Well suited	Well suited	Well suited	Poorly suited
MyD2	Poorly suited	Suited	Well suited	Well suited	Poorly suited
Nappanee:					
NaA, NpA	Suited	Suited	Suited	Well suited	Poorly suited
NaB, NpB	Suited	Suited	Suited	Well suited	Poorly suited
NpC2	Suited	Suited	Suited	Well suited	Poorly suited
Ottokee: OtB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Pewamo: Pm, Po	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Quarry: Qu	Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.
Randolph:					
RbA, RlA	Suited	Suited	Well suited	Well suited	Poorly suited
RlB	Suited	Suited	Well suited	Well suited	Poorly suited
Rawson:					
RmA	Well suited	Well suited	Well suited	Well suited	Poorly suited
RmB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Rimer:					
RnA	Suited	Suited	Well suited	Well suited	Poorly suited
RnB	Suited	Suited	Well suited	Well suited	Poorly suited
Ritchey: RrB	Poorly suited	Poorly suited	Suited	Suited	Poorly suited
Romeo: RsC	Unsuited	Unsuited	Poorly suited	Unsuited	Well suited

wildlife habitat and kinds of wildlife

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow water developments	Ponds	Openland	Woodland	Wetland
Well suited	Well suited	Well suited	Unsuited	Unsuited	Well suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Unsuited	Unsuited	Well suited	Suited	Unsuited.
Poorly suited	Poorly suited	Unsuited	Well suited	Well suited	Unsuited.
Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Unsuited	Poorly suited	Well suited to unsuited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Suited	Suited	Unsuited	Well suited	Suited	Poorly suited.
Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Unsuited	Poorly suited	Well suited to unsuited.
Suited	Suited	Unsuited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Unsuited	Well suited	Suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Poorly suited	Poorly suited	Well suited	Well suited	Unsuited.
Suited	Suited	Suited	Suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Suited	Suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited.
Poorly suited	Poorly suited	Unsuited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Well suited	Suited	Poorly suited.
Suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Suited	Unsuited	Unsuited	Poorly suited	Well suited	Poorly suited.
Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Well suited	Suited	Poorly suited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Well suited	Well suited	Unsuited	Unsuited	Well suited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Well suited	Unsuited	Poorly suited	Well suited	Well suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Suited	Suited	Suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Suited	Suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.	Well suited to unsuited.
Suited	Suited	Unsuited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Unsuited	Well suited	Suited	Poorly suited.
Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Well suited	Suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited.

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

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grass and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants
Seward:					
SdA	Well suited	Well suited	Well suited	Well suited	Poorly suited
SdB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Shinrock: SeB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Shoals: Sh	Suited	Suited	Well suited	Well suited	Poorly suited
Sloan: Sn, So	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Toledo: To	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Tuscola:					
TpA	Well suited	Well suited	Well suited	Well suited	Poorly suited
TpB, TsB	Well suited	Well suited	Well suited	Well suited	Poorly suited
Vaughnsville: VaB	Well suited	Well suited	Well suited	Well suited	Poorly suited

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

OPENLAND WILDLIFE.—Examples are quail, pheasant, meadowlark, cottontail rabbit, red foxes, and woodchuck.

WOODLAND WILDLIFE.—Examples are gray squirrel, raccoon, woodcock, and various songbirds.

WETLAND WILDLIFE.—Examples are ducks, geese, rails, heron, and other waterfowl, as well as muskrat and beaver.

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. For additional information concerning management of soils for wildlife purposes, the reader should contact the local office of the Soil Conservation Service or the Division of Wildlife, Ohio Department of Natural Resources.

Engineering Uses of the Soils [2]

Some soil properties are of particular interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties that are important to the engineer are permeability to water, compaction characteristics, natural drainage, shrink-swell characteristics, grain-size distribution, plasticity, and reaction. Depth to water table, depth to bedrock, and topography are also important.

Results of tests on soil samples are given in table 4; estimates of the soil properties significant in engineering are in table 5; and interpretations relating to engineering uses of the soils are in table 6. The estimates and interpretations of soil properties in these tables can be used to—

1. Make studies that will aid in selecting and developing small industrial, business, residential, and recreational sites.
2. Make preliminary estimates of soil properties that are significant in the planning of farm drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other construction materials.
5. Correlate performance of engineering structures with soil mapping units to develop information for overall planning that will be useful in designing and maintaining certain engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. 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.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations 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.

The information in this section is to a depth of 5 feet or to bedrock if it is within a 5 foot depth. Information about soil material below 5 feet must be obtained by deeper sampling.

Some of the terms used in this publication, for example soil, sand, silt, clay, topsoil, subsoil, and solum, have special meanings to soil scientists and different meanings to engineers. These terms and others are defined in the Glossary.

[2] Reviewed by LLOYD E. GILLOGLY, construction engineer, Soil Conservation Service, Columbus, Ohio.

wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow water developments	Ponds	Openland	Woodland	Wetland
Poorly suited	Poorly suited	Unsuited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Suited	Poorly suited	Well suited	Suited	Suited.
Suited	Suited	Unsuited	Poorly suited	Well suited	Suited.
Suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.

Engineering classification systems

Two systems of classifying soils are in general use among engineers.

Most highway engineers classify soil materials according to the system approved by the American Association of State Highway Officials (AASHO) (*2*). This system of classification is based on grain-size gradation, liquid limit, plasticity index, and field performance in highways. In the AASHO system, soil materials are classified in seven principal groups. The groups range from A-1, which consists of gravelly soils having high bearing strength (the best soils for subgrade), to A-7, which consists of clayey soils having low strength when wet (the poorest soils for subgrade). Within each group, the relative engineering value of a soil is indicated by group index numbers that range from 0 for the best material to 20 for the poorest. The group index number is given in parentheses after the soil group symbol, for example, A-7-6(12) in table 4.

Some engineers prefer to use the Unified soil classification system established by the Department of Defense (*22*). In this system the soils are identified according to texture and plasticity and are grouped according to their performance as engineering construction materials. Soil materials are identified as coarse grained (eight classes), fine grained (six classes), and highly organic.

Engineering test data

Samples of 10 soil profiles in Hancock 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.

If a soil material is compacted at increasing moisture content, assuming that the compaction effort remains constant, the density of the compacted material increases 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, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The mechanical analysis was made by combined sieve and hydrometer methods. Percentages of clay obtained by the hydrometer method are not used in naming the textural class for soil classification.

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; they will not become plastic at any moisture content.

Estimated properties

Table 5 shows estimated properties of the soils in addition to engineering and USDA texture classifications. The estimated physical data shown in table 5 are based on the soil test data in table 4 and on experience with test data from the same kinds of soil in other counties. The following paragraphs briefly describe the columns shown in table 5.

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

The estimated depth to bedrock is based on observations made during the course of the survey. From place to place, however, the depth to bedrock may vary considerably.

TABLE 4.—*Engineering*

[Test performed by the Ohio Department of Highways in accordance with standard

Soil name and location	Parent material	Report No.	Depth from surface	Moisture-density data[1]	
				Maximum dry density	Optimum moisture
			In.	*Lb. per cu. ft.*	*Pct.*
Blount silt loam:					
SW¼SW¼ sec. 2, Marion Township (finer textured than modal).	Glacial till.	37690	0–10	106	18
		37691	10–28	103	21
		37692	28–80	115	17
Haskins loam:					
SW¼NW¼ sec. 34, Portage Township (coarser textured than modal).	Glaciofluvial outwash.	41058	0–6	113	14
		41059	6–40	114	14
		41060	40–80	113	15
Hoytville clay loam:					
NE¼SW¼ sec. 18, T. 3 N., R. 10 E., Wood County (modal).	Lacustrine clay enriched till.	41038	0–7	114	14
		41039	7–38	106	17
		41040	38–96	97	21
Kibbie loam:					
SE¼SE¼ sec. 30, Blanchard Township; Putnam County, 15 feet west of Hancock County line (finer textured than modal).	Lacustrine clay, silt, and sand.	714	0–8	107	18
		715	18–27	112	16
		716	44–48	105	19
Lenawee loam:					
SW¼SW¼ sec. 30, Blanchard Township (coarser textured than modal).	Lacustrine clay, silt, and sand.	697	0–7	98	21
		698	22–32	108	18
		699	76–84	116	14
Morley silt loam:					
SE¼NE¼ sec. 20, Orange Township (finer textured than modal).	Glacial till.	38029	0–8	106	17
		38030	15–22	102	20
		38031	34–97	109	16
Nappanee silt loam:					
SW¼SW¼ sec. 3, Portage Township (modal)	Glacial till.	96677	0–7	104	19
		96678	7–22	106	19
		96679	22–94+	112	15
Pewamo silty clay loam:					
SE¼NW¼ sec. 34, Eagle Township (coarser textured than modal).	Glacial till.	38032	0–8	99	22
		38033	29–38	101	20
		38034	58–110	113	16
Rimer loamy fine sand:					
NE¼NW¼ sec. 33, Union Township (modal).	Glacially deposited sand over till.	42039	0–12	115	12
		42040	26–34	101	19
		42041	38–66	112	17
Vaughnsville loam:					
NE¼SE¼ sec. 16, Portage Township (modal).	Beach ridge and outwash deposits.	41055	0–24	114	15
		41056	24–32	121	12
		41057	32–72	113	16

[1] Based on AASHO Designation T 99, Method A (*2*).

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

[3] Based on AASHO Designation M 145-49 (*2*).

test data

procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Mechanical analysis [2]							Liquid limit	Plasticity index	Classification		
Percentage passing sieve—						Percentage smaller than 0.005 mm.					
2-inch	½-inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				AASHO [3]	Unified [4]	Ohio [5]
-------	-------	-------	100	98	92	42	32	8	A-4(8)	ML-CL	A-4a
-------	-------	-------	100	99	95	55	44	19	A-7-6(12)	ML-CL	A-7-6
-------	99	92	79	75	66	36	37	16	A-6(9)	CL	A-6b
-------	-------	100	99	95	72	26	21	4	A-4(8)	ML-CL	A-4a
-------	-------	-------	100	95	67	29	28	10	A-4(6)	CL	A-4a
-------	100	96	85	82	71	40	33	15	A-6(9)	CL	A-6a
-------	-------	-------	100	94	81	51	35	12	A-6(9)	ML-CL	A-6a
-------	-------	-------	100	98	87	56	46	27	A-7-6(16)	CL	A-7-6
-------	-------	99	98	96	84	52	42	16	A-7-6(11)	ML-CL	A-7-6
-------	-------	-------	100	98	66	38	24	3	A-4(6)	ML	A-4a
-------	-------	-------	100	99	75	53	33	14	A-6(10)	CL	A-6a
-------	-------	-------	100	96	89	73	38	16	A-6(10)	CL	A-6b
-------	-------	-------	100	98	83	33	32	4	A-4(8)	ML	A-4b
-------	-------	-------	100	98	87	43	38	14	A-6(10)	ML-CL	A-6a
-------	100	98	96	88	68	38	27	11	A-6(7)	CL	A-6a
-------	-------	100	99	94	77	39	30	6	A-4(8)	ML-CL	A-4a
-------	-------	100	98	94	84	62	38	13	A-6(9)	ML-CL	A-6a
-------	100	99	96	90	79	50	34	13	A-6(9)	ML-CL	A-6a
-------	-------	-------	100	95	81	37	33	8	A-4(8)	ML-CL	A-7-6
-------	-------	99	97	94	80	50	48	23	A-7-6(15)	CL	A-6a
-------	-------	98	95	90	78	45	33	13	A-6(9)	CL	A-6a
-------	-------	-------	100	97	84	48	37	11	A-6(8)	ML-CL	A-6a
-------	-------	-------	100	98	89	62	40	16	A-6(10)	ML-CL	A-6b
-------	100	99	96	88	74	47	40	19	A-6(12)	CL	A-6b
-------	-------	-------	100	94	35	15	([6])	([6])	A-2-4(0)	SM	A-3a
-------	100	98	94	90	77	59	41	20	A-7-6(12)	CL	A-7-6
100	95	93	88	83	74	48	36	15	A-6(10)	CL	A-6a
100	84	81	80	75	42	22	30	10	A-4(1)	SC	A-4a
100	71	60	56	55	35	10	([6])	([6])	A-2-4(0)	GM	A-2-4
-------	100	96	93	88	76	42	34	16	A-6(10)	CL	A-6b

[4] Based on MIL-STD-619B (*22*). The SCS and the Bureau of Public Roads have agreed that any soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. ML-CL is an example of a borderline classification.

[5] Based on Classification of Soils, Ohio State Highway Testing Laboratory, February 1, 1955.

[6] Nonplastic.

TABLE 5.—*Estimated*

[The symbol >

Soil series and map symbols	Depth to— Seasonally high water table	Depth to— Bedrock	Depth from surface	Percentage passing sieve— No. 4 (4.7 mm.)	Percentage passing sieve— No. 10 (2.0 mm.)	Percentage passing sieve— No. 40 (0.42 mm.)	Percentage passing sieve— No. 200 (0.074 mm.)	Classification: Dominant USDA texture
	Feet	*Feet*	*Inches*					
Adrian: Ad	0–½	>5	0–23					Muck
			23–60	100	100	80–90	15–30	Loamy fine sand and sand
Belmore: BlA, BlB, BmA, BmB, BmC. The BlA and BlB units have a sandier surface layer than shown.	>3	>5	0–11	90–100	90–100	70–95	60–75	Loam
			11–35	95–100	90–100	65–85	45–70	Sandy clay loam
			35–60	65–100	65–75	25–75	6–35	Fine gravel and sand and strata of sandy loam and loam.
Blount: BnA, BnB, BoA, BoB, BoB2.	½–1½	>5	0–11	100	90–100	85–100	70–90	Silt loam and silty clay loam
			11–28	95–100	90–100	90–100	85–95	Silty clay
			28–39	95–100	90–100	90–100	70–80	Silty clay loam
			39–60	95–100	90–100	85–95	70–80	Clay loam
Celina: CeA	1½–3	3½–6	0–8	95–100	90–100	85–95	70–80	Silt loam
			8–40	95–100	85–100	80–95	70–85	Clay loam
			40–51	80–90	65–80	60–70	50–60	Loam
			51					Limestone bedrock.
Clay pits: Cl. No estimates were made because soil properties are too variable.								
Colwood: Co	0–½	>5	0–11	100	100	95–100	60–75	Loam
			11–33	100	100	90–100	40–55	Sandy clay loam
			33–60	95–100	95–100	85–100	40–70	Stratified silt loam and fine sandy loam.
Crosby: CrA	½–1½	3½–6	0–10	95–100	95–100	90–100	80–95	Silt loam
			10–24	95–100	90–100	90–100	80–95	Silty clay loam and clay
			24–58	80–95	70–90	60–85	55–70	Loam
			58					Limestone bedrock.
Cut and fill land: Cu. No estimates were made because soil properties are too variable.								
Digby: DgA, DmA, DmB	½–1½	>5	0–8	95–100	90–100	70–95	60–75	Loam
			8–25	90–100	85–100	50–75	40–55	Sandy clay loam
			25–33	80–100	70–85	50–60	40–70	Gravelly sandy clay loam
			33–60	65–100	60–75	25–60	6–30	Gravelly sandy loam
Dunbridge: DuB	>3	1½–3½	0–8	90–100	80–100	75–100	15–30	Loamy fine sand
			8–22	85–100	80–100	75–100	40–55	Fine sandy loam
			22–26	90–100	85–100	75–90	45–60	Sandy clay loam
			26					Limestone bedrock.
Eel: Ea, Em	1½–3	>5	0–28	100	90–100	85–100	70–95	Silt loam
			28–60	100	90–100	75–95	60–85	Loam and silt loam
Fulton: FtA, FtB	½–1½	>5	0–7	100	100	85–100	80–90	Silt loam
			7–36	100	100	85–100	90–95	Silty clay
			36–60	100	100	90–100	85–95	Silty clay loam and silty clay
Genesee: Gn	2½–3+	>5	0–11	95–100	90–100	85–100	70–90	Silt loam
			11–62	95–100	90–100	80–100	60–75	Loam
Granby: Go	0–½	>5	0–24	100	100	90–100	15–30	Loamy fine sand
			24–30	100	100	90–100	25–45	Fine sandy loam
			30–50	100	100	90–100	15–30	Fine sand

See footnotes at end of table.

engineering properties of the soils
means more than]

Classification—Continued		Permeability	Available moisture capacity	Reaction [1]	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
Pt		2.0-6.3	0.20-0.25	5.1-6.0		High	Moderate.
SM	A-2	6.3-12.0	0.03-0.06	5.1-7.8	Low	High	Moderate.
ML	A-4	2.0-6.3	0.14-0.18	5.6-6.5	Low		Low.
CL, SC	A-6	2.0-6.3	0.15-0.19	5.6-7.3	Low	Low	Low to moderate.
SM, SW-SM	A-1, A-2, A-3	2.0-6.3	0.08-0.12	[2] 7.4-8.4	Low	Low	Low.
ML, ML-CL	A-4	0.63-2.0	0.16-0.20	5.1-6.0	Low		Moderate.
ML-CL, CH	A-7	0.2-0.63	0.13-0.15	4.6-6.0	High	High	High.
CL, ML-CL	A-6	0.06-0.2	0.13-0.16	[2] 6.6-7.4	Moderate	High	Low.
CL	A-6	0.06-0.2	0.07-0.10	[2] 7.4-8.4	Moderate	High	Low.
ML, ML-CL	A-4	0.63-2.0	0.16-0.20	5.6-6.5	Low	High	Moderate.
CL, CL-ML	A-6, A-7	0.2-0.63	0.14-0.17	4.6-6.5	Moderate	High	Moderate to high.
CL, CL-ML	A-4	0.2-0.63	0.07-0.10	[2] 7.4-8.4	Moderate	Moderate	Low.
ML	A-4	0.63-2.0	0.17-0.22	6.6-7.3	Low		Low.
CL, SC	A-6	0.63-2.0	0.15-0.19	6.6-7.3	Low	High	Low.
ML, SM	A-4	0.63-2.0	0.10-0.15	[2] 7.4-8.4	Low	High	Low.
ML, ML-CL	A-4	0.2-2.0	0.15-0.19	6.1-7.3	Low		Low.
CL, CH	A-6, A-7	0.2-0.63	0.13-0.16	5.1-6.7	High	High	Moderate.
CL, ML-CL	A-4	0.2-0.63	0.07-0.10	[2] 7.4-8.4	Moderate	High	Low.
ML	A-4	0.63-2.0	0.13-0.19	5.6-6.5	Low		Moderate to low.
SC, CL	A-6	0.63-2.0	0.15-0.19	4.6-6.5	Moderate	High	Moderate.
SC, CL	A-6	0.63-2.0	0.13-0.17	6.6-7.3	Moderate	High	Low.
SM	A-1, A-2, A-3	6.3+	0.12-0.16	[2] 7.4-8.4	Low	High	Low.
SM	A-2	6.3+	0.05-0.09	6.1-6.5	Low		Low.
SM, ML	A-4	6.3+	0.08-0.12	6.1-6.5	Low	Low	Low.
SC, CL	A-6	6.3+	0.14-0.19	6.6-7.3	Low	Low	Low.
ML, ML-CL	A-4, A-6	0.63-2.0	0.16-0.22	6.1-7.3	Low to moderate	Moderate	Low.
ML, ML-CL	A-4, A-6	0.63-2.0	0.14-0.18	6.6-7.8	Low to moderate	Moderate	Low.
ML, CL	A-4, A-6	0.63-2.0	0.17-0.20	5.6-6.5	Low		Moderate.
CH, CL	A-6, A-7	0.06-0.2	0.13-0.15	5.1-7.3	High	High	Moderate to low.
CH, CL	A-6, A-7	<0.06	0.13-0.15	[2] 7.4-8.4	High	High	Low.
ML, CL	A-4, A-6	0.63-2.0	0.15-0.20	6.6-7.8	Low	Moderate	Low.
ML, CL	A-4, A-6	0.63-2.0	0.14-0.18	6.6-7.8	Low	Moderate	Low.
SM	A-2	6.3-12.0	0.05-0.09	5.6-7.3	Low		Low to moderate.
SM	A-4, A-2	6.3-12.0	0.08-0.12	6.6-7.8	Low	High	Low.
SM	A-2	6.3-12.0	0.05-0.09	[2] 7.4-8.4	Low	High	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to—		Depth from surface	Percentage passing sieve—				Classification
	Seasonally high water table	Bedrock		No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Dominant USDA texture
Gravel pits: Gp. No estimates were made because soil properties are too variable.	*Feet*	*Feet*	*Inches*					
Haney: HaA, HaB, HdA, HdB. The HaA and HaB units have a sandier surface layer than shown.	1½–3	>5	0–13	95–100	90–100	70–95	60–75	Loam
			13–33	95–100	85–95	65–85	40–60	Sandy clay loam
			33–60	65–100	65–75	25–60	6–35	Sand and fine gravel
Haskins: HkA, HkB, HnA, HnB. The HkA and HkB units have a sandier surface layer than shown.	½–1½	>5	0–9	95–100	90–100	80–95	60–75	Loam
			9–18	90–100	85–100	75–90	40–60	Sandy clay loam
			18–30	95–100	80–100	75–90	65–85	Clay loam
			30–60	95–100	80–100	75–90	65–85	Clay loam
Hoytville: Ho, Hv. The Ho unit has a silty clay loam surface layer.	0–½	>5	0–8	100	90–100	90–100	90–100	Clay
			8–40	100	90–100	90–100	90–100	Clay
			40–50	90–100	85–100	85–95	80–95	Heavy clay loam
Joliet: Jo	0–½	1–2	0–9	100	90–100	90–100	85–95	Silty clay loam
			9–18	100	90–100	85–95	70–80	Clay loam
			18					Limestone bedrock.
Kibbie: KfA, KfB, KlA, KlB, KsA, KsB.	½–1½	>5	0–25	100	100	70–85	40–55	Fine sandy loam
			25–44	100	90–100	80–90	35–55	Sandy clay loam
			44–60	100	100	80–100	35–60	Stratified silt and fine sand
Lenawee: Le, Ln. The Le unit has a less clayey surface layer than shown.	0–½	>5	0–15	100	100	90–100	85–95	Silty clay loam
			15–46	100	90–100	80–95	80–90	Clay loam
			46–60	100	90–100	85–100	85–95	Stratified silty clay loam, clay loam, clay, and silt loam.
Linwood: Lw	0–½	>5	0–20					Muck and peat
			20–30	100	80–90	75–95	40–55	Sandy clay loam
			30–60	100	85–100	70–90	30–40	Sandy loam
Mermill: Me, Mf	0–½	>5	0–9	90–100	80–90	80–90	60–75	Loam
			9–30	90–100	80–90	80–90	45–80	Sandy clay loam
			30–60	100	85–95	80–90	75–90	Clay loam
Millgrove: Mg, Mh, Mk. The Mg unit has a sandier surface layer than shown. Mk has a more clayey surface layer than shown.	0–½	>5	0–10	100	85–100	75–95	70–90	Loam
			10–40	95–100	80–100	65–85	40–70	Sandy clay loam
			40–60	50–100	50–75	25–60	20–55	Sand and fine gravel
Millsdale: Mm, Mn, Mo. The Mm and Mn units have a less clayey surface layer than shown.	0–½	1½–3½	0–9	100	90–100	85–100	85–95	Silty clay loam
			9–23	100	90–100	90–100	85–95	Clay
			23–31	90–100	80–90	75–85	70–80	Clay loam
			31					Limestone bedrock.
Milton: MrA, MrB	>3	1½–3½	0–11	100	80–100	85–95	80–90	Silt loam
			11–26	100	90–100	75–100	70–90	Clay
			26					Limestone bedrock.
Morley: MsB, MyB, MyB2, MyC, MyC2, MyD2.	1½–3	>5	0–9	95–100	95–100	90–100	75–85	Silt loam
			9–33	95–100	95–100	90–100	80–95	Silty clay and silty clay loam
			33–60	95–100	95–100	85–95	70–85	Clay loam
Nappanee: NaA, NaB, NpA, NpB, NpC2.	½–1½	>5	0–7	100	100	90–100	65–80	Loam
			7–22	100	95–100	90–100	80–95	Clay
			22–60	95–100	85–100	85–95	75–95	Clay loam

See footnotes at end of table.

properties of the soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction [1]	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
ML	A-4	0. 63-2. 0	0. 15-0. 19	4. 6-6. 5	Low		Low.
SC, CL	A-6	0. 63-2. 0	0. 14-0. 18	5. 1-7. 3	Moderate	Moderate	Moderate to low.
SM, SW-SM	A-1, A-2, A-3	6. 3+	0. 10-0. 14	[2] 7. 4-8. 4	Low	Moderate	Low.
ML, ML-CL	A-4	0. 63-6. 3	0. 14-0. 18	5. 6-7. 3	Low		Moderate.
SC, CL	A-4, A-6	0. 63-2. 0	0. 15-0. 18	5. 1-7. 3	Moderate	High	Moderate to low.
CL	A-6	0. 63-2. 0	0. 16-0. 19	6. 6-7. 3	Moderate	High	Low.
CL	A-6	0. 06-0. 2	0. 07-0. 10	[2] 7. 4-8. 4	Moderate	High	Low.
MH, ML-CL	A-6, A-7	0. 63-2. 0	0. 15-0. 20	6. 6-7. 3	High		Low.
CH, CH-MH, CL, ML-CL	A-7	0. 2-0. 63	0. 13-0. 15	6. 6-7. 3	High	High	Low.
CH-MH, ML-CL	A-7	0. 06-0. 2	0. 06-0. 08	[2] 7. 4-8. 4	High	High	Low.
CL	A-6, A-7	0. 63-2. 0	0. 16-0. 22	6. 6-7. 3	Moderate to high		Low.
CL	A-6, A-7	0. 63-2. 0	0. 15-0. 19	6. 6-7. 8	Moderate to high	High	Low.
SM, ML	A-4	0. 63-2. 0	0. 17-0. 20	5. 6-7. 3	Low		Low.
SC, CL	A-4, A-6	0. 63-2. 0	0. 15-0. 19	6. 6-7. 3	Moderate	High	Low.
SM, ML, CL	A-4, A-6	0. 63-2. 0	0. 17-0. 20	[2] 7. 4-8. 4	Low	High	Low.
CL	A-6	0. 2-0. 63	0. 16-0. 20	5. 6-6. 5	Moderate		Moderate.
ML, CL	A-6, A-7	0. 2-0. 63	0. 15-0. 18	6. 1-7. 3	High	High	Low.
CL, CH	A-6, A-7	0. 2-0. 63	0. 16-0. 19	[2] 7. 4-8. 4	High	High	Low.
Pt		2. 0-6. 3	0. 23-0. 27	5. 6-6. 1	Low		Moderate.
SC, CL	A-6, A-4	0. 63-2. 0	0. 14-0. 17	6. 1-7. 3	Moderate	High	Low.
SM	A-2, A-4	0. 63-2. 0	0. 08-0. 12	[2] 7. 4-8. 4	Low	High	Low.
ML, ML-CL	A-4	0. 63-2. 0	0. 18-0. 22	6. 1-7. 3	Low		Low.
CL, SC	A-4, A-6	0. 63-2. 0	0. 16-0. 19	6. 6-7. 3	Moderate	High	Low.
CL, CH	A-6, A-7	<0. 06	0. 07-0. 10	[2] 6. 6-8. 4	Moderate	High	Low.
ML	A-4	0. 63-2. 0	0. 18-0. 22	6. 1-7. 3	Low		Low.
CL, SC	A-6	0. 63-2. 0	0. 16-0. 19	6. 6-7. 8	Moderate	High	Low.
SM, GM, ML	A-2, A-4	6. 3	0. 10-0. 16	[2] 7. 4-8. 4	Low	High	Low.
CL, CH	A-6, A-7	0. 2-2. 0	0. 16-0. 19	5. 6-7. 3	High		Moderate to low.
CH	A-7	0. 2-0. 63	0. 13-0. 15	5. 6-7. 3	High	High	Moderate to low.
CL	A-6	0. 2-0. 63	0. 15-0. 18	6. 6-7. 8	Moderate	High	Low.
ML, ML-CL	A-4, A-6	0. 63-2. 0	0. 17-0. 20	5. 6-6. 5	Low		Low to moderate.
CH, ML-CL	A-7, A-6	0. 2-0. 63	0. 13-0. 15	6. 6-7. 8	High	Moderate to high	Low.
ML, ML-CL	A-4, A-6	0. 2-2. 0	0. 17-0. 19	5. 1-6. 0	Low to moderate		Moderate.
CL, CH, ML-CL	A-6, A-7	0. 06-0. 2	0. 13-0. 15	5. 1-6. 0	High	High	Moderate.
CL, ML-CL	A-6	0. 06-0. 2	0. 06-0. 10	[2] 7. 4-8. 4	Moderate	High	Low.
ML-CL, CL	A-4, A-6	0. 2-2. 0	0. 14-0. 19	5. 6-7. 3	Low		Moderate.
CL, CH	A-6, A-7	0. 06-0. 2	0. 13-0. 15	5. 1-7. 3	High	High	Moderate.
CL, ML-CL	A-6	<0. 06	0. 10-0. 14	[2] 7. 4-8. 4	Moderate	High	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to— Seasonally high water table	Depth to— Bedrock	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.)	Classification — Dominant USDA texture
	Feet	*Feet*	*Inches*					
Ottokee: OtB	1½–3	>5	0–55	100	100	90–100	15–30	Loamy fine sand
			55–65	100	100	90–100	20–35	Fine sand
Pewamo: Pm, Po	0–½	>5	0–8	100	100	90–100	80–95	Silty clay loam
The Po unit has a clay surface layer.			8–44	95–100	90–100	90–100	80–95	Clay
			44–56	90–100	80–100	75–90	70–85	Clay loam
Quarry: Qu. No estimates were made because soil properties are too variable.								
Randolph: RbA, RlA, RlB	½–1½	1½–3½	0–8	100	100	80–90	75–85	Silt loam
			8–16	100	100	85–95	80–90	Silty clay loam
			16–27	100	100	85–95	75–95	Clay
			27					Limestone bedrock.
Rawson: RmA, RmB	1½–3	>5	0–10	90–100	90–100	85–90	40–75	Loam
			10–32	85–95	80–90	75–90	40–60	Clay loam and sandy clay loam.
			32–60	95–100	90–100	80–95	70–80	Clay loam
Rimer: RnA, RnB	½–1½	>5	0–22	100	100	85–100	20–35	Loamy fine sand
			22–26	100	100	85–100	40–55	Fine sandy loam
			26–60	90–100	85–95	80–90	70–80	Clay loam
Ritchey: RrB	>3	1–2	0–8	100	90–100	80–90	70–90	Silt loam
			8–13	100	85–100	85–90	70–90	Clay loam
			13–17	100	80–100		80–90	Clay
			17					Limestone bedrock.
Romeo: RsC	>3	0–1	0–5	100	90–100	80–95	70–90	Silt loam
			5					Limestone bedrock.
Seward: SdA, SdB	1½–3	>5	0–25	100	90–100	85–100	15–30	Loamy fine sand
			25–30	100	90–100	75–90	30–40	Sandy loam
			30–60	100	85–100	75–90	70–85	Clay loam and silty clay loam.
Shinrock: SeB	1½–3	>5	0–9	100	90–100	85–95	75–90	Silt loam
			9–39	100	90–100	85–100	85–95	Silty clay loam
			39–60	100	90–100	85–100	80–95	Silt loam
Shoals: Sh	½–1½	>5	0–9	100	100	85–100	70–80	Silt loam
			9–36	100	90–100	85–100	60–75	Loam
			36–60	100	90–100	85–95	65–80	Silt loam
Sloan: Sn, So	0–½	>5	0–8	90–100	90–100	95–95	60–75	Loam
			8–37	90–100	90–100	85–95	70–80	Clay loam
			37–55	90–100	95–95	80–90	60–75	Loam
			55–60	90–100	80–90	60–85	30–40	Sandy loam
Toledo: To	0–½	>5	0–9	100	100	90–100	85–95	Silty clay loam
			9–46	100	100	90–100	85–95	Silty clay
			46–60	100	100	90–100	85–100	Silty clay
Tuscola: TpA, TpB, TsB	1½–3	>5	0–16	100	100	90–100	40–55	Fine sandy loam
			16–48	100	100	90–100	40–45	Fine sandy loam
			48–60	100	100	90–100	50–95	Stratified very fine sand and silt.
Vaughnsville: VaB	1–3	>5	0–8	80–100	80–100	65–90	45–70	Loam
			8–29	65–100	60–90	50–85	30–55	Sandy clay loam, clay loam and sandy loam.
			29–60	90–100	85–95	75–85	70–80	Clay loam

[1] If limed, the surface layer may have a higher pH than is indicated.

properties of the soils—Continued

Classification—Continued		Permeability	Available moisture capacity	Reaction [1]	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
SM	A–2	6.3–12.0	0.05–0.09	6.1–6.5	Low	Low	Low.
SM	A–2	6.3–12.0	0.05–0.09	[2] 7.4–7.8	Low	Low	Low.
ML, MH, ML–CL	A–6, A–7	0.63–2.0	0.16–0.22	6.6–7.3	Moderate		Low.
ML–CL, CH	A–6, A–7	0.2–0.63	0.13–0.15	6.6–7.3	High	High	Low.
CL	A–6	0.2–0.63	0.07–0.10	[2] 7.4–8.4	Moderate	High	Low.
ML, ML–CL	A–4	0.63–2.0	0.16–0.19	5.6–6.0	Moderate		Moderate.
CL	A–6	0.2–0.63	0.16–0.19	5.1–5.5	High	High	Moderate.
ML–CL, CH	A–6, A–7	0.2–0.63	0.13–0.15	6.6–7.8	High	High	Low.
ML, SM	A–4	0.63–2.0	0.14–0.18	5.6–6.5	Low		Moderate.
SC, CL	A–4, A–6	0.63–2.0	0.15–0.18	5.1–7.3	Moderate	High	Low.
CL	A–6	0.06–0.2	0.07–0.09	[2] 7.4–8.4	Moderate	High	Low.
SM	A–2	6.3–12.0	0.05–0.09	5.1–6.5	Low		Moderate.
SM, ML	A–4	6.3–12.0	0.08–0.12	6.1–6.6	Low	High	Low.
CL, CH	A–6, A–7	<0.06–0.2	0.07–0.10	[2] 6.6–7.8	Low to moderate	High	Low.
ML, ML–CL	A–4	0.63–2.0	0.17–0.20	5.6–7.3	Low		Low to moderate.
CL	A–4, A–6	0.63–2.0	0.15–0.18	5.6–7.3	Moderate	Moderate	Low.
CH	A–7	0.63–2.0	0.13–0.15	6.6–7.3	High	High	Low.
ML, CL	A–4, A–6	0.63–2.0	0.16–0.22	6.1–7.8	Low		Low.
SM	A–2	6.3–12.0	0.05–0.09	5.1–6.0	Low		Moderate.
SM	A–2, A–4	6.3–12.0	0.08–0.12	6.6–7.3	Low	Low	Low.
CL, ML, CL	A–6	0.06–0.2	0.07–0.09	[2] 6.6–8.4	Moderate	Low	Low.
ML	A–4	0.63–2.0	0.16–0.20	5.1–6.5	Low		Moderate.
CL, CH	A–6, A–7	0.2–0.63	0.15–0.18	5.1–6.0	High	High	Moderate.
ML, ML–CL	A–4, A–6	0.2–0.63	0.12–0.15	7.4–8.4	Moderate	Moderate	Low.
ML, ML–CL	A–4, A–6	0.63–2.0	0.17–0.10	6.1–7.3	Low		Low.
ML, CL	A–4, A–6	0.63–2.0	0.14–0.18	6.6–7.3	Low	High	Low.
ML, ML–CL	A–4, A–6	0.63–2.0	0.17–0.20	6.6–7.3	Low	High	Low.
ML	A–4	0.63–2.0	0.14–0.18	6.1–7.3	Low		Low.
CL	A–6	0.63–2.0	0.16–0.19	6.6–7.3	Low	High	Low.
ML	A–4	0.63–2.0	0.14–0.18	6.6–7.8	Low	High	Low.
SM	A–2, A–4	0.63–2.0	0.18–0.12	[2] 7.4–8.4	Low	High	Low.
MH, CH	A–7	0.2–0.63	0.17–0.22	6.1–6.5	High		Low.
CH, CL	A–7	0.06–0.2	0.13–0.15	6.6–7.3	High	High	Low.
CH	A–7	0.06–0.2	0.13–0.15	[2] 7.4–8.4	High	High	Low.
SM, ML	A–4	0.63–2.0	0.13–0.16	5.6–6.5	Low		Moderate.
SM, ML	A–4	0.63–2.0	0.12–0.14	7.1–7.3	Low	Low	Low.
ML	A–4	0.63–2.0	0.14–0.18	[2] 7.4–8.4	Low	Moderate	Low.
SM, ML	A–4	0.63–2.0	0.14–0.18	6.1–7.3	Low		Low.
SC, CL, GM	A–2, A–4, A–6	0.63–2.0	0.15–0.18	6.6–7.3	Low to moderate	High	Low.
CL	A–6	0.06–0.2	0.16–0.19	[2] 7.4–8.4	Moderate	High	Low.

[2] Calcareous.

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
					Subsoil	Substratum	
Adrian: Ad	Not suitable: muck soil; high water table.	High	Poor: good if mixed properly with mineral soil.	Not suitable	Not suitable	Not suitable	High water table; soft muck material.
Belmore: BlA, BlB, BmA, BmB, BmC.	Fair for surface soil and subsoil. Good for substratum.	Low to moderate.	Fair to good	Fair: 6 to 35 percent fines.	Fair to good	Good	Well drained; cut slopes are droughty.
Blount: BnA, BnB, BoA, BoB, BoB2.	Poor: seasonally wet and clayey in subsoil.	High	Fair: limited amount of suitable material.	Not suitable	Poor: clayey	Poor: clayey	Seasonally high water table; clayey subsoil; slow permeability.
Celina: CeA	Poor: seasonally wet; moderately fine subsoil.	High	Fair: limited amount of suitable material.	Not suitable	Poor: moderately fine textured subsoil.	Not suitable: limestone bedrock.	Moderately well drained; seasonally high water table; moderately slow permeability; limestone at a depth of 40 to 60 inches.
Clay pits: Cl	Poor: clayey	High	Poor: clayey	Not suitable		Poor: clayey	Variable water table; high shrink-swell potential.
Colwood: Co	Poor: very poorly drained; seasonally wet.	High	Good	Not suitable	Poor: silt and very fine sand; flows when saturated; very poorly drained.	Poor: silt and very fine sand; flows when saturated; very poorly drained.	Very poor natural drainage; seasonally high water table; moderately permeable; soft, compressible material.
Crosby: CrA	Poor: limestone at a depth of 40 to 60 inches.	High	Fair: limited amount of suitable material.	Not suitable	Poor: moderately fine textured; seasonally wet.	Fair: limestone at a depth of 40 to 60 inches.	Somewhat poorly drained; seasonally high water table; moderately slow permeability; limestone at a depth of 40 to 60 inches.
Cut and fill land: Cu. Properties are too variable for reliable evaluation.							
Digby: DgA, DmA, DmB	Poor: seasonally wet.	Moderate	Fair: limited amount of suitable material.	Poor: 15 to 30 percent fines. Fair to good in places.	Fair: moderately fine textured.	Good: sand and gravel.	Somewhat poorly drained; seasonally high water table; moderate permeability; cut slopes are droughty.
Dunbridge: DuB	Good: limestone at a depth of 20 to 40 inches; well drained.	Low	Good	Poor for sand and gravel; limestone at a depth of 20 to 40 inches.	Fair: loamy	Not suitable: limestone at a depth of 20 to 40 inches.	Well drained; limestone at a depth of 20 to 40 inches; cut slopes are droughty.
Eel: Ea, Em	Fair to poor: generally wet in winter.	Moderate	Good	Not suitable	Fair to poor: loamy.	Fair to poor: loamy.	Subject to flooding; seasonally high water table; nearly level.

See footnote at end of table.

interpretations

Soil features affecting—Continued						
Pipeline construction and maintenance	Pond reservoir areas	Dikes, levees, or embankments [1]	Agricultural drainage	Irrigation	Terraces or diversions	Waterways
Organic soil; high water table.	Soft muck material that is very unstable and permeable.	Soft muck material that is very unstable.	High water table; permeable.	Nearly level; high available moisture capacity.	Nearly level; organic soil.	Nearly level; high water table; organic soil.
Well drained; trench walls are subject to caving.	Excessive rate of seepage in the substratum.	Good strength and stability; permeable material.	Not needed; well drained.	Moderate to rapid infiltration; medium available moisture capacity.	Permeable material; cuts are droughty.	Sandy and gravelly in cut areas; droughty.
Seasonally high water table; clayey subsoil.	Slow rate of seepage; seasonally high water table.	Fair stability and compaction characteristics; very slow permeability; medium to high compressibility.	Slow permeability; seasonally high water table.	Slow permeability; seasonally high water table.	Nearly level to gently sloping; moderately erodible channel.	Clayey material; seasonally high water table; moderately erodible channel.
Limestone at a depth of 40 to 60 inches; moderately well drained.	Pervious limestone at a depth of 40 to 60 inches.	Fair stability and compaction characteristics; very slow permeability; medium compressibility.	Moderately well drained; limestone at a depth of 40 to 60 inches; moderately slow permeability; seasonally high water table.	Moderately slow permeability; medium available moisture capacity.	Nearly level; limestone at a depth of 40 to 60 inches.	Nearly level; limestone at a depth of 40 to 60 inches.
Seasonal wetness; dense; clayey.	Slow rate of seepage	Fair stability; slow permeability; high compressibility.	Not applicable	Not applicable	Not applicable	Not applicable.
Flows when saturated; very poorly drained.	Medium to rapid rate of seepage particularly in areas with sandy layers; seasonally high water table.	Poor stability and compaction characteristics; permeable material, limited clay content.	Very poorly drained; moderately permeable; seasonally high water table.	High available moisture capacity; very poor natural drainage; moderately permeable; seasonally high water table.	Nearly level; seasonally high water table; erodible channel.	Nearly level; seasonally high water table; erodible channel.
Seasonally high water table; moderately fine textured subsoil; limestone at a depth of 40 to 60 inches.	Pervious limestone at a depth of 40 to 60 inches.	Fair to good stability and compaction characteristics; slowly permeable; medium to high compressibility.	Somewhat poorly drained; moderately slow permeability; seasonally high water table; limestone at a depth of 40 to 60 inches.	Somewhat poorly drained; moderately slow permeability; seasonally high water table.	Nearly level; seasonally wet.	Nearly level; somewhat poorly drained and seasonally wet.
Seasonally high water table; trench walls subject to caving.	Excessive rate of seepage; seasonally high water table.	Good stability and compaction characteristics; permeable substratum.	Somewhat poorly drained; seasonally high water table; moderate permeability.	Somewhat poorly drained; seasonally high water table; moderate permeability; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel; seasonally high water table.	Nearly level to gently sloping; moderately erodible channel; seasonally high water table.
Well drained; limestone at a depth of 20 to 40 inches.	Limestone at a depth of 20 to 40 inches.	Limestone at a depth of 20 to 40 inches; limited amount of soil material.	Not needed; well drained.	Low available moisture capacity; rapid infiltration.	Limestone at a depth of 20 to 40 inches; cut channels are droughty.	Limestone at a depth of 20 to 40 inches; cut channels are droughty.
Subject to flooding; deep; loamy.	Subject to flooding; moderate seepage losses; seasonally high water table for short periods.	Fair stability and compaction characteristics; permeable; susceptible to piping.	Moderately well drained; moderate permeability; subject to flooding; seasonally high water table for short periods.	Moderate infiltration and permeability; high available moisture capacity; subject to flooding.	Nearly level; subject to flooding.	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— Topsoil	Sand and gravel	Road fill: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Fulton: FtA, FtB	Poor: seasonally wet; clayey subsoil.	High	Poor: thin layer of suitable material.	Not suitable	Poor: clayey; subject to cracking.	Poor: clayey; subject to cracking.	Somewhat poorly drained; seasonally high water table; slow permeability.
Genesee: Gn	Fair: loamy material; commonly wet in winter.	Moderate	Good	Not suitable	Fair: well drained; loamy.	Fair: well drained; loamy.	Subject to flooding; nearly level.
Granby: Go	Poor	High	Poor to fair: sandy.	Fair to good for fine sand. Not suitable for gravel.	Fair: low shrink-swell potential; high water table; flows when saturated.	Fair: low shrink-swell potential; high water table; flows when saturated.	Very poorly drained; high water table; sand flows when wet.
Gravel pits: Gp	Good: coarse material; well drained.	Low	Poor: coarse material.	Variable: generally good.	Not rated: too variable.	Not rated: too variable.	Well drained; permeable material.
Haney: HaA, HaB, HdA, HdB.	Fair: moderately well drained.	Moderate	Fair	Fair: 6 to 35 percent fines.	Fair: loamy	Good: coarse sand and gravel.	Moderately well drained; moderate permeability; seasonally high water table for short periods.
Haskins: HkA, HkB, HnA, HnB.	Poor: upper 20 to 40 inches is loamy; generally wet in winter.	Moderate	Fair	Not suitable	Fair: loamy	Poor: high clay content.	Somewhat poorly drained; seasonally high water table; slow permeability in substratum.
Hoytville: Ho, Hv	Poor: very poorly drained; clayey subsoil.	High	Fair to poor: high clay content in surface layer.	Not suitable	Poor: clayey; high shrink-swell potential; very poorly drained.	Poor: clayey; high shrink-swell potential; very poorly drained.	Very poorly drained; seasonally high water table; slow permeability.
Joliet: Jo	Poor: seasonally wet; limestone at a depth of 10 to 20 inches.	Moderate	Fair: limited amount of suitable material.	Not suitable: limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches; poorly drained.	Limestone at a depth of 10 to 20 inches; poorly drained; moderate permeability.
Kibbie: KfA, KfB, KlA, KlB, KsA, KsB.	Poor: high silt content; generally wet in winter.	High	Good	Not suitable	Poor: high in silt and very fine sand; poor stability if wet.	Poor: high in silt and very fine sand; poor stability if wet.	Somewhat poorly drained; seasonally high water table; moderate permeability; unstable if wet.
Lenawee: Le, Ln	Poor: very poorly drained; seasonally wet.	High	Good for the Le unit. Fair for the Ln unit; moderately fine textured.	Not suitable	Fair to poor: moderately fine textured; very poorly drained.	Fair to poor: moderately fine textured; very poorly drained.	Very poorly drained; seasonally high water table; moderately slow permeability; nearly level.
Linwood: Lw	Not suitable: organic soil; high water table.	High	Poor: organic soil; good if mixed with mineral soil.	Not suitable	Not suitable	Fair: loamy	High water table; very unstable soft muck.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Pond reservoir areas	Dikes, levees, or embankments [1]	Agricultural drainage	Irrigation	Terraces or diversions	Waterways
Seasonally high water table; clayey.	Slow rate of seepage; seasonally high water table.	Poor stability and compaction characteristics; very slow permeability; clayey; high compressibility.	Somewhat poorly drained; slow permeability; seasonally high water table.	Slow infiltration and permeability; somewhat poorly drained; seasonally high water table.	Nearly level to gently sloping; moderately erodible channel.	Nearly level to gently sloping; moderately erodible channel.
Subject to flooding; deep; loamy.	Subject to flooding; contains sandy layers; moderate seepage losses.	Fair stability and compaction characteristics; permeable; susceptible to piping.	Subject to flooding; moderate permeability.	Moderate infiltration and permeability; high available moisture capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
High water table; unstable sands when wet.	Excessive rate of seepage; high water table.	Fair to poor stability and compaction characteristics; permeable; subject to piping.	Very poorly drained; rapid permeability.	Rapid infiltration and permeability; low available moisture capacity.	Nearly level; channel is very erodible.	Nearly level; channel is very erodible; sandy soil material.
Not rated: too variable.	Excessive rate of seepage.	Good stability and compaction characteristics; permeable material.	Not applicable	Not applicable	Not applicable	Not applicable.
Moderately well drained; sandy and gravelly substratum.	Excessive rate of seepage.	Good stability and compaction characteristics; limited clay content; permeable substratum.	Moderately well drained; moderate permeability.	Moderately rapid infiltration; moderate permeability; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel.	Nearly level to gently sloping; moderately erodible channel.
Somewhat poorly drained; seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Fair stability and compaction characteristics; very slow permeability.	Somewhat poorly drained; seasonally high water table; moderately permeable subsoil.	Moderately rapid infiltration; moderately permeable subsoil; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel.	Nearly level to gently sloping; moderately erodible channel.
Clayey; very poorly drained; seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Fair stability and poor compaction characteristics; slow permeability.	Very poorly drained; seasonally high water table; moderately slow permeability.	Moderately slow infiltration; slow permeability; very poorly drained; seasonally high water table.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel; clayey.
Limestone at a depth of 10 to 20 inches; seasonally wet.	Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches; poorly drained; moderate permeability.	Poorly drained; very low available moisture capacity.	Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches; very low available moisture capacity.
Somewhat poorly drained; poor stability in trenches; seasonally high water table.	Medium to rapid seepage, particularly in areas with sandy layers; seasonally high water table.	Poor to very poor stability and compaction characteristics; permeable; susceptible to piping.	Somewhat poorly drained; seasonally high water table; moderate permeability; flows if saturated.	Moderate permeability; seasonally high water table; high available moisture capacity; somewhat poorly drained.	Nearly level to gently sloping; channel severely erodible and a source of siltation.	Nearly level to gently sloping; channel severely erodible and a source of siltation.
Very poorly drained; seasonally high water table.	Moderately slow rate of seepage; seasonally high water table.	Fair to good stability and compaction characteristics; slow permeability.	Very poorly drained; moderately slow permeability; seasonally high water table.	Seasonally high water table; moderately slow permeability; very poorly drained.	Nearly level; seasonally wet.	Nearly level; seasonally wet.
Soft muck over sandy loam; high water table.	High water table; very unstable, permeable, soft muck.	Very unstable, soft organic material.	High water table; permeable; subject to subsidence if drained.	High water table; high available moisture capacity; organic soil.	Nearly level; high water table; organic soil.	Nearly level; high water table; organic soil.

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: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Mermill: Me, Mf	Poor: very poorly drained; generally wet in winter.	Moderate	Fair: limited amount of suitable material.	Not suitable	Fair: loamy	Poor: clayey	Very poorly drained; seasonally high water table; moderate permeability; very slowly permeable substratum.
Millgrove: Mg, Mh, Mk	Poor: very poorly drained; generally wet in winter.	Moderate	Good for the Mg and Mh units. Fair for the Mk unit; moderately fine textured.	Fair to poor: 20 to 55 percent fines.	Fair: loamy	Good: sandy and gravelly.	Very poorly drained; seasonally high water table; moderate permeability.
Millsdale: Mm, Mn, Mo	Poor: limestone at a depth of 20 to 40 inches; very poorly drained; moderately fine textured to fine textured subsoil.	High	Fair to good for the Mm and Mn units: high organic-matter content; limited amount of suitable material. Fair for the Mo unit: moderately fine textured.	Not suitable: limestone at a depth of 20 to 40 inches.	Poor: moderately fine textured to fine textured.	Not suitable: limestone at a depth of 20 to 40 inches.	Limestone at a depth of 20 to 40 inches; seasonally high water table; very poorly drained.
Milton: MrA, MrB	Fair to poor: moderately fine textured subsoil; well drained.	Moderate	Fair: limited amount of material.	Not suitable: limestone at a depth of 20 to 40 inches.	Poor: moderately fine textured.	Not suitable: limestone at a depth of 20 to 40 inches.	Limestone at a depth of 20 to 40 inches; well drained.
Morley: MsB, MyB, MyB2, MyC, MyC2, MyD2.	Poor: clayey subsoil; generally wet in winter.	High	Fair: limited amount of suitable material.	Not suitable	Poor: clayey	Poor: moderately fine textured to fine textured.	Moderately well drained; seasonally high water table; slow permeability; clayey.
Nappanee: NaA, NaB, NpA, NpB, NpC2.	Poor: seasonally wet; clayey.	High	Poor: limited amount of suitable material.	Not suitable	Poor: clayey	Poor: clayey	Somewhat poorly drained; seasonally high water table; very slow permeability; clayey.
Ottokee: OtB	Good: well drained.	Low	Poor: sandy	Good for fine sand. Not suitable for gravel.	Good: moderately well drained; sandy.	Good: moderately well drained; sandy.	Moderately well drained; rapid permeability.
Pewamo: Pm, Po	Poor: very poorly drained; clayey.	High	Fair for the Pm unit; moderately fine textured. Poor for the Po unit; clayey.	Not suitable	Poor: clayey	Poor: clayey	Very poorly drained; seasonally high water table; moderately slow permeability; clayey.
Quarry: Qu. Properties are too variable for evaluation.							

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Pond reservoir areas	Dikes, levees, or embankments [1]	Agricultural drainage	Irrigation	Terraces or diversions	Waterways
Very poorly drained; seasonally high water table; clayey substratum.	Very slow rate of seepage; seasonally high water table.	Fair stability and compaction characteristics; very slow permeability; medium to high compressibility.	Very poorly drained; seasonally high water table; moderate permeability; very slowly permeable substratum.	Moderate infiltration and permeability; very poorly drained; seasonally high water table; high available moisture capacity.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel.
Very poorly drained; trench walls are unstable; seasonally high water table.	Excessive rate of seepage; seasonally high water table.	Good stability and compaction characteristics; permeable substratum.	Very poorly drained; moderate permeability; seasonally high water table.	Moderate infiltration and permeability; seasonally high water table; high available moisture capacity.	Nearly level; seasonally wet.	Nearly level; seasonally wet.
Limestone at a depth of 20 to 40 inches; very poorly drained; seasonally high water table.	Limestone at a depth of 20 to 40 inches; seasonally high water table.	Poor stability and compaction characteristics; slow permeability; limestone at a depth of 20 to 40 inches.	Very poorly drained; moderately slow permeability; limestone at a depth of 20 to 40 inches.	Moderately slow permeability; medium available moisture capacity; very poorly drained; seasonally high water table.	Nearly level; limestone at a depth of 20 to 40 inches; seasonally wet.	Nearly level; limestone at a depth of 20 to 40 inches; seasonally wet.
Well drained; limestone at a depth of 20 to 40 inches.	Limestone at a depth of 20 to 40 inches; possible excessive seepage.	Fair stability and compaction characteristics; slow permeability; limestone at a depth of 20 to 40 inches.	Not needed; well drained.	Moderately slow permeability; medium available moisture capacity.	Nearly level to gently sloping; limestone at a depth of 20 to 40 inches.	Nearly level to gently sloping; limestone at a depth of 20 to 40 inches.
Clayey; moderately well drained.	Slow rate of seepage; seasonally high water table for short periods.	Fair stability and compaction characteristics; very slow permeability.	Moderately well drained; slow permeability; seasonally high water table.	Slow permeability; medium available moisture capacity.	Gently sloping to moderately steep; moderately erodible channel.	Gently sloping to moderately steep; moderately erodible channel.
Clayey material; somewhat poorly drained; seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Poor stability and compaction characteristics; very slowly permeable; subject to cracking.	Somewhat poorly drained; very slow permeability; seasonally high water table.	Slow infiltration and permeability; somewhat poorly drained; seasonally high water table; medium to low available moisture capacity.	Nearly level to sloping; moderately erodible channel.	Nearly level to sloping; moderately erodible channel.
Moderately well drained sandy soil; unstable in trenches.	Excessive rate of seepage.	Fair to good stability and compaction characteristics; permeable material; subject to piping.	Not needed: moderately well drained.	Rapid infiltration and permeability; low available moisture capacity.	Gently sloping; severely erodible channel.	Gently sloping; severely erodible channel; sandy; droughty; low organic-matter content.
Clayey soil material; very poorly drained; seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Fair to poor stability and compaction characteristics; slow permeability; high shrink-swell potential.	Very poorly drained; moderately slow permeability; seasonally high water table.	Moderately slow infiltration and permeability; very poorly drained; seasonally high water table; high available moisture capacity.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel; clayey.

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: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Randolph: RbA, RlA, RlB	Poor: limestone at a depth of 20 to 40 inches; clayey subsoil; seasonally wet.	High	Fair: limited amount of suitable material.	Not suitable	Poor: limestone at a depth of 20 to 40 inches; clayey.	Poor: limestone at a depth of 20 to 40 inches.	Somewhat poorly drained; seasonally high water table; moderately slow permeability; limestone at at a depth of 20 to 40 inches.
Rawson: RmA, RmB	Fair to poor: generally wet and sticky in winter.	High	Fair: limited amount of suitable material.	Not suitable	Fair to poor: moderately fine textured.	Poor: moderately fine textured to fine textured.	Moderately well drained; moderate permeability; slowly permeable substratum; seasonally high water table for short periods.
Rimer: RnA, RnB	Poor: seasonally wet; somewhat poorly drained.	Low	Poor: sandy	Not suitable for gravel; poor for sand; high content of fines.	Fair to good: loamy.	Poor: high clay content.	Seasonally high water table; somewhat poorly drained; slowly permeable substratum.
Ritchey: RrB	Poor: well drained; limestone at a depth of 10 to 20 inches; moderately fine textured subsoil.	Moderate	Poor: limestone at a depth of 10 to 20 inches; limited amount of suitable material.	Not suitable	Poor: limited amount of suitable material.	Poor: limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches; well drained.
Romeo: RsC	Poor: limestone at a depth of less than 10 inches.	Low	Poor: limestone at a depth of less than 10 inches.	Not suitable	Poor: limited amount of suitable material.	Poor: limestone at a depth of less than 10 inches.	Limestone at a depth of less than 10 inches.
Seward: SdA, SdB	Fair: loamy material; moderately well drained; seasonally wet.	Low to moderate.	Poor: high sand content.	Not suitable for gravel; poor for sand; high content of fines.	Fair: loamy in upper 20 to 40 inches.	Poor: clayey below a depth of 20 to 40 inches.	Seasonally high water table; moderately well drained.
Shinrock: SeB	Poor: seasonally wet; sticky.	High	Fair: limited amount of suitable material.	Not suitable	Poor: moderately fine textured.	Poor: medium textured and moderately fine textured.	Seasonally high water table; moderately well drained.
Shoals: Sh	Poor: somewhat poorly drained; wet in winter.	High	Good	Not suitable	Poor: loamy; high in silt content.	Poor: loamy; high in silt content.	Subject to flooding; somewhat poorly drained; moderate permeability.
Sloan: Sn, So	Poor: very poorly drained; subject to flooding.	High	Fair: So unit is moderately textured and has limited amount of suitable material.	Not suitable	Poor: loamy; seasonally wet.	Poor: loamy; seasonally wet.	Very poorly drained; seasonally high water table; subject to flooding; moderate permeability.

See footnote at end of table.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Pond reservoir areas	Dikes levees, or embankments [1]	Agricultural drainage	Irrigation	Terraces or diversions	Waterways
Somewhat poorly drained; limestone at a depth of 20 to 40 inches.	Limestone at a depth of 20 to 40 inches; excessive seepage losses in fractured limestone.	Fair to poor stability and compaction characteristics; slow permeability; high compressibility; limestone at a depth of 20 to 40 inches.	Somewhat poorly drained; limestone at a depth of 20 to to 40 inches; moderately slow permeability.	Somewhat poorly drained; moderately slow permeability; seasonally high water table.	Nearly level to gently sloping; limestone at a depth of 20 to 40 inches.	Nearly level to gently sloping; limestone at a depth of 20 to 40 inches; seasonally wet.
Clayey substratum within 3½ feet of the surface; seasonally high water table for short periods.	Excessive rate of seepage in upper 1½ to 3½ feet; seasonally high water table for short periods.	Good stability and compaction characteristics; medium compressibility; slow permeability.	Moderately well drained; moderate permeability in upper 1½ to 3½ feet; slowly permeable substratum.	Moderate infiltration and permeability; moderately well drained; medium available moisture capacity.	Gently sloping; moderately erodible.	Gently sloping; low organic-matter content; moderately erodible.
Somewhat poorly drained; seasonally high water table.	Slow rate of seepage at a depth below 1½ to 3½ feet; high seepage losses in upper 1½ to 3½ feet.	Soil material has fair to poor stability and compaction characteristics; slowly permeable substratum.	Somewhat poorly drained; rapid permeability at a depth above 20 to 40 inches; slow permeability at a depth below 20 to 40 inches; seasonally high water table.	Rapid infiltration; somewhat poor natural drainage; seasonally high water table; medium available moisture capacity.	Nearly level to gently sloping; erodible channels.	Nearly level to gently sloping; erodible channels.
Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches.	Not needed; shallow; well drained.	Low to very low available moisture capacity; moderately slow permeability.	Limestone at a depth of 10 to 20 inches.	Limestone at a depth of 10 to 20 inches; crusts easily; low organic-matter content.
Limestone at a depth of less than 10 inches.	Limestone at a depth of less than 10 inches.	Limestone at a depth of less than 10 inches.	Not needed; well drained; very shallow.	Very low available moisture capacity.	Limestone at a depth of less than 10 inches.	Limestone at a depth of less than 10 inches very low available moisture capacity.
20 to 40 inches of loamy and sandy material over clayey material; seasonally high water table; moderately well drained.	Excessive rate of seepage in upper 20 to 40 inches; slowly permeable substratum.	Fair to poor stability and compaction characteristics; permeable and susceptible to piping at a depth of 20 to 40 inches; clayey substratum.	Moderately well drained; rapid permeability in upper 20 to 40 inches; seasonally high water table.	Rapid infiltration and permeability; low to medium available moisture capacity.	Nearly level to gently sloping; severely erodible channel.	Nearly level to gently sloping; severely erodible channel.
Moderately well drained; seasonally high water table for short periods.	Slow rate of seepage....	Fair stability and compaction characteristics; slow permeability.	Moderately well drained; moderately slow permeability; seasonally high water table.	Moderately slow permeability; medium available moisture capacity.	Gently sloping; moderately erodible.	Gently sloping; soil material moderately erodible.
Subject to flooding; deep loamy material; subject to caving in trenches.	Moderate rate of seepage; permeable sandy layers in some areas; subject to flooding.	Fair to poor stability and compaction characteristics; slow permeability; susceptible to piping.	Somewhat poorly drained; subject to flooding; moderate permeability.	Moderate permeability; somewhat poor natural drainage; subject to flooding; high available moisture capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding; seasonally wet.
Subject to flooding; seasonally high water table.	Slow rate of seepage; susceptible to seepage in areas having sandy layers.	Fair stability and compaction characteristics; slowly permeable materials; subject to flooding; possibility of piping.	Very poorly drained; seasonally high water table; moderate permeability; subject to flooding.	Moderate infiltration and permeability; very poor natural drainage; seasonally high water table; high available moisture capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding; seasonally wet.

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: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Toledo: To	Poor: very poorly drained; clayey.	High	Fair: moderately fine textured.	Not suitable	Poor: clayey	Poor: clayey	Very poorly drained; slow permeability; seasonally high water table.
Tuscola: TpA, TpB, TsB	Fair: moderately well drained; generally wet in winter.	Moderate	Good	Not suitable	Fair: loamy	Fair: loamy	Seasonally high water table; moderately well drained; moderate permeability.
Vaughnsville: VaB	Fair: seasonally wet and sticky.	Moderate	Fair: limited amount of suitable material.	Not suitable	Fair to poor: loamy.	Fair to poor: loamy to clayey.	Moderately well drained to somewhat poorly drained; moderate permeability; slowly permeable substratum; seep areas.

[1] The permeability given is for properly compacted soil material.

The depth from surface, given for the major layers in each soil, corresponds to significant differences in texture in the representative profile for each soil series. As the estimated data given is for the representative soil profile in each series, the depth from the surface and thickness of the major layers may vary somewhat from those shown.

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

Permeability values are estimates of the range in rates of downward water movement in the major soil horizons when they are saturated above a true water table but allowed to drain freely. These estimates are based on soil texture, soil structure, porosity, bulk density, permeability and infiltration tests, and drainage observations. 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 is 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.

The pH values given in the column headed "Reaction" represent a summary of the many field pH determinations taken during the survey on each of the soils in the county.

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

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 value. The rating given is for average concrete. The ratings do not apply to concrete mixed specifically for corrosion resistance.

Engineering interpretations

Table 6 lists, for each soil in Hancock County, interpretations of features that affect suitability for specific engineering purposes. These interpretations are based on the soil test data in table 4, on the estimates of properties in table 5, and on field experience. The column headings are discussed briefly in the following paragraphs.

Because of wetness, plasticity, or susceptibility to frost action, many of the soils are not suitable for grading during parts of the winter. Such soils are rated as poor.

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

The thickness, texture, and inherent fertility of the surface layer determines the suitability of a soil for use as topdressing for road banks and embankment. These features should be favorable for the growth of vegetation. Only the surface layer of the soil is considered in this rating, except as noted otherwise.

It should not be assumed that all areas of a soil that is rated good as a source of sand and gravel can be used for commercial development. A soil rated good has better possibilities as a source of sand or gravel than soils that are rated poor or fair.

The rating for suitability of soil material for road fill is based largely on the properties that affect the Atterburg limits, namely, particle-size distribution and behavior when wet. Well-graded, coarse-grained material or mixtures of clay and coarse-grained material are desired for road fill. Highly plastic material, poorly graded silty material, and organic soils are difficult to compact and are low in stability. Consequently, they are poorly suited for road fill.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Pond reservoir areas	Dikes, levees, or embankments [1]	Agricultural drainage	Irrigation	Terraces or diversions	Waterways
Very poorly drained; clayey; seasonally high water table.	Very slow rate of seepage; seasonally high water table.	Poor stability and compaction characteristics; very slow permeability.	Very poorly drained; slow permeability; seasonally high water table.	Slow infiltration; slow permeability; seasonally high water table; high available moisture capacity.	Nearly level; very poorly drained.	Nearly level; clayey; very poorly drained.
Deep; loamy; moderately well drained.	Moderate rate of seepage; excessive in areas where substratum contains sandy layers.	Fair stability and compaction characteristics; moderate permeability; subject to piping.	Moderately well drained; moderate permeability; seasonally high water table.	High available moisture capacity; moderate permeability.	Nearly level to gently sloping; severely erodible channels.	Nearly level to gently sloping; severely erodible channels.
Seasonally high water table; seepage areas.	Excessive seepage; slowly permeable substratum.	Good stability and compaction characteristics; moderate permeability; subject to piping.	Moderately well drained to somewhat poorly drained; moderate permeability in upper layers.	Moderate infiltration and permeability; medium available moisture capacity.	Gently sloping; mixture of clayey material and sand and gravel; subject to excessive seepage.	Gently sloping; mixture of clayey material and sand and gravel; subject to excessive seepage.

Soil features that affect highway location include depth to rock, a high water table, slopes, and flood hazard.

Soil features that affect pipeline construction and maintenance are depth to hard bedrock, soil stability, and natural drainage.

For farm ponds consideration is given primarily to the sealing potential of the reservoir area. Shallowness to bedrock and the susceptibilty to overflow on flood plains are also noted. The soils are rated according to the stability and permeability of the materials used in the construction of pond embankments, low dikes, and levees. The permeability is for the soil material when compacted at optimum moisture.

For agricultural drainage the soil features are considered relative to their natural drainage, their in-place permeability, and the presence of a seasonally high water table.

The features considered for irrigation are the relative ease that water normally infiltrates into, percolates through, and drains from each of the soils and the available moisture capacity.

The slope of the land and the relative erodibility of the soil materials are the main features affecting terraces and diversions. Other features are the depth to rock and the presence of a seasonally high water table. Nearly level soils do not need terracing; steep soils are not well suited to terracing. Highly erodible soils require special care in the construction of diversions.

Slope of the land and erodibility of the soil materials are the main features affecting waterways. Depth to rock, high water table, and other applicable features are noted.

Soils and Land Use Planning

Hancock County is mostly rural, but it has cities and towns, such as Findlay and McComb, that have outer limits in rural-fringe areas. The continuing outward expansion of town limits into rural areas as the population increases affects the economic use of the existing farmland.

The expansion of nonfarm uses of land in the county can remove many acres from farm use in a short period of time. Highways, airports, factories, houses, and shopping centers tend to permanently remove land from farming.

Community planners and industrial users of land generally look for areas where soil conditions are such that development is least costly. These areas commonly have a good farming potential. This section of the survey gives information on the properties of the soils and their effect on selected land uses in rural-farming areas. This information can be useful as a guide for overall land-use planning.

Comparisons can be made among the soils in the county for any of the selected uses. Planners, whether individuals or groups, can find useful information on the soil maps and in other parts of this survey. Table 7 gives the kinds and estimated degree of limitations of soils for selected land uses. Knowledgeable alternatives can be developed as a basis for long-range planning and zoning. It must be recognized that extensive manipulation of the soil can alter some of its natural properties; therefore, in areas where there has been extensive cutting and filling operations, the ratings for some uses will no longer apply. In disturbed areas, where the natural vegetation has been removed or destroyed, erosion is a serious hazard. Over a period of time many of these areas contribute much runoff and erosional debris to lower lying streets, roads, or streams. Conservation practices in these areas are as essential as they are in many farm areas.

The degree of limitation imposed by a soil property may vary according to the land use. The estimated degree of limitation for each soil and specified land use is indicated by one or more of three ratings. Slight indicates that the soil presents no important limitation to the specified use. Moderate shows that the soil presents some limitations to the specified use that need to be recognized, but they can be overcome or corrected. Severe indicates that the soil presents limitations that are difficult and costly to overcome for a specified use and that the soil might better be considered for uses having a less than severe rating.

The column headings in table 7 are discussed in the following paragraphs.

FARMS.—Currently, most of the rural-fringe areas in Hancock County are in farm use. Most land-use changes in the county involve the conversion of farmland to nonfarm uses. Such land-use changes tend to be permanent.

Farming is an important enterprise in Hancock County, and it should be considered important in planning that involves land-use changes. In the column headed "Farms" in table 7, the soils have been rated only for cultivated crops. The degree of limitation is based on such hazards as erosion, wetness, and droughtiness.

Farming is rated in this table to aid land use planners in considering the soundness of farming specific soils.

SEWAGE EFFLUENT DISPOSAL.—Soil properties important to the installation and operation of septic tank disposal fields include permeability, depth to rock, slope, natural drainage, water table level, and susceptibility to flooding. Use of a soil for the disposal of effluent is severely limited by flooding, by very poor natural drainage, or by moderately slow to very slow permeability. Permeability of each soil in the county has been estimated and is shown in table 5.

The possibility of erosion and seepage is greater if the filter fields for septic tanks are placed where the slope is more than 12 percent than if they are placed where the slope is less. Also, the more sloping soils might become unstable when saturated. A severe limitation is imposed by a restrictive layer, such as solid bedrock, a dense compact layer, or a layer of clay that interferes with adequate filtration and the movement of the effluent from the soil.

Some soils in the county have a gravelly and sandy substratum or are underlain by creviced bedrock 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 investigation of the proposed site should be made to determine the limitations of the soil.

SEWAGE LAGOONS.—Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They may be needed in areas where septic tanks or a central sewage system is not feasible or practical. Among the features that control the degree of limitation are the susceptibility to flooding, degree of slope, depth to rock, and permeability.

HOMESITE LOCATIONS.—The ratings are for homes of three stories or less that have a basement, but the ratings also apply to sites for small industrial, commercial, and institutional buildings of similar size. Most of the acreage taken from farm use has been converted to residential developments. These areas are generally adjacent to urban areas. Individual houses or small groups of houses have also been built in rural areas throughout the county. Soil properties and related site characteristics that are used as a basis for ratings are depth to bedrock, slope, natural drainage, flood hazard, and surface stoniness or rockiness. The method of sewage disposal is not considered.

Flooding is a special hazard where soils are used for permanent structures. Though flooding may be infrequent, it is costly and damaging. Homes on naturally wet soils, such as Pewamo, Mermill, Hoytville, and Blount soils, have wet basements if adequate drainage has not been provided. In many areas of the county, well-developed systems that include tile drains and open

TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Adrian: Ad	Severe: very poorly drained, organic soil.	Severe: high water table; very poorly drained.	Severe: organic soil.	Severe: high water table; very poorly drained, organic soil.	Severe: very poorly drained; high water table.	Severe: very poorly drained, organic soil; high water table.
Belmore:						
BlA, BmA	Slight	Slight [2]	Severe: [2] permeable material.	Slight	Slight	Slight
BlB, BmB	Slight	Slight [2]	Severe: [2] permeable material.	Slight	Slight	Moderate: slope.
BmC	Moderate: slope; erodibility.	Moderate: [2] slope.	Severe: [2] permeable material.	Moderate: slope.	Moderate: slope.	Severe: slope

See footnotes at end of table.

ditches have been installed for farm use. Excavations in these areas for homesites can disrupt the established drainage system and thus cause the soil to revert to its natural wetness.

Soft, unstable soils, such as Linwood and Adrian soils, are not so favorable for supporting structural foundations as coarser textured soils, such as Belmore. Soils having high shrink-swell potential are likely to heave and cause the foundations to crack unless special precautions are taken. A high shrink-swell potential also affects the alinement of sidewalks, patios, floors, and rock walls. To minimize this effect, a subgrade or layers of sandy or gravelly material below the structure is desirable. The shrink-swell potential of each soil is shown in table 5.

Excavations of basements and installation of underground utility lines are difficult and expensive in soils that have a limited depth to bedrock, such as the Milton, Ritchey, and Romeo soils. On soils having slopes of more than 12 percent, the erosion hazard is greater and there are additional problems in excavating and leveling.

Lawns, landscaping, and golf fairways.—Some soils in the county are suitable sources of topsoil and are so indicated in table 6. During the process of construction the upper foot of topsoil can be scalped and pushed aside into a stockpile. After grading has been completed, it can then be redistributed over the area where it provides a good rooting zone for lawns, flowers, shrubs, and trees. In the same way, the natural surface soil removed in grading for streets can be used to improve adjacent areas.

Among the soil properties that determine whether a good lawn or golf fairway can be established are natural drainage, degree of slope, depth to bedrock, texture of the surface soil, stoniness and rockiness, and the susceptibility to flooding.

Streets and parking lots.—This column rates the use of soils for streets and parking lots in subdivisions. The ratings apply to streets and parking lots not subject to continual heavy traffic. Soil characteristics that affect this use are drainage, slope, depth to rock, susceptibility to flooding, and stoniness or rockiness. Tables 5 and 6 give additional information about the soils that is important for streets and parking lots. The degree of slope on the side of cuts and fills depends on the erodibility of the soil and its capacity to support close-growing vegetation.

Recreation.—Recreation is becoming increasingly important in Hancock County. All the soils of the county are potentially suitable for one or more kinds of recreational development. Soils on flood plains are excellent for some kinds of recreation because they are generally in long, winding areas along streams and adjacent scenic hills. Use of these soils for homes, highways, and most other nonfarm purposes is severely limited by their susceptibility to flooding. Construction in these areas may hold back the natural flow of floodwater.

Recreational facilities that can be safely developed on flood plains are extensive play areas and such intensive play areas as ball diamonds, picnic areas, and tennis courts. These play areas are not used during normal periods of flooding and are not subject to costly damage by floodwater. An onsite assessment of flooding height and duration should be made before recreational facilities are developed on flood plains.

Athletic fields.—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 if the site is other than nearly level. Consequently, the degree of limitation is moderate or severe on slopes of more than 2 percent. For soils having a surface layer of silt loam, fine sandy loam, very fine sandy loam, loam, or sandy loam the degree of limitation is only slight for this use.

soils for specified land uses

Recreation: Athletic fields	Recreation: Parks and play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills, trench type	Cemeteries
Severe: very poorly drained; high water table.	Severe: organic soil; high water table.	Severe: high water table; very poorly drained, organic soil.	Severe: high water table; very poorly drained, organic soil.	Severe: high water table; very poorly drained, organic soil.	Severe: high water table; very poorly drained, organic soil.
Slight	Slight	Slight	Slight	Severe: [2] moderately rapid permeability.	Slight.
Moderate: slope.	Slight	Slight	Moderate: slope	Severe: [2] moderately rapid permeability.	Slight.
Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: [2] moderately rapid permeability.	Moderate: slope.

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TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Blount:						
BnA, BoA	Slight	Severe: slow permeability.	Slight	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
BnB, BoB, BoB2	Slight for the BnB and BoB units. Moderate for the BoB2 unit: erodibility.	Severe: slow permeability.	Moderate: slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.
Celina: CeA	Slight	Severe: moderately slow permeability.	Moderate: limestone at a depth of 40 to 60 inches.	Moderate: limestone at a depth of 40 to 60 inches.	Slight	Slight
Clay pits: Cl. Properties are too variable for reliable evaluation.						
Colwood: Co	Slight	Severe: very poorly drained.	Moderate: moderately permeable.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Crosby: CrA	Slight	Severe: moderately slow permeability; limestone at a depth of 40 to 60 inches.	Moderate: limestone at a depth of 40 to 60 inches.	Moderate: somewhat poorly drained; limestone at a depth of 40 to 60 inches.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained; moderately slow permeability.
Cut and fill land: Cu. Properties are too variable for reliable evaluation.						
Digby:						
DgA, DmA	Slight	Moderate: [2] somewhat poorly drained.	Severe: [2] permeable substratum.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
DmB	Slight	Moderate: [2] somewhat poorly drained.	Severe: [2] permeable substratum; slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.
Dunbridge: DuB	Moderate: low available moisture capacity.	Severe: [2] limestone at a depth of 20 to 40 inches.	Severe: [2] limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Severe: low available moisture capacity.	Moderate: limestone at a depth of 20 to 40 inches; slope.
Eel: Ea, Em	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

See footnotes at end of table.

soils for specified land uses—Continued

Recreation				Sanitary land fills, trench type	Cemeteries
Athletic fields	Parks and play areas	Campsites			
		Tents	Trailers		
Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Moderate: somewhat poorly drained; clay loam texture.	Severe: slow permeability.
Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Moderate: somewhat poorly drained; clay loam texture.	Severe: slow permeability.
Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Severe: limestone at a depth of 40 to 60 inches.	Moderate to severe: limestone at a depth of 40 to 60 inches.
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; moderately slow permeability; limestone at a depth of 40 to 60 inches.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained; moderately slow permeability.	Severe: limestone at a depth of 40 to 60 inches.	Severe: somewhat poorly drained; limestone at a depth of 40 to 60 inches.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Severe:[2] pervious substratum.	Severe: somewhat poorly drained.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.	Severe:[2] pervious substratum.	Severe: somewhat poorly drained.
Moderate: limestone at a depth of 20 to 40 inches; slope.	Slight	Slight	Moderate: slope	Severe:[2] limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.
Slight to severe: depending on the frequency and duration of local flooding.	Slight to severe: depending on the frequency and duration of local flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Fulton:						
FtA	Moderate: wetness hazard.	Severe: slow permeability.	Slight	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
FtB	Moderate: wetness and erosion hazards.	Severe: slow permeability.	Moderate: slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Genesee: Gn	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Granby: Go	Moderate: wetness.	Severe: [2] very poorly drained.	Severe: [2] rapid permeability.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Gravel pits: Gp. Properties are too variable for reliable evaluation.						
Haney:						
HaA, HdA	Slight	Slight [2]	Moderate: [2] moderate permeability; permeable substratum.	Slight	Slight	Slight
HaB, HdB	Slight	Slight [2]	Moderate: [2] moderate permeability; permeable substratum; slope.	Slight	Slight	Moderate: slope.
Haskins:						
HkA, HnA	Slight	Severe: slow permeability; seasonally high water table.	Moderate: moderate permeability in upper 20 to 40 inches.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table.
HkB, HnB	Slight	Severe: slow permeability; seasonally high water table.	Moderate: moderate permeability in upper 20 to 40 inches; slope.	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Moderate: slope; seasonally high water table.
Hoytville: Ho, Hv	Slight	Severe: very poorly drained; slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Joliet: Jo	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.

See footnotes at end of table.

soils for specified land uses—Continued

Recreation				Sanitary land fills, trench type	Cemeteries
Athletic fields	Parks and play areas	Campsites			
		Tents	Trailers		
Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey texture.	Severe: somewhat poorly drained; slow permeability.
Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey texture.	Severe: somewhat poorly drained; slow permeability.
Slight to severe: depending on the frequency and duration of local flooding.	Slight to severe: depending on the frequency and duration of local flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
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.
Slight	Slight	Slight	Slight	Severe:[2] pervious substratum.	Moderate: moderately well drained.
Moderate: slope.	Slight	Slight	Moderate: slope	Severe:[2] pervious substratum.	Moderate: moderately well drained.
Moderate to severe: slow permeability; seasonally high water table.	Moderate: seasonally high water table.	Moderate: seasonally high water table; slow permeability at a depth below 20 to 40 inches.	Moderate: seasonally high water table; slow permeability at a depth below 20 to 40 inches.	Severe: seasonally high water table; clayey texture at a depth below 20 to 40 inches.	Severe: seasonally high water table; slow permeability at a depth below 20 to 40 inches.
Moderate to severe: slope; slow permeability at a depth below 20 to 40 inches.	Moderate: seasonally high water table.	Moderate: seasonally high water table; slow permeability at a depth below 20 to 40 inches.	Moderate: seasonally high water table; slow permeability at a depth below 20 to 40 inches; slope.	Severe: seasonally high water table; clayey texture at a depth below 20 to 40 inches.	Severe: seasonally high water table; slow permeability at a depth below 20 to 40 inches.
Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained; clayey texture.	Severe: very poorly drained.
Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.

TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Kibbie:						
KfA, KlA, KsA	Slight	Moderate:[2] somewhat poorly drained; moderate permeability.	Moderate:[2] moderate permeability.	Moderate: somewhat poorly drained; soft and compressible when wet.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
KfB, KlB, KsB	Slight	Moderate:[2] somewhat poorly drained; moderate permeability.	Moderate:[2] moderate permeability; slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.
Lenawee: Le, Ln	Slight	Severe: very poorly drained.	Slight	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Linwood: Lw	Slight	Severe: very poorly drained.	Severe: organic soil.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained; saturated.
Mermill: Me, Mf	Slight	Severe: very poorly drained; very slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Millgrove: Mg, Mh, Mk.	Slight	Severe:[2] very poorly drained; permeable substratum.	Severe:[2] moderate permeability; permeable substratum.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Millsdale: Mm, Mn, Mo.	Moderate: wetness.	Severe: very poorly drained; limestone at a depth of 20 to 40 inches; locally subject to flooding.	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches; very poorly drained; locally subject to flooding.	Severe: very poorly drained.	Severe: very poorly drained; limestone at a depth of 20 to 40 inches; locally subject to flooding.
Milton:						
MrA	Slight	Severe:[2] limestone at a depth of 20 to 40 inches; moderately slow permeability.	Severe:[2] limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Moderate: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.
MrB	Slight	Severe:[2] limestone at a depth of 20 to 40 inches; moderately slow permeability.	Severe:[2] limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Moderate: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.

See footnotes at end of table.

soils for specified land uses—Continued

Recreation: Athletic fields	Recreation: Parks and play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills, trench type	Cemeteries
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate:[2] somewhat poorly drained; moderate permeability.	Severe: somewhat poorly drained.
Moderate: somewhat poorly drained; slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.	Moderate:[2] somewhat poorly drained; moderate permeability.	Severe: somewhat 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.
Severe: very poorly drained; saturated.	Severe: saturated; organic soil.	Severe: very poorly drained; saturated; organic soil.	Severe: very poorly drained; saturated; organic soil.	Severe: very poorly drained; saturated; organic soil.	Severe: very poorly drained; saturated; organic soil.
Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained; clayey texture.	Severe: very poorly drained.
Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe:[2] very poorly drained; permeable substratum.	Severe: very poorly drained.
Severe: very poorly drained; limestone at a depth of 20 to 40 inches.	Severe: very poorly drained.	Severe: very poorly drained; locally subject to flooding.	Severe: very poorly drained; locally subject to flooding.	Severe: very poorly drained; limestone at a depth of 20 to 40 inches.	Severe: very poorly drained; limestone at a depth of 20 to 40 inches.
Severe: limestone at a depth of 20 to 40 inches.	Moderate: limestone at a depth of 20 to 40 inches.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Severe:[2] limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.
Severe: limestone at a depth of 20 to 40 inches; slope.	Moderate: limestone at a depth of 20 to 40 inches.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.	Severe:[2] limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.

TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Morley:						
MsB, MyB, MyB2	Slight for the MsB and MyB units. Moderate for the MyB2 unit; erodibility.	Severe: slow permeability.	Moderate: slope.	Slight	Slight	Moderate: slope.
MyC, MyC2	Moderate: slope; erodibility.	Severe: slow permeability.	Severe: slope	Moderate: slope.	Moderate: slope; erodibility.	Severe: slope
MyD2	Severe: slope; erodibility.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Nappanee:						
NaA, NpA	Moderate: seasonal wetness.	Severe: slow permeability.	Slight	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
NaB, NpB	Moderate: seasonal wetness.	Severe: slow permeability.	Moderate: slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
NpC2	Severe: erodibility.	Severe: slow permeability.	Severe: slope	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.	Severe: slope
Ottokee: OtB	Moderate: low available moisture capacity.	Slight [2]	Severe: [2] rapid permeability.	Slight	Severe: low available moisture capacity.	Slight
Pewamo: Pm, Po	Slight	Severe: moderately slow permeability; very poorly drained.	Slight	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Quarry: Qu. Properties are too variable for reliable evaluation						
Randolph:						
RbA, RlA	Moderate: seasonal wetness.	Severe: moderately slow permeability; limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Moderate: somewhat poorly drained; limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.
RlB	Moderate: wetness.	Severe: moderately slow permeability; limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.	Moderate: somewhat poorly drained; limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches.

See footnotes at end of table.

soils for specified land uses—Continued

Recreation				Sanitary land fills, trench type	Cemeteries
Athletic fields	Parks and play areas	Campsites			
		Tents	Trailers		
Severe: slow permeability.	Slight	Severe: slow permeability.	Severe: slow permeability.	Slight	Severe: slow permeability.
Severe: slope; slow permeability. Severe: slope; slow permeability.	Moderate: slope Severe: slope	Severe: slow permeability. Severe: slope; slow permeability.	Severe: slope; slow permeability. Severe: slope; slow permeability.	Moderate: slope Severe: slope	Severe: moderately well drained; slope. Severe: slope.
Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey texture.	Severe: slow permeability; clayey texture; somewhat poorly drained.
Severe: slow permeability.	Moderate: somewhat poorly drained.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey texture.	Severe: clayey texture; slow permeability; somewhat poorly drained.
Severe: slow permeability; slope.	Moderate: somewhat poorly drained; slope.	Severe: slow permeability.	Severe: slow permeability; slope.	Severe: clayey texture.	Severe: slow permeability; somewhat poorly drained.
Moderate: sandy texture.	Slight	Slight	Moderate: slope	Severe:[2] rapid permeability.	Moderate: surface texture.
Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained; clayey texture.	Severe: very poorly drained.
Severe: limestone at a depth of 20 to 40 inches.	Moderate: somewhat poorly drained; limestone at a depth of 20 to 40 inches.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained; moderately slow permeability.	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches; somewhat poorly drained.
Severe: limestone at a depth of 20 to 40 inches.	Moderate: somewhat poorly drained; limestone at a depth of 20 to 40 inches.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained; moderately slow permeability; slope.	Severe: limestone at a depth of 20 to 40 inches.	Severe: limestone at a depth of 20 to 40 inches; somewhat poorly drained.

TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Rawson:						
RmA	Slight	Severe: slowly permeable substratum.	Moderate: moderate permeability in upper part; slowly permeable substratum.	Slight	Slight	Slight
RmB	Slight	Severe: slowly permeable substratum.	Moderate: moderate permeability in upper part; slowly permeable substratum.	Slight	Slight	Moderate: slope.
Rimer:						
RnA	Slight	Severe: slow permeability.	Moderate: permeable in upper 20 to 40 inches.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
RnB	Slight	Severe: slow permeability.	Moderate: slope; permeable in upper 20 to 40 inches.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.
Ritchey: RrB	Moderate: erodibility.	Severe: [2] limestone at a depth of 10 to 20 inches; moderately slow permeability.	Severe: [2] limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 20 inches.
Romeo: RsC	Severe: very shallow soil.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.
Seward:						
SdA	Slight	Severe: slowly permeable substratum.	Moderate: pervious in upper 20 to 40 inches	Slight	Slight	Slight
SdB	Slight	Severe: slowly permeable substratum.	Moderate: pervious in upper 20 to 40 inches.	Slight	Slight	Moderate: slope.
Shinrock: SeB	Slight	Severe: moderately slow permeability.	Slight	Slight	Slight	Moderate: slope.
Shoals: Sh	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

See footnotes at end of table.

soils for specified land uses—Continued

Recreation: Athletic fields	Recreation: Parks and play areas	Recreation: Campsites: Tents	Recreation: Campsites: Trailers	Sanitary land fills, trench type	Cemeteries
Slight	Slight	Slight	Slight	Moderate: moderately well drained; moderate permeability in upper 20 to 40 inches.	Moderate: moderately well drained; slowly permeable substratum.
Moderate: slope	Slight	Slight	Moderate: slope	Moderate: moderately well drained; moderate permeability in upper 20 to 40 inches.	Moderate: moderately well drained; slowly permeable substratum.
Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; rapid permeability in upper 20 to 40 inches.	Severe: somewhat poorly drained; slow permeability below a depth of 40 inches.
Moderate: somewhat poorly drained; slope.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slope.	Severe: somewhat poorly drained; rapid permeability in upper 20 to 40 inches.	Severe: somewhat poorly drained; slow permeability below a depth of 40 inches.
Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.	Severe: limestone at a depth of 10 to 20 inches.
Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.	Severe: limestone at a depth of less than 10 inches.
Slight	Slight	Slight	Slight	Moderate: moderately well drained; pervious in upper 20 to 40 inches.	Severe: slowly permeable substratum.
Moderate: slope	Slight	Slight	Moderate: slope	Moderate: moderately well drained; pervious in upper 20 to 40 inches.	Severe: slowly permeable substratum.
Moderate: moderately slow permeability; slope.	Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.	Slight	Moderate: moderately well drained; moderately slow permeability.
Severe: subject to flooding.	Moderate: somewhat poorly drained; subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; somewhat poorly drained.

TABLE 7.—*Estimated degree and kinds of*

Soil series and map symbols	Farms	Sewage effluent disposal	Sewage lagoons	Homesite locations [1]	Lawns, landscaping, and golf fairways	Streets and parking lots
Sloan: Sn, So	Moderate: wetness hazard.	Severe: subject to flooding; very poorly drained.	Severe: subject to flooding.	Severe: subject to flooding; very poorly drained.	Severe: subject to flooding; very poorly drained.	Severe: subject to flooding; very poorly drained.
Toledo: To	Moderate: seasonal wetness.	Severe: very poorly drained; slow permeability.	Slight	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Tuscola:						
TpA	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Slight	Slight
TpB, TsB	Slight	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Slight	Slight	Slight
Vaughnsville: VaB	Slight	Severe: [2] subject to seepage; slow permeability in lower part.	Severe: [2] moderate permeability in upper part.	Moderate: moderately well drained to somewhat poorly drained.	Moderate: moderately well drained to somewhat poorly drained.	Moderate: slope; moderately well drained to somewhat poorly drained.

[1] Also applies to small industrial, institutional, and commercial buildings that are not more than 3 stories high.
[2] Possible pollution of ground water because the substratum is porous and filtration is inadequate.

PARKS AND PLAY AREAS.—Picnic areas and extensive play areas can be located on many kinds of soils. Areas consisting of several different soils support many kinds of wildlife and natural vegetation. Considered in determining the degree of limitation for picnicking, hiking, nature study, and similar uses are degrees of slope, texture of the surface layer, natural drainage, stoniness, and susceptibility to 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.—Campsites for tents and trailers should be located in areas where the landscape is attractive, the trafficability is good, and the productivity for grasses and trees is medium or high. In soils where the natural drainage is good or moderately good, the limitations are less serious than in wetter soils. As a rule, slopes in excess of 12 percent are a severe limitation for tent campsites, but slope is more limiting for trailer sites than for tent sites. Soils that are firm when moist and nonsticky when wet are desirable. Among the soils most suitable for campsites are those having a surface layer of loam, silt loam, sandy loam, fine sandy loam, or very fine sandy loam.

SANITARY LAND FILLS, TRENCH TYPE.—Depth to bedrock is particularly important in considering soils suitable for sanitary land fills. The most favorable soils for trench type fills are those that are well drained and slowly permeable. Among the soil features that limit their use are shallowness to bedrock, clayey texture, seasonal wetness, rapid permeability, slope, and flooding.

Both soil and site conditions should permit year round cutting and filling operations. Careful onsite investigation is needed to prevent pollution of ground water or nearby water supplies. A sufficient quantity of clayey soil material should surround all sides of buried refuse.

CEMETERIES.—For use as cemeteries, soils that are deep, are well drained or moderately well drained, and have slopes of less than 12 percent have slight or moderate limitations; steeper soils have severe limitations. Soils that are naturally somewhat poorly drained, poorly drained, and very poorly drained are affected by a seasonally high water table and have severe limitations. On some soils, if the water table is permanently lowered, limitations are slight or moderate. The use of soils for cemeteries is severely limited by hard bedrock near the surface, but it is only slightly or moderately limited if the underlying materials are soft or rippable. Throughout the year, excavation is most favorable in the sandier soils. Preserving the topsoil for replacement on the surface is important. Liming and fertilizing are needed for maintaining sod.

UTILITY LINES.—The installation and maintenance of utility lines are affected by soil properties but are not *soils for specified uses*—Continued

Recreation				Sanitary land fills, trench type	Cemeteries
Athletic fields	Parks and play areas	Campsites			
		Tents	Trailers		
Severe: very poorly drained; subject to flooding.	Severe: very poorly drained; subject to flooding.	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: very poorly drained; slow permeability.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained; slow permeability; clayey texture; subject to ponding.	Severe: very poorly drained; slow permeability; clayey texture.
Slight	Slight	Slight	Slight	Slight	Moderate: moderately well drained.
Moderate: slope	Slight	Slight	Moderate: slope	Slight	Moderate: moderately well drained.
Moderate: slope; moderately well drained to somewhat poorly drained.	Slight	Moderate to severe; subject to seepage.	Moderate to severe: subject to seepage.	Severe: subject to excessive seepage.	Severe: subject to excessive seepage.

separately shown in table 6 or 7. Depth to bedrock, natural drainage, water table characteristics, and corrosion potential are among the outstanding properties affecting utility lines. During the planning stages, routing of utility lines can be facilitated if information in the soil survey is used. The establishment, control, and maintenance of vegetation on utility rights-of-way are in many ways influenced by soil properties.

Descriptions of the Soils

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

Each series description contains a short, narrative description of a soil profile considered representative of the series and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. The colors described are for moist soils, unless otherwise noted. Soil materials that have a Munsell color value of 4 or more are considered light colored; those that have a color value of less than 4 are considered dark colored. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and others are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 8. At the back of this soil survey the "Guide to Mapping Units" lists the mapping units of the county and shows the capability unit each mapping unit is in and the pages on which the mapping units and capability units are described.

Adrian Series

The Adrian series consists of organic soils that are dark colored and very poorly drained. These soils formed in organic materials 16 to 42 inches thick overlying coarse-textured mineral material. They are in level areas and depressions in Biglick Township.

A representative Adrian soil has a layer of black muck to a depth of 23 inches. This muck has a few dark-brown and yellowish-red peat fragments in the lower part. At a depth between 23 and 48 inches, the substratum is gray loamy fine sand mottled with dark yellowish brown. Below a depth of 48 inches, it is gray calcareous sand.

Adrian soils have moderately rapid permeability in the organic layer. The sandy substratum is rapidly perme-

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

Soils	Acres	Percent
Adrian muck	308	(1)
Belmore sandy loam, 0 to 2 percent slopes	245	(1)
Belmore sandy loam, 2 to 6 percent slopes	1, 057	0. 3
Belmore loam, 0 to 2 percent slopes	275	(1)
Belmore loam, 2 to 6 percent slopes	2, 046	. 6
Belmore loam, 6 to 12 percent slopes	113	(1)
Blount loam, 0 to 2 percent slopes	3, 922	1. 1
Blount loam, 2 to 6 percent slopes	3, 084	. 9
Blount silt loam, 0 to 2 percent slopes	77, 852	22. 9
Blount silt loam, 2 to 6 percent slopes	40, 832	12. 0
Blount silt loam, 2 to 6 percent slopes, moderately eroded	196	(1)
Celina silt loam, limestone substratum, 0 to 2 percent slopes	494	. 1
Clay pits	250	(1)
Colwood loam	1, 037	. 3
Crosby silt loam, limestone substratum, 0 to 2 percent slopes	76	(1)
Cut and fill land	912	. 3
Digby sandy loam, 0 to 2 percent slopes	707	. 2
Digby loam, 0 to 2 percent slopes	4, 137	1. 2
Digby loam, 2 to 6 percent slopes	654	. 2
Dunbridge loamy fine sand, 2 to 6 percent slopes	46	(1)
Eel loam	296	(1)
Eel silt loam	2, 914	. 9
Fulton silt loam, 0 to 2 percent slopes	522	. 2
Fulton silt loam, 2 to 6 percent slopes	218	(1)
Genesee silt loam	191	(1)
Granby loamy fine sand	88	(1)
Gravel pits	150	(1)
Haney sandy loam, 0 to 2 percent slopes	432	. 1
Haney sandy loam, 2 to 6 percent slopes	761	. 2
Haney loam, 0 to 2 percent slopes	1, 175	. 3
Haney loam, 2 to 6 percent slopes	1, 532	. 5
Haskins fine sandy loam, 0 to 2 percent slopes	1, 397	. 4
Haskins fine sandy loam, 2 to 6 percent slopes	889	. 3
Haskins loam, 0 to 2 percent slopes	10, 242	3. 0
Haskins loam, 2 to 6 percent slopes	3, 630	1. 1
Hoytville clay loam	115	(1)
Hoytville clay	28, 696	8. 4
Joliet silty clay loam	257	(1)
Kibbie fine sandy loam, 0 to 2 percent slopes	666	. 2
Kibbie fine sandy loam, 2 to 6 percent slopes	191	(1)
Kibbie loam, 0 to 2 percent slopes	2, 544	. 7
Kibbie loam, 2 to 6 percent slopes	548	. 2
Kibbie silt loam, 0 to 2 percent slopes	938	. 3
Kibbie silt loam, 2 to 6 percent slopes	56	(1)
Lenawee loam	1, 162	. 3
Lenawee silty clay loam	8, 850	2. 6
Linwood muck	756	. 2
Mermill loam	9, 429	2. 8
Mermill clay loam	4, 486	1. 3
Millgrove fine sandy loam	524	. 1
Millgrove loam	4, 798	1. 4
Millgrove clay loam	2, 249	. 7
Millsdale loam	620	. 2
Millsdale silt loam	267	(1)
Millsdale silty clay loam	2, 315	. 7
Milton silt loam, 0 to 2 percent slopes	703	. 2
Milton silt loam, 2 to 6 percent slopes	571	. 2
Morley loam, 2 to 6 percent slopes	841	. 2
Morley silt loam, 2 to 6 percent slopes	9, 008	2. 6
Morley silt loam, 2 to 6 percent slopes, moderately eroded	517	. 2
Morley silt loam, 6 to 12 percent slopes	221	(1)
Morley silt loam, 6 to 12 percent slopes, moderately eroded	685	. 2
Morley silt loam, 12 to 18 percent slopes, moderately eroded	126	(1)
Nappanee loam, 0 to 2 percent slopes	547	. 2
Nappanee loam, 2 to 6 percent slopes	251	(1)
Nappanee silt loam, 0 to 2 percent slopes	2, 419	. 7
Nappanee silt loam, 2 to 6 percent slopes	156	(1)
Nappanee silt loam, 4 to 10 percent slopes, moderately eroded	73	(1)
Ottokee loamy fine sand, 0 to 4 percent slopes	428	. 1
Pewamo silty clay loam	73, 696	21. 6
Pewamo clay	275	(1)
Quarry	350	. 1
Randolph loam, 0 to 2 percent slopes	387	. 1
Randolph silt loam, 0 to 2 percent slopes	774	. 2
Randolph silt loam, 2 to 6 percent slopes	228	(1)
Rawson loam, 0 to 2 percent slopes	107	(1)
Rawson loam, 2 to 6 percent slopes	425	. 1
Rimer loamy fine sand, 0 to 2 percent slopes	283	(1)
Rimer loamy fine sand, 2 to 6 percent slopes	206	(1)
Ritchey silt loam, 1 to 5 percent slopes	199	(1)
Romeo silt loam, 0 to 10 percent slopes	184	(1)
Seward loamy fine sand, 0 to 2 percent slopes	250	(1)
Seward loamy fine sand, 2 to 6 percent slopes	886	. 3
Shinrock silt loam, 2 to 6 percent slopes	150	(1)
Shoals silt loam	1, 639	. 5
Sloan loam	3, 592	1. 1
Sloan silty clay loam	5, 814	1. 7
Toledo silty clay loam	448	. 1
Tuscola fine sandy loam, 0 to 2 percent slopes	156	(1)
Tuscola fine sandy loam, 2 to 6 percent slopes	554	. 2
Tuscola loam, 2 to 6 percent slopes	290	(1)
Vaughnsville loam, 1 to 4 percent slopes	240	(1)
Water	654	. 2
Soils less than 0.1 percent of county	--------	2. 0
Total	340, 480	100. 0

(1) Less than 0.1 percent

able. They have a high available moisture capacity. The Adrian soils have a high water table for long periods of time. The organic layer is generally medium to strongly acid. Trace element deficiencies as well as low levels of phosphorus and potash are common. Adrian soils are too wet for crop production, unless they are artificially drained. If these soils are drained, the rooting zone is moderately deep to deep, depending on the depth to water.

Corn is the major crop grown on Adrian soils in areas that are drained.

Representative profile of Adrain muck, in the NE¼ NE¼, sec. 25, T. 1 N., R. 12 E., Biglick Township:

1—0 to 9 inches, black (10YR 2/1) muck; medium, granular structure; very friable; many roots; medium acid; clear, wavy boundary.

2—9 to 23 inches, black (10YR 2/1) muck; medium, granular structure; friable; few dark-brown (7.5YR 4/4) and yellowish-red (5YR 4/6) fragments of peat; common roots; medium acid; abrupt, wavy boundary.

IIC1g—23 to 48 inches, gray (10YR 6/1) loamy fine sand; dark yellowish-brown (10YR 4/6) mottles; single grain; loose, yellowish-red (5YR 4/8) and dark yellowish-brown (10YR 4/4) staining around roots and root channels; discontinuous pockets of grayish-brown (10YR 5/2) sandy clay loam that has strong-brown (7.5YR 5/6) mottles occur only in the upper part; few roots; strongly acid; gradual, wavy boundary.

IIC2—48 to 60 inches, gray (10YR 6/1) sand; single grain; loose; moderately alkaline; calcareous.

The thickness of the organic material ranges from 16 to 42 inches. The organic-matter content in the surface of the

Adrian soil averages about 30 percent. Woody fragments can occur in the organic part of this soil.

The Adrian soils are commonly near or adjacent to the mineral soils of the Granby, Millgrove, and Mermill series. They have a coarser textured substratum than Linwood soils, which are underlain by loamy mineral material.

Adrian muck (Ad).—In some areas of this soil, depth to limestone bedrock is as shallow as 40 inches. This soil has serious nutrient deficiencies. It is subject to subsidence if it is drained. Tile placed in the sandy substratum has a tendency to plug because of flowing sands.

Included in mapping were small areas of very poorly drained Granby, Millgrove, Mermill, and Linwood soils. A few areas of sand deposits, generally less than half an acre in size, are shown on the maps by the symbol for sand.

The major limitation of this soil is a high water table. For nonfarm uses, the major limitations are a high water table and instability. (Capability Unit IIw-6)

Belmore Series

The Belmore series consists of soils that are deep and well drained. These soils formed in loamy materials over poorly stratified fine gravel and sand that contains some finer textured sediment. They are nearly level to sloping, and they occupy slightly elevated, narrow beach ridges. These beach ridges mark the outer limits of glacial lakes that existed during and immediately following the Wisconsin glaciation.

A representative Belmore soil that is cultivated has a dark-brown loam plow layer. The subsoil, at a depth between 7 and 35 inches, is dark yellowish-brown loam, dark-brown sandy clay loam, and dark-brown gravelly sandy clay loam. Below the subsoil is brown fine gravel and sand that contains strata of sandy loam and loam and extends to a depth of 60 inches. This underlying material is loose and calcareous.

Belmore soils have moderately rapid permeability. They have medium available moisture capacity. The organic-matter content of the surface layer is generally low. The soil is medium acid within the rooting zone and less acid with increasing depth. The rooting zone is moderately deep to deep, depending on the depth to loose sand and gravel.

The Belmore soils were some of the first soils cleared in the county. Their drainage and elevation above the nearly level lake plain make them suitable for roads, farmsteads, and cemeteries. They tend to warm up early in spring. They are well suited to short-season truck crops, such as strawberries. Drought is a hazard for late-maturing crops, such as corn and soybeans. Belmore soils are well suited to irrigation. Crops respond to additions of lime and fertilizer. The Belmore soils are a likely source of sand and gravel. Many gravel pits are on these soils.

Representative profile of Belmore loam, 2 to 6 percent slopes, north of State Route 113, NE¼ sec. 2, Washington Township:

Ap—0 to 7 inches, dark-brown (10YR 4/3) loam; weak, medium, granular structure; very friable; few fine pebbles; common fine roots; neutral; abrupt, smooth boundary.

B1—7 to 11 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure; friable; few fine pebbles; common fine roots; slightly acid; clear, smooth boundary.

B21t—11 to 22 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, very dark brown (7.5YR 3/3) clay films on ped surfaces and bridging sand grains; common fine pebbles; few fine roots; slightly acid; gradual, wavy boundary.

IIB22t—22 to 35 inches, dark-brown (10YR 4/3) gravelly sandy clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, very dark brown (7.5YR 2/2) clay films on peds and bridging sand grains; common fine pebbles; slightly acid; abrupt, wavy boundary.

IIC—35 to 60 inches, brown (10YR 5/3) fine gravel and sand that contain strata of sandy loam and loam; single grain; loose; moderately alkaline; calcareous.

The A horizon is loam or sandy loam; loam is the most extensive. The A horizon is 10YR in hue, 4 to 5 in value, and 3 to 4 in chroma. The B horizon is loam, sandy clay loam, or clay loam. In many places this horizon contains fine gravel. The B horizon is dominantly 10YR or 7.5YR in hue and 3 to 4 in value and chroma. The C horizon is variable in degree of stratification and in texture. Fine gravel, coarse sand, loam, sandy loam, and sand are dominant. The depth to calcareous sandy and gravelly material ranges from 24 to 50 inches. The greater depths occur where tongues of the B22t horizon extend into the sandy and gravelly material. The solum ranges from strongly acid to neutral.

Belmore soils are the well-drained members of a drainage sequence that includes moderately well drained Haney soils, somewhat poorly drained Digby soils, and very poorly drained Millgrove soils. Belmore soils differ from Haney soils in that they are better drained and lack low-chroma mottles in the upper part of the Bt horizon. They have brighter colors and are better drained than Digby and Millgrove soils. In some places on the sides of beach ridges, Belmore soils are adjacent to the moderately well drained to somewhat poorly drained, reddish Vaughnsville soils. They are better drained and less red than the Vaughnsville soils.

Belmore sandy loam, 0 to 2 percent slopes (BlA).—This soil is in elongated areas on the crest of beach ridges, mostly the northernmost ridges. Surface runoff is slow. This soil has a profile similar to the one described as representative for the series, but it contains more sand throughout. Because this soil is sandier than Belmore loam, it dries more readily and is more droughty. Also, germination of seeds is poorer in this soil because the available moisture capacity in the surface layer is lower. Included in mapping were small areas that have a surface layer of loamy fine sand or fine sandy loam.

The major limitation of this soil for farming is droughtiness. The limitations for many nonfarm uses are few. (Capability unit IIs-1)

Belmore sandy loam, 2 to 6 percent slopes (BlB).—This soil is on the upper part of beach ridges, generally on the northernmost ridges. The areas are narrow and elongated. Surface runoff is moderate. This soil has a profile similar to the one described as representative for the series but it contains more sand throughout.

Included with this soil in mapping were small areas where the texture of the surface layer is loamy fine sand or fine sandy loam. This soil is more droughty than Belmore loam, and in consequence, seed germination is commonly poor.

The major limitations of this soil for farming are soil blowing and water erosion. Droughtiness is a secondary limitation. Slope is a limitation to some nonfarm uses. (Capability unit IIe-1)

Belmore loam, 0 to 2 percent slopes (BmA).—This soil is in elongated areas on the crests of beach ridges. Surface runoff is slow.

The major limitation of this soil for farming is droughtiness. It is subject to damage from soil blowing, but not to the same degree as the Belmore sandy loams. For many nonfarm uses, this soil has few limitations. (Capability unit IIs-1)

Belmore loam, 2 to 6 percent slopes (BmB).—This soil is on the upper part of beach ridges in long, narrow areas. A profile of this soil is described as representative for the Belmore series. Surface runoff is medium.

Included in mapping this soil were a few areas of Vaughnsville soils, which are redder than this soil, more poorly drained, and, in places, seepy and in need of drainage.

The hazards of water erosion and soil blowing are the major limitations of this soil for farming. Droughtiness is a secondary limitation. Slope is a limitation for some nonfarm uses. (Capability unit IIe-1)

Belmore loam, 6 to 12 percent slopes (BmC).—This soil is on sides of the southernmost beach ridges. Its slopes are typically short. The soil areas are narrow and elongated, but not so long as areas of the more gently sloping soils in this series. Surface runoff is rapid.

Included in mapping were a few small areas that have a fine sandy loam surface layer. These included areas have lower organic-matter content than this soil, are more susceptible to soil blowing and water erosion, and because of their limited available moisture capacity, cause poor germination of seeds. Also included with this soil are small areas of moderately well drained Haney soils.

Water erosion and soil blowing are the major limitations for farming. Droughtiness is a secondary limitation. Slope is the dominant limitation to many nonfarm uses. (Capability unit IIIe-3)

Blount Series

The Blount series consists of soils that are deep, nearly level to gently sloping, and somewhat poorly drained. These soils formed in clay loam glacial till. Blount soils occupy nearly one-third of the land area of the county. They are on the till plain.

A representative Blount soil that is cultivated has a dark grayish-brown silt loam plow layer. The upper part of the subsoil, at depths between 8 to 11 inches, is light brownish-gray silty clay loam. At depths between 11 and 28 inches, it is grayish-brown and yellowish-brown silty clay. The lower part of the subsoil is yellowish-brown and light olive-brown silty clay loam to a depth of 39 inches. Firm, calcareous, light olive-brown, and brown clay loam glacial till is at a depth between 39 and 60 inches.

Blount soils have slow permeability in both the subsoil and underlying glacial till. They have a seasonally high water table for a significant period of time during winter and spring. They are slow to dry out in spring unless they are artificially drained. The major rooting zone for most crops is less than 36 inches, but some roots penetrate deeper. Within the rooting zone, Blount soils have medium available moisture capacity. The rooting zone is medium acid to very strongly acid in the upper 24 inches, except that the plow layer is less acid where limed. At a depth below 24 inches, the rooting zone is slightly acid to mildly alkaline.

Most areas of Blount soils are cultivated. Many areas of Blount soils are artificially drained to permit more timely management practices and to help minimize crop losses.

Representative profile of Blount silt loam, 0 to 2 percent slopes, in NW¼SE¼ sec. 20, 1.5 miles NW. of Houcktown, Jackson Township:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1t—8 to 11 inches, light brownish-gray (2.5Y 6/2) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable to firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; strongly acid; clear, wavy boundary.

B21t—11 to 14 inches, grayish-brown (2.5Y 5/2) silty clay; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, continuous, dark grayish-brown (10YR 4/2) clay films; very strongly acid; clear, wavy boundary.

B22t—14 to 18 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, fine, subangular blocky structure; firm; medium, continuous, dark grayish-brown (10YR 4/2) clay films; strongly acid; gradual, wavy boundary.

B23t—18 to 28 inches, yellowish-brown (10YR 5/4) silty clay; many, medium, fine, grayish-brown (10YR 5/2) mottles; moderate, medium to fine, subangular blocky structure; firm; thin, continuous, dark grayish-brown (10YR 4/2) clay films on vertical faces and thin patchy clay films on horizontal faces; neutral; gradual, wavy boundary.

B31—28 to 33 inches, yellowish-brown (10YR 5/6) silty clay loam; many, medium, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; firm; mildly alkaline; calcareous; gradual, wavy boundary.

B32—33 to 39 inches, light olive-brown (2.5Y 5/4) silty clay loam; common, medium, faint, light olive-brown (2.5Y 5/6) mottles; very weak, medium, subangular blocky structure; firm; mildly alkaline; calcareous gradual, wavy boundary.

C1—39 to 47 inches, light olive-brown (2.5Y 5/4) clay loam till; common, medium, distinct, reddish-brown (5YR 5/4) mottles; massive; firm; moderately alkaline; calcareous.

C2—47 to 60 inches, brown (10YR 5/3) clay loam till; common, medium, faint, yellowish-brown (10YR 5/6) mottles; massive; firm; moderately alkaline; calcareous.

The A horizon ranges from 2.0 to 3.5 percent in organic-matter content. The Ap horizon ranges from dark brown (10YR 4/3) to dark grayish-brown (10YR 4/2). In some uncultivated areas there is a thin A2 horizon. The B horizon is silty clay loam or silty clay. In some places, the lower part of the B horizon has a weak, coarse, prismatic structure parting to moderate, medium, angular blocky. The B horizon ranges from very strongly acid to medium acid in the upper part and from slightly acid to mildly alkaline in the lower part. The C horizon ranges from clay loam to silty clay loam. The depth to calcareous material ranges from 20 to 38 inches but averages 29 inches. In some places, there are igneous pebbles, up to 5 percent on the surface and in the profile. Where Blount soils are associated with Fulton soils, the depth to till is greater and there are fewer coarse fragments than in the representative profile. The till underlying Blount soils has loam or silt loam lenses or pockets in local areas.

The somewhat poorly drained Blount soils are in a drainage sequence that includes the moderately well drained Morley soils and the very poorly drained Pewamo soils and are adjacent to these soils in many places. Blount soils are less gray than Pewamo soils and have a lighter colored A horizon. They are grayer in the upper part of the B horizon than the Morley soils. Blount soils are shallower to the clayey B horizon than Crosby soils, and they formed in finer textured glacial till.

Blount loam, 0 to 2 percent slopes (BnA).—This soil lies on slightly elevated areas of the till plain. Surface runoff is slow. This soil has a profile similar to the one described as representative for the Blount series, but the surface layer contains more sand. It is not susceptible to surface crusting.

Included in mapping were small areas of Haskins soils.

Seasonal wetness is the major limitation for farming. For many nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIw-4)

Blount loam, 2 to 6 percent slopes (BnB).—This soil lies on low knolls and along borders of drainageways on the till plain. Surface runoff is medium. This soil has a profile similar to the one described as representative for the Blount series, but the surface layer contains more sand. It is less susceptible to surface crusting than Blount silt loam.

Included in mapping were small areas of Haskins soils.

The major limitation for farming is seasonal wetness. A secondary limitation is the hazard of erosion. For many nonfarm uses, seasonal wetness, slow permeability, and slope are limitations. (Capability unit IIw-4)

Blount silt loam, 0 to 2 percent slopes (BoA).—This soil lies on the till plain, generally in the south-central part of the county. A profile of this soil is described as representative for the series. The surface layer has a high content of silt and is susceptible to surface crusting. Surface runoff is slow.

Included in mapping were small elongated areas of dark-colored, very poorly drained Pewamo soils. These inclusions are in drainageways or shallow depressions. Ponding may occur in the depressions.

The major limitation for farming is seasonal wetness. For many nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIw-4)

Blount silt loam, 2 to 6 percent slopes (BoB).—This soil lies on knolls and along drainageways on the till plain in the southern part of the county. The surface layer has a high content of silt and is susceptible to surface crusting. Surface runoff is medium.

Included in mapping were small areas of the moderately well drained Morley soils, which occupy small rises on the landscape.

The major limitation for farming is seasonal wetness. A secondary limitation is the hazard of erosion. For many nonfarm uses, slow permeability, seasonal wetness, and slope are limitations. (Capability unit IIw-4)

Blount silt loam, 2 to 6 percent slopes, moderately eroded (BoB2).—This soil lies in areas along drainageways on the till plain. This soil has a profile similar to the one described as representative for the series, but at least 50 percent of the original surface layer has been removed on more than half the acreage. The plow layer is now a mixture of the original surface layer and some of the finer textured upper part of the subsoil. Surface runoff is medium to rapid.

This soil has a low organic-matter content and is susceptible to crusting and surface sealing. Tillage produces cloddy surfaces that are difficult to prepare in making seedbeds.

Included in mapping were small areas of the somewhat poorly drained Haskins soils and the moderately well drained Morley soils.

The limitations for farming are seasonal wetness and a severe hazard of erosion. For many nonfarm uses, slow permeability, slope, and seasonal wetness are limitations. (Capability unit IIIe-2)

Celina Series

Soils in the Celina series are deep and moderately well drained. They are nearly level and are on the till plain in the southeastern part of Biglick Township. They formed mostly in weathered, loam-textured till, but in some areas they have a thin mantle of loess.

A representative Celina soil that is cultivated has a dark-brown silt loam plow layer. The subsoil, at depths between 8 and 40 inches, is brown, dark yellowish-brown, yellowish-brown, and dark-brown clay loam. Below the subsoil, at depths between 40 and 51 inches, is dark yellowish-brown, calcareous loam glacial till. Limestone bedrock is at a depth of 51 inches.

Celina soils have moderately slow permeability in the lower part of the subsoil and in the substratum. They have a seasonal high water table which rises during winter and spring to a height of about 18 inches below the surface. The rooting zone for most crops on these soils is less than 36 inches, but some roots penetrate deeper. Root development is restricted in the compact, underlying till. Within the rooting zone, Celina soils have medium available moisture capacity. The upper part of the rooting zone is very strongly acid if lime has not been recently applied. The organic-matter content of the surface layer is medium to low.

Nearly all areas of Celina soils are cleared and used for cultivated crops. They are particularly well suited to wheat and other small grains.

Representative profile of Celina silt loam, limestone substratum, 0 to 2 percent slopes, NW¼ sec. 35, T. 1 N., R. 12 E., Biglick Township, 2 miles NE. of Vanlue:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; very friable; slightly acid; abrupt, smooth boundary.

IIB1t—8 to 11 inches, brown (7.5YR 5/4) clay loam; weak, fine, subangular blocky structure; friable; thin, very patchy, dark grayish-brown (10YR 4/2) clay films; medium acid; gradual, wavy boundary.

IIB21t—11 to 19 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm, thin, patchy, dark grayish-brown (10YR 4/2) clay films; medium acid; gradual, wavy boundary.

IIB22t—19 to 30 inches, yellowish-brown (10YR 5/4) clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films on ped faces and in some root channels; medium acid; gradual, wavy boundary.

IIB23t—30 to 40 inches, brown (7.5YR 5/4) clay loam; few, fine, distinct, pale-brown (10YR 6/3) mottles; weak, fine, subangular blocky structure; friable; thin, patchy, dark grayish-brown (10YR 4/2) clay films; slightly acid; clear, wavy boundary.

IIC—40 to 51 inches, dark yellowish-brown (10YR 4/4) loam till; weak, medium, platy structure; friable; very pale brown (10YR 7/4) lime coatings; few igneous pebbles and shale fragments; mildly alkaline; calcareous; abrupt, wavy boundary.

IIIR—51 to 60 inches, limestone bedrock.

The Ap horizon ranges from dark brown (10YR 4/3) to dark grayish brown (10YR 4/2) in color. It is mainly low to medium in content of organic matter. A brown (10YR 5/3) or yellowish-brown (10YR 5/4) silt loam A2 horizon, 1 to 2 inches thick, is in some areas. The B horizon ranges from clay loam or silty clay loam to clay. It ranges from medium acid to very strongly acid in the upper part and from slightly acid to mildly alkaline in the lower part. The profile is less acid as depth increases. The depth to calcareous till ranges from 30 to 40 inches. In this county, Celina soils are underlain by limestone at depths ranging from 42 to 84 inches; in most places limestone begins at a depth of 48 to 60 inches. The depth to mottling ranges from 19 to 30 inches.

The Celina soils in this county differ slightly from Celina soils in other survey areas in that they lack grayish mottles in the B horizon. This slight difference does not materially affect the use and management of the soils.

The Celina soils are the moderately well drained members of a drainage sequence that includes somewhat poorly drained Crosby soils. The Celina soils are generally adjacent to the Crosby soils and differ principally by having a brighter colored B horizon. The Celina soils typically have a lower clay content in the B and C horizons than the Morley soils. They are deeper to underlying limestone bedrock than the nearby well-drained Ritchey and Milton soils that are in Biglick Township.

Celina silt loam, limestone substratum, 0 to 2 percent slopes (CeA).—This soil is nearly level. Included in mapping were small areas where the surface soil is loam and the slope is slightly greater than 2 percent. Also included were a few small areas of somewhat poorly drained Crosby soils.

There are few or no limitations for farming. Because of its position over limestone bedrock, this soil dries out and warms up quickly in spring but is somewhat droughty late in summer during prolonged dry periods. Moderately slow permeability and limited depth to bedrock are limitations to some nonfarm uses. (Capability unit 1-1)

Clay Pits

Clay pits (Cl) are open excavations from which the surface layer and some of the upper part of the subsoil have been removed so that the lower part of the original subsoil and substratum can be excavated. The material excavated is used to manufacture ceramic draintile. This land type is in an area of Blount and Pewamo soils. Many of the pits are filled with water.

The entire area is adjacent to and southeast of the city of Findlay. The clay pits are of little value for farming, but they do offer the possibility of shallow water developments for waterfowl. Slow permeability is a major limitation for many nonfarm uses. (Not placed in a capability unit).

Colwood Series

The Colwood series consists of deep, level or nearly level soils that are dark colored and very poorly drained. These soils formed in stratified calcareous silt and fine and very fine sand and some lenses of silty clay loam. They are on lake plains, deltas, outwash plains, and terraces. They occupy only a few large areas in the county.

A representative Colwood soil that is cultivated has a very dark gray loam plow layer. The subsoil, at depths between 11 and 33 inches, is mottled, very dark gray, very dark grayish-brown, and gray sandy clay loam. The lower part of the subsoil, to a depth of 42 inches, is light brownish-gray fine sandy loam. Below the subsoil, to a depth of 60 inches, is friable, stratified, gray silt loam and fine sandy loam and thin lenses of silty clay loam.

Colwood soils have moderate permeability and high available moisture capacity. The organic-matter content of the surface layer is high. They have a high water table for significant periods of time. They are slow to dry out in spring unless they are artificially drained. The soil is generally neutral, but in some places it is slightly acid in the surface layer. The rooting zone is deep in summer when the water table is low and in areas that have been drained.

Most of the acreage has been artificially drained, and almost all the acreage is used for cultivated crops. Special crops, such as sugar beets and tomatoes, are grown on this soil.

Representative profile of Colwood loam in the SW¼SW¼ sec. 2, T. 1 S., R. 9 E., Union Township:

Ap—0 to 11 inches, very dark gray (10YR 3/1) loam; moderate, fine, granular structure; very friable; neutral; clear, smooth boundary.

B21g—11 to 18 inches, very dark gray (10YR 3/1) light sandy clay loam; common, fine, prominent, dark reddish-brown (5YR 3/4) mottles; weak, fine, subangular blocky structure; friable; black (10YR 2/1) oxide concretions 3 millimeters in diameter; neutral; gradual, wavy boundary.

B22g—18 to 24 inches, dark grayish-brown (10YR 4/2) sandy clay loam; many, medium, prominent, dark reddish-brown (5YR 3/4) mottles; weak, medium, subangular blocky structure; friable; black (10YR 2/1) oxide concretions 3 to 7 millimeters in diameter; neutral; clear, wavy boundary.

B31g—24 to 33 inches, gray (10YR 5/1) sandy clay loam; many, medium, prominent, yellowish-red (5YR 4/6) mottles; moderate, medium, subangular blocky structure; friable; black (10YR 2/1) oxide concretions 3 to 7 millimeters in diameter; mildly alkaline; clear, wavy boundary.

B32—33 to 42 inches, light brownish-gray (10YR 6/2) fine sandy loam; many, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, fine, granular structure; loose; mildly alkaline; clear, smooth boundary.

C—42 to 60 inches, gray (10YR 5/1) stratified silt loam and fine sandy loam; thin lenses of silty clay loam; common, medium, distinct, light yellowish-brown (10YR 6/4) and olive-brown (2.5Y 4/4) mottles; massive in place; friable; moderately alkaline; calcareous.

The A horizon ranges from very dark brown (10YR 2/2) to very dark gray (10YR 3/1) in color. The thickness of the dark-colored upper part of the solum ranges from 11 to 18 inches. The A horizon and the upper part of the B horizon range from slightly acid to mildly alkaline. The B horizon ranges from heavy fine sandy loam to loam, silt loam, light sandy clay loam, or light silty clay loam. Generally, the B horizon has a slightly higher content of clay than the A horizon, but there are no evident clay films. The depth to calcareous material ranges from 36 to 50 inches. Within a given area, the thickness and sequence of the stratified layers within the C horizon may vary considerably. The silty clay loam lenses are thinner and less common than the layers of silt loam and fine sandy loam.

The Colwood soils in this county have a darker colored B horizon and are generally sandier in texture than Colwood soils in other survey areas. These slight differences do not greatly alter the use and behavior of these soils.

Colwood soils are the very poorly drained members of a drainage sequence that includes moderately well drained Tuscola soils and somewhat poorly drained Kibbie soils. Colwood soils are adjacent to Lenawee soils in many places. They have a darker colored surface layer and grayer colors throughout than either Tuscola or Kibbie soils. They grade texturally to Lenawee soils but contain more fine sand and very fine sand. They resemble the Millgrove soils but have a higher content of silt, fine sand, and very fine sand and lack the stratified sand and gravel in the substratum that is common in Millgrove soils.

Colwood loam (Co).—This soil is nearly level. Surface runoff is slow.

Included in mapping were small areas of very poorly drained Mermill soils and some areas of sandier soils that have a fine sandy loam surface layer.

The major limitation for farm or nonfarm use is seasonal wetness. The soil material flows if it is saturated. Ditchbanks are subject to slumping, and tile drains tend to plug easily. (Capability unit IIw-5)

Crosby Series

Soils in the Crosby series are deep and somewhat poorly drained. These soils are nearly level and are on the till plain in the southeastern part of Biglick Township. In most places, they formed in loam glacial till material, but in some places they formed partly in a thin mantle of loess overlying the glacial till. The Crosby soils are moderately deep to calcareous till.

A representative Crosby soil that is cultivated has a dark grayish-brown silt loam plow layer. The subsoil, at depths between 10 and 18 inches, is pale-brown silty clay loam mottled with strong brown. At depths between 18 to 24 inches, it is grayish-brown clay mottled with yellowish-brown. Below the subsoil, at depths between 24 to 58 inches, is firm, grayish-brown and brown loam glacial till. Limestone bedrock is at a depth of 58 inches.

Crosby soils have moderately slow permeability in the lower part of the subsoil and in the substratum. They have a seasonal high water table for significant periods of time and are slow to dry out in the spring unless they are artificially drained. Organic-matter content is medium to low. Reaction is medium to strongly acid in the upper part of the subsoil unless lime has been recently applied. In most places the rooting zone is moderately deep. Root growth and movement of air and water are restricted by the dense underlying glacial till. Crosby soils have a medium available moisture capacity in the rooting zone.

Nearly all areas of Crosby soils are cleared and used for cultivated crops. They are commonly used for growing grain crops and for pasture.

Representative profile of Crosby silt loam, limestone substratum, 0 to 2 percent slopes, in the SE¼SE¼ sec. 36, T. 1 N., R. 12 E., Biglick Township:

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

B1t—10 to 18 inches, pale-brown (10YR 6/3) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, angular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; neutral; gradual, wavy boundary.

B2t—18 to 24 inches, grayish-brown (10YR 5/2) clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; a few black (10YR 2/1) oxide coatings on ped surfaces; neutral; gradual, wavy boundary.

C1—24 to 36 inches, grayish-brown (10YR 5/2) loam till; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; mildly alkaline; calcareous; gradual, wavy boundary.

C2—36 to 58 inches, brown (10YR 5/3) loam till; many, medium, faint, light-gray (10YR 7/1) mottles; massive; firm; moderately alkaline; calcareous; abrupt, wavy boundary.

IIR—58 to 60 inches, limestone bedrock.

The A horizon ranges from dark brown (10YR 4/3) to dark grayish brown (10YR 4/2) in color. A pale-brown (10YR 6/3) A2 horizon, 1 to 2 inches thick, is in some areas. The B horizon ranges from neutral to strongly acid. The B1t horizon ranges from silty clay loam to clay loam, and the B2t horizon ranges from heavy silty clay loam to clay in texture. The depth to calcareous till ranges from 22 to 36 inches. In Hancock County, limestone underlies Crosby soils at depths ranging from 42 to 84 inches; it is typically at depths between 48 and 60 inches.

The Crosby soils are somewhat poorly drained members of a drainage sequence that includes moderately well drained Celina soils. They are either adjacent to or near Blount soils and Randolph soils. They differ from Randolph soils in lacking limestone bedrock within a depth of 40 inches. The Crosby soils formed in loam glacial till, and the Blount soils formed in clay loam till.

Crosby silt loam, limestone substratum, 0 to 2 percent slopes (CrA).—This soil is on parts of the till plain in Biglick Township. The till in this area is relatively thin over limestone bedrock.

Included in mapping were a few small areas of moderately well drained Celina silt loam and a small acreage of soils that have a loam surface layer .

The major limitation for farming is seasonal wetness. During long dry periods, long-season crops can be affected by droughtiness caused by the shallowness to bedrock. Surface drainage is used in some places where the depth to bedrock does not permit proper installation of tile and outlets. For some nonfarm uses, moderately slow permeability is a limitation. (Capability unit IIw-3)

Cut and Fill Land

Cut and fill land (Cu) consists almost exclusively of the constructed right-of-way for Interstate Highway 75 and U.S. Route 68 through Hancock County. The soil material ranges from the original subsoil and substratum material of the Hoytville and Nappanee soils in the northern part of the county to material from the Morley, Blount, and Pewamo soils in the central and southern parts of the county.

Included in mapping were a few industrial areas in and around the city of Findlay where the soils could not be identified because they were mixed in land filling. (Not placed in a capability unit)

Digby Series

The Digby series consists of soils that are deep and somewhat poorly drained. These soils formed in loamy material over poorly stratified fine gravel and sand that contain some silt and clay. They are nearly level to gently sloping, and they occupy slightly elevated remnants of the beach ridges on the glacial lake plain and in glaciofluvial outwash areas. Most of the Digby soils occur as narrow areas on the low secondary beach ridges parallel to the main beach ridges, but some Digby soils are near the major streams on terrace deposits adjacent to the soils in the flood plains.

A representative Digby soil that is cultivated has a dark grayish-brown loam plow layer. The subsoil, at depths between 8 and 25 inches, is dark-brown and dark grayish-brown sandy clay loam. At depths between 25 and 33 inches, it is grayish-brown gravelly sandy clay loam. The subsoil is mottled with yellowish brown. Below the subsoil, at depths between 33 inches and 60 inches, is loose, calcareous, grayish-brown and brown gravelly sandy loam.

The Digby soils have moderate permeability in the subsoil and rapid permeability in the underlying sand and gravel substratum. They have a seasonally high water table, but normally the soils can easily be drained. They have medium available moisture capacity in the rooting zone. The rooting zone is moderately deep, 24 to 40 inches, and extends down to loose sand and gravel. The reaction is very strongly acid in the upper 2 feet and is less acid with increasing depth.

Most areas of the Digby soils have been cleared and are used for cultivated crops. Many farmsteads and truck-crop patches are on these soils because the elevation is above the adjacent very poorly drained soils. Most areas of Digby soil are drained by tile installations.

Representative profile of Digby loam, 0 to 2 percent slopes, in the N½ sec. 27, T. 2 N., R. 9 E., Pleasant Township:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

B21t—8 to 14 inches, dark-brown (10YR 4/3) sandy clay loam; common, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films on ped surfaces and bridging sand grains; medium acid; clear, wavy boundary.

B22t—14 to 25 inches, dark grayish-brown (10YR 4/2) sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, continuous, dark-brown (10YR 4/3) clay films on ped surfaces; common fine pebbles; slightly acid; gradual, wavy boundary.

IIB3t—25 to 33 inches, grayish-brown (10YR 5/2) gravelly sandy clay loam; many, medium, prominent, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few dark-brown (10YR 4/3) clay films on ped surfaces and sand grains; neutral; clear, wavy boundary.

IIC—33 to 60 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) gravelly sandy loam; single grain; loose; moderately alkaline; calcareous.

The Ap horizon ranges from dark grayish brown (10YR 4/2) or very dark grayish brown (10YR 3/2) to dark gray (10YR 4/1) in color. The Bt horizon is dark grayish brown (10YR 4/2 or 2.5Y 4/2), dark brown (10YR 4/3), grayish brown (10YR 5/2 or 2.5Y 5/2), and light brownish gray (10YR 6/2 or 2.5Y 6/2). It has bright-colored mottles that range from common to many in abundance. The B horizon ranges from slightly acid to strongly acid in the upper part and slightly acid to neutral in the lower part. It has a wide range of texture within short distances. It is generally loam, sandy clay loam, or clay loam and in places is gravelly. The depth to the IIC horizon ranges from 24 to 40 inches, and the thickness of this horizon is variable. The amount of coarse material through the profile ranges from 5 percent to as much as 30 percent. The depth to carbonates ranges from 28 inches to more than 48 inches.

The Digby soils are the somewhat poorly drained members of a drainage sequence that includes well drained Belmore soils, moderately well drained Haney soils, and very poorly drained Millgrove soils. Digby soils have grayer colors than Belmore or Haney soils, and they lack the dark surface layer typical of Millgrove soils. The Digby soils are commonly near areas of Haskins soils and Kibbie soils. The Digby soils have coarser textured IIB and IIC horizons than Haskins soils. Digby soils are coarser textured in the lower part of the B horizon and in the C horizon than Kibbie soils.

Digby sandy loam, 0 to 2 percent slopes (DgA).—This soil has a profile similar to the one described as representative for the series, but the surface layer is sandier. The surface layer dries quickly during dry periods causing poor germination of seeds. Though seasonally wet in spring, this soil is drier in summer than other Digby soils.

The major limitation for farming is seasonal wetness. For many nonfarm uses, the seasonally high water table is a limitation. (Capability unit IIw-3)

Digby loam, 0 to 2 percent slopes (DmA).—A profile of this soil is described as representative for the series. This soil is generally in good tilth, and surface runoff is slow. In some areas the soil material is lacustrine clay or fine-textured glacial till below a depth of 48 inches.

The major limitation for crops is moderate wetness. For many nonfarm uses, a seasonally high water table is a limitation. (Capability unit IIw-3)

Digby loam, 2 to 6 percent slopes (DmB).—The slopes of this soil are generally short. Surface runoff is medium.

Included in mapping were a few small areas that have a surface layer of sandy loam. These included areas have a lower organic-matter content, and they dry out more quickly than Digby loam. In these areas the germination of seeds is affected by the lack of moisture during dry periods in spring.

The major limitation for farming is seasonal wetness. Erosion is a secondary limitation for farming. The seasonal high water table and slope are limitations for some nonfarm uses. (Capability unit IIw-3)

Dunbridge Series

The Dunbridge series consists of moderately deep, well-drained soils that have a dark-colored surface layer. These soils formed in mixed sandy beach ridge material and loamy glacial till material overlying limestone bedrock. They are gently sloping and occur only on a beach ridge in the southeastern part of Biglick Township.

A representative Dunbridge soil that is cultivated has a dark-brown, loamy fine sand plow layer. The subsoil, at depths between 8 and 22 inches, is brown fine sandy loam. Below this is dark-brown sandy clay loam that contains some pebbles and limestone fragments and extends to a depth of 27 inches. Limestone bedrock is at a depth of 27 inches.

The Dunbridge soils have rapid permeability and low available moisture capacity. The rooting zone is mainly moderately deep and is limited by the limestone bedrock. The rooting zone is slightly acid to neutral.

All areas of Dunbridge soils have been cleared. The dominant use of this soil is permanent pasture. A few areas are cultivated.

Representative profile of Dunbridge loamy fine sand, 2 to 6 percent slopes, in the SW¼NW¼ sec. 25, T. 1 N., R. 12 E., Biglick Township:

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) loamy fine sand; weak, fine, granular structure; very friable; slightly acid; abrupt, smooth boundary.

B1—8 to 22 inches, brown (10YR 5/3) fine sandy loam; very weak, fine, subangular blocky structure; very friable; slightly acid; clear, wavy boundary.

B2t—22 to 26 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, fine, subangular blocky structure; thin patchy clay films on ped surfaces and bridgings between sand grains; firm; few pebbles and limestone fragments; neutral; abrupt, wavy boundary.

IIC—26 to 27 inches, very pale brown (10YR 7/4), soft, partly weathered limestone; moderately alkaline; calcareous.

IIR—27 to 30 inches, limestone bedrock.

The Ap horizon is dark brown (7.5YR 3/2), dark yellowish brown (10YR 3/4), or very dark grayish brown (10YR 3/2). The B1 horizon is brown (10YR 5/3), yellowish brown (10YR 5/4), or dark brown (7.5YR 4/4). The upper part of the B1 horizon ranges from dark brown (7.5YR 4/4) to brown (7.5YR 5/4). The B2t horizon is heavy fine sandy loam, loam, or sandy clay loam. In some profiles there is no IIC horizon. A few pebbles, cobblestones, and limestone fragments occur throughout most profiles. The solum is neutral to slightly acid. The depth to limestone ranges from 20 to 40 inches.

The Dunbridge soils are generally near Milton, Ritchey, Romeo, and Ottokee soils. They have a coarser textured B horizon than Milton soils and Ritchey soils. They are lighter in color when dry and are deeper to bedrock than Romeo soils. They are less deep than Ottokee soils.

Dunbridge loamy fine sand, 2 to 6 percent slopes (DuB).—The areas of this soil vary in size and shape. The depth to bedrock varies widely within short distances. Surface runoff is medium.

Included in mapping were small areas of well drained Milton, Ritchey, and Romeo soils and small areas of moderately well drained Ottokee soils.

Low available moisture capacity is a severe limitation for farming. Erosion is a hazard on areas that are cultivated. For some nonfarm uses, slope and moderate depth to limestone are limitations. (Capability unit IIIs-1)

Eel Series

The Eel series consists of loamy soils that are deep and moderately well drained. These soils are nearly level and are on flood plains along the larger streams in the county. They formed in alluvium from uplands underlain by highly calcareous glacial till. Eel soils are subject to flooding.

A representative Eel soil that is cultivated has a very dark grayish-brown silt loam plow layer. The subsoil, at depths between 8 and 28 inches, is very dark grayish-brown silt loam. At depths between 28 and 44 inches is dark-brown loam mottled with yellowish red. Below this, the subsoil is dark-gray silt loam mottled with yellowish red. Below the subsoil is grayish-brown loam that extends to a depth of 60 inches.

The Eel soils have moderate permeability. They have high available moisture capacity. The organic-matter content of the surface layer is high. Surface runoff is slow. Reaction is mostly neutral, grading to mildly alkaline with increasing depth. The rooting zone is deep.

A large acreage of the Eel soils has been cleared and is cultivated. The frequency of the flooding determines the kinds of crops grown. Corn and soybeans are the principal crops. Small grains and meadows that are likely to be damaged by winter and spring flooding are seldom grown. A few small areas along narrow stream valleys are in permanent pasture or woodland.

Representative profile of Eel silt loam in the NW¼NW¼ sec. 11, T. 1 S., R. 9 E., Union Township:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; brown (10YR 4/3) when crushed; moderate, medium, granular structure; very friable; mildly alkaline; clear, smooth boundary.

B1—8 to 28 inches, very dark grayish-brown (10YR 3/2) silt loam; brown (10YR 4/3) when crushed; strong, fine, granular structure; friable; neutral; diffuse, wavy boundary.

B2—28 to 44 inches, dark-brown (10YR 4/3) loam; common, fine, prominent, yellowish-red (5YR 4/6) mottles; moderate, coarse, granular structure; very friable; neutral; abrupt, wavy boundary.

B3—44 to 56 inches, dark-gray (10YR 4/1) silt loam; many, medium, prominent, yellowish-red (5YR 4/6) mottles; moderate, medium, granular structure; friable; mildly alkaline.

C—56 to 60 inches, grayish-brown (10YR 5/2) loam; common, fine, prominent, yellowish-red (5YR 4/6) mottles; massive; friable; mildly alkaline.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) or very dark brown (10YR 3/3) to brown (10YR 5/3) in color. The Ap horizon is 8 to 12 inches in thickness. In some places the C horizon is loam, silt loam, or sandy clay loam to coarse clay loam; in other places it is stratified. Thin strata of loamy sand or fine gravel occur in some areas. The depth to mottling ranges from 18 to 30 inches. The peds have organic coatings to an average depth of 24 inches. Because of these coatings, the crushed color is generally one unit of value higher than the uncrushed color. The solum ranges from neutral to mildly alkaline.

The Eel soils in Hancock County differ from Eel soils mapped in other survey areas in lacking 2 chroma mottles within a depth of 24 inches. This slight difference does not greatly affect the use or management of these soils.

Eel soils are the moderately well drained members of a drainage sequence that includes well-drained Genessee soils, somewhat poorly drained Shoals soils, and very poorly drained Sloan soils. These soils are adjacent to or near the Eel soils. The Eel soils and Genesee soils typically are a little higher above stream level than the Shoals soils and Sloan soils. They are not so subject to frequent flooding as the Shoals soils. Eel soils differ from Genesse soils in having bright-colored mottles in the lower part of the B horizon. They differ from Shoals and Sloan soils in having brighter colors in the B2 horizon.

Eel loam (Ea).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand. This is the result of deposits of coarse-textured materials during flooding. The organic-matter content is lower in this soil than in Eel silt loam. Eel loam dries out faster in the spring and is more easily tilled than Eel silt loam.

Included in mapping were a few small areas of fine sandy loam.

The only limitation for crops is the susceptibility to flooding. The soil is well suited to corn and soybeans in areas where flooding is not a hazard in summer. For most nonfarm uses, flooding is a serious limitation. (Capability unit IIw-8)

Eel silt loam (Em).—A profile of this soil is described as representative for the Eel series. The organic-matter content in this soil is normally higher than in Eel loam. Maintenance of good tilth is more of a problem on this soil than on Eel loam because this soil is subject to surface crusting.

The only limitation for farming is susceptibility to flooding. This soil is generally well suited to corn and other summer row crops. For most nonfarm uses, flooding is a serious limitation. (Capability unit IIw-8)

Fulton Series

The Fulton series consists of somewhat poorly drained soils. These soils formed in clayey sediments interstratified with very thin layers of silt, silty clay loam, and fine sand. They are nearly level to gently sloping, and they occupy scattered lacustrine areas on the Defiance end moraine and on deltas between the Defiance end moraine and the Blanchard River.

A representative Fulton soil that is cultivated has a grayish-brown silt loam plow layer. The subsoil, at depths between 6 and 36 inches, is brown, grayish-brown, and gray silty clay. Below this is a firm, yellowish-brown silty clay loam that extends to a depth of 40 inches. Below the subsoil is firm yellowish-brown silty clay that extends to a depth of 60 inches.

The Fulton soils have slow to very slow permeability and a seasonally high water table. They dry slowly in spring even if artificially drained. The available moisture capacity is medium. The rooting zone is generally moderately deep. The rooting zone is strongly acid in the upper 18 inches but is less acid with increasing depth.

Nearly all areas of Fulton soil have been cleared and are cultivated.

Representative profile of Fulton silt loam, 0 to 2 percent slopes, in the SE¼ sec. 36, T. 2 N., R. 10 E., Portage Township:

Ap—0 to 6 inches, grayish-brown (2.5Y 5/2) silt loam; strong, medium and coarse, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—6 to 7 inches, brown (10YR 5/3) silty clay loam; weak, fine and very fine, subangular blocky structure; friable; medium acid; clear, broken boundary.

B21t—7 to 12 inches, brown (10YR 5/3) silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; medium acid; clear, smooth boundary.

B22t—12 to 17 inches, grayish-brown (10YR 5/2) silty clay; common, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, fine, angular blocky structure; firm; clear, thin, patchy, dark grayish-brown (10YR 4/2) clay films; neutral; clear, smooth boundary.

B23t—17 to 25 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; very firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; neutral; clear, smooth boundary.

B24t—25 to 36 inches, gray (10YR 5/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; strong, medium, angular blocky structure; very firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films on vertical ped faces only; mildly alkaline; clear, smooth boundary.

B3—36 to 40 inches, yellowish-brown (10YR 5/6) silty clay loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles; pinkish-gray (7.5YR 7/2) lime coatings; moderate, fine, subangular blocky structure; firm; moderately alkaline; calcareous; clear, smooth boundary.

C—40 to 60 inches, yellowish-brown (10YR 5/6) silty clay; many, medium, distinct, white (10YR 8/2) mottles or lime coatings; weak, medium, platy structure; firm; moderately alkaline; calcareous.

The Ap horizon ranges from dark grayish brown (10YR 4/2) or dark gray (10YR 4/1) to grayish brown (2.5Y 5/2 or 10YR 5/2) in color. The A horizon ranges from 2.5 to 4.5 percent in organic-matter content. The A horizon and the upper part of the B horizon is neutral to strongly acid. The lower part of the B horizon ranges from slightly acid to alkaline. Very thin lenses of fine sand, silty clay loam, or loam are commonly present in the lower part of the B horizon and in the C horizon. Ped surfaces in the lower part of the B horizon commonly have thin coatings of very fine sand. The depth to carbonates ranges from 30 to 42 inches.

Fulton soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Toledo soils and moderately well drained Shinrock soils. These soils are commonly adjacent to each other. Fulton soils have a lighter colored A horizon and are less gray throughout than Toledo soils. They have a grayer solum and are mottled at lesser depths than Shinrock soils. They have a lower content of sand than the Blount soils. Fulton soils have a higher content of clay and are finer textured throughout the profile than the Kibbie soils.

Fulton silt loam, 0 to 2 percent slopes (FtA).—A profile of this soil is described as representative for the Fulton series. Surface runoff is slow.

Included in mapping were a few small areas of the dark-colored, very poorly drained Toledo soils that are intermingled with this soil along shallow drainageways. Water frequently ponds on these Toledo soils. Also included were a few small areas that have a finer textured surface layer.

The major limitation for cultivated crops is wetness. For many nonfarm uses, seasonal wetness and slow to very slow permeability are limitations. (Capability unit IIIw-3)

Fulton silt loam, 2 to 6 percent slopes (FtB).—This soil is along the edges of drainageways and in some places occurs as low rises on the lake plain. Surface runoff is medium. Because of slope, there is an erosion hazard.

Included in mapping were a few areas that have a silty clay loam surface layer.

The major limitation of this soil for farming is a seasonal high water table. Tile drainage helps to remove excess water from the soil. Surface drainage is not generally used on this soil because of the slope. For many nonfarm uses, slow to very slow permeability and slope are limitations. (Capability unit IIIw-3)

Genesee Series

The Genesee series consists of deep loamy soils that are well drained. These soils are nearly level and are on flood plains along the larger streams in the county. They formed in alluvium derived from highly calcareous glacial till. Genesee soils are subject to flooding from adjacent streams.

A representative Genesee soil in a cultivated field has a very dark grayish-brown silt loam plow layer. The subsoil, of a depth between 11 and 24 inches, is very dark grayish-brown loam. The underlying material is very dark grayish-brown loam that extends to a depth of 62 inches or more.

Genesee soils have moderate permeability and high available moisture capacity. They have moderate to high organic-matter content. Surface runoff is generally slow.

Reaction is neutral or mildly alkaline throughout. The rooting zone is deep.

A large acreage of this soil has been cleared and is cultivated. The frequency of flooding determines the kind of crops grown. Corn and soybeans are the principal crops. Small grain and meadow crops that might be damaged by winter or spring flooding are seldom grown. A few small areas along narrow stream valleys are in pasture or woodland.

Representative profile of Genesee silt loam in the NW¼NW¼ sec. 13, T. 1 N., R. 10 E., Liberty Township:

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2) silt loam; dark grayish brown (10YR 4/2) when crushed; weak, fine, granular structure; very friable; many roots; mildly alkaline; diffuse, smooth boundary.

B—11 to 24 inches, very dark grayish-brown (10YR 3/2) loam; dark grayish brown (10YR 4/2) when crushed; moderate, medium, granular structure; friable; common roots; mildly alkaline; gradual, wavy boundary.

C—24 to 62 inches, very dark grayish-brown (10YR 3/2) loam; dark brown (10YR 4/3) when crushed; moderate, medium, granular structure; very friable; few roots; mildly alkaline.

The Ap horizon is dark brown (10YR 4/3), brown (10YR 5/3), dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), or dark brown (10YR 3/3) in color. The peds have organic coatings to an average depth of 24 inches. Because of these coatings the crushed color is generally one unit of value higher than the uncrushed color. The B horizon is generally loam or silt loam. In some places the C horizon is loam, silt loam, sandy clay loam, or coarse clay loam; in others it is stratified. In some places thin strata of fine sand and silt occur. The C horizon ranges from dark brown (10YR 4/3) to dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) to dark yellowish brown (10YR 3/4). In some places mottling occurs below a depth of 30 inches. In some places the soil has moderate or weak, medium to fine, granular structure throughout the profile; in others it is massive.

Genesee soils are the well drained members of a drainage sequence that includes moderately well drained Eel soils, somewhat poorly drained Shoals soils, and very poorly drained Sloan soils. These soils are commonly near or adjacent to the Genesee soils. The Genesee soils generally are a little higher above stream level than are the Shoals soils and Sloan soils. They are not so subject to frequent flooding as the Shoals soils and Sloan soils. Genesee soils differ from Eel soils in typically having a uniform color and few or no mottles. They differ from Shoals soils in having no mottles above a depth of 30 inches. They differ from Sloan soils in having a less gray color throughout.

Genesee silt loam (Gn).—The surface layer of this loamy soil is high in content of silt and is subject to surface crusting. This soil is easy to till, and it dries out and warms up readily in spring. It is subject to flooding late in winter and spring.

The major limitation of this soil is the susceptibility to flooding. Areas where flooding is not a limitation or where it is controlled are well suited to row crops. For nonfarm uses of this soil, flooding is a serious limitation. (Capability unit IIw-8)

Granby Series

The Granby series consists of soils that are deep, dark colored, nearly level, and very poorly drained. These soils formed in thick deposits of sandy material. They are in Biglick Township.

A representative Granby soil that is cultivated has a black loamy fine sand surface layer. At depths between 10 and 12 inches is a thin subsurface layer of very dark grayish-brown loamy fine sand. The upper part of the subsoil, at depths between 12 and 24 inches, is grayish-brown loamy fine sand mottled with yellowish brown and yellowish red. The lower part of the subsoil, at depths between 24 and 30 inches, is brown fine sandy loam. Below the subsoil is calcareous, pale-brown fine sand that extends to a depth of 50 inches.

Granby soils have a high water table for long periods unless they are artificially drained. They have low available moisture capacity. Their permeability is rapid. Granby soils have a rooting zone that, in most places, is moderately deep even when the water table is low. The reaction in the rooting zone is neutral to mildly alkaline. There is calcareous sandy material at a depth of about 30 inches. Granby soils have high organic-matter content in the surface layer.

Most areas of the Granby soils are artificially drained and are cultivated. Most cash-grain crops and some special crops, such as tomatoes and sugar beets, are grown.

Representative profile of Granby loamy fine sand in the SE¼NW¼ sec. 26, T. 1 N., R. 12 E., Biglick Township:

Ap—0 to 10 inches, black (10YR 2/1) loamy fine sand; moderate, medium, granular structure; very friable; neutral; clear, smooth boundary.

A3—10 to 12 inches, very dark grayish-brown (10YR 3/2) loamy fine sand; massive; slightly hard when dry, very friable when moist; neutral; clear, wavy boundary.

B21g—12 to 18 inches, grayish-brown (10YR 5/2) loamy fine sand; few, fine, faint, yellowish-brown (10YR 5/4) mottles; massive; slightly hard when dry, very friable when moist; neutral; gradual, wavy boundary.

B22g—18 to 24 inches, grayish-brown (10YR 5/2) loamy fine sand; few, fine, prominent, yellowish-red (5YR 5/6) mottles; massive; slightly hard when dry, very friable when moist; neutral; gradual, wavy boundary.

IIB23g—24 to 30 inches, brown (10YR 5/3) fine sandy loam; common, medium, prominent, yellowish-red (5YR 5/6 mottles; weak, fine, subangular blocky structure; friable; mildly alkaline; gradual, wavy boundary.

IIIC—30 to 50 inches, pale-brown (10YR 6/3) fine sand; single grain; loose; moderately alkaline; calcareous.

The Ap horizon ranges from very dark gray (10YR 3/1) to black (10YR 2/1) in color, and reaction is slightly acid to neutral. The A3 horizon is very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The matrix of the B horizon ranges from very dark gray (10YR 3/1), dark gray (10YR 4/1), or gray (10YR 5/1) to dark grayish brown (2.5Y 4/2) or grayish brown (10YR 5/2) in color. In some profiles, the IIB horizon is brown (10YR 5/3). The mottles of the B horizon range from olive brown (2.5Y 4/4), light olive brown (2.5Y 5/6), or strong brown (7.5Y 5/6) to yellowish brown (10YR 5/6), yellowish red (5YR 5/6), or reddish yellow (5YR 6/6). In some places thin lenses of coarse sandy clay loam occur in the B and C horizons because of stratification. The C horizon also shows stratification of loamy fine sand, fine sand, sandy loam, or fine sandy loam.

Granby soils are the very poorly drained members of the drainage sequence that includes the moderately well drained Ottokee soils. They, typically, have a much darker surface layer and a grayer solum than Ottokee soils. The Granby soils are near the Linwood, Adrian, Mermill, and Millgrove soils and, in Biglick Township, are adjacent to the Linwood soils and Adrian soils. Granby soils lack the 12- to 42-inch layer of organic deposits that characterize the Linwood and Adrian soils. They differ from Mermill soils in lacking a contact with fine-textured material within a depth of 40 inches. Granby soils have a coarser, sandier textured solum than the Millgrove soils.

Granby loamy fine sand (Go).—This soil is in low-lying sandy areas on outwash plains. Though very poorly drained naturally, it can be artificially drained with tile. The fine sand in the Granby soil tends to flow when saturated and can cause tile lines to plug.

Included in mapping were some areas that have silty or clayey material within a depth of 40 inches.

The major limitation for farming and for most nonfarm uses is a high water table. The lack of outlets for tile drains is a problem in some areas. (Capability unit IIIw-4)

Gravel Pits

Gravel pits (Gp) are open excavations from which the upper layers of the soil have been removed to expose the underlying gravelly material used in construction. They are on gravelly beach ridges and in areas of local outwash. Almost all of this land type is along the beach ridge in the northern part of the county adjacent to the Lake Plain. A few small areas are on the till plain and in the Findlay Basin. This land type is generally associated with soils of the Belmore, Haney, and Digby series.

Many of these gravel pits fill with water and offer possibilities for development as recreation or wildlife areas. Their farming value is limited unless the upper layers of soil are replaced after the removal of the gravel. (Not placed in a capability unit)

Haney Series

The Haney series consists of soils that are deep and moderately well drained. These soils formed in loamy material over poorly stratified fine gravel and sand that contains some silt and clay. They are nearly level to gently sloping, and they occupy slightly elevated remnants of beach ridges on the lake plain and in glacial outwash areas. Most areas of these soils are narrow bands on the low secondary beach ridges parallel to the main beach ridges, but some areas are on the main beach ridges and on terraces adjacent to the major streams.

A representative Haney soil that is cultivated has a dark-brown loam plow layer. The upper part of the subsoil, at depths between 8 and 13 inches, is dark yellowish brown loam. Below this, at depths between 13 and 33 inches, the subsoil is dark-brown sandy clay loam mottled with yellowish brown. Below the subsoil is yellowish-brown, pale-brown, and grayish-brown, poorly sorted sand and fine gravel that is loose and calcareous and extends to a depth of 60 inches.

The Haney soils have moderate permeability in the subsoil and rapid permeability below the subsoil. The soil reaction is very strongly acid in the upper part of the profile but is less acid with increasing depth. Available moisture capacity is medium in the rooting zone. The rooting zone is generally moderately deep; it extends down to the loose, calcareous sand and gravel.

Most areas of the Haney soils are farmed. Compared with nearby soils, these soils are well suited to roads and farmsteads because of their good natural drainage and their elevation. The Haney soils tend to warm up early in spring. They are well suited to the growing of short-season truck crops, such as strawberries. Late-maturing crops, such as corn and soybeans, commonly are damaged by drought during prolonged dry periods.

Representative profile of Haney loam, 2 to 6 percent slopes, in the SE¼NE¼ sec. 21, T. 2 N., R. 10 E., Portage Township:

Ap—0 to 8 inches, dark-brown (10YR 4/3) loam; moderate, medium, granular structure; friable; few fine pebbles; slightly acid; abrupt, smooth boundary.

B1t—8 to 13 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure; friable; some clay bridgings between sand grains; few, fine pebbles; slightly acid; clear, wavy boundary.

B21t—13 to 24 inches, dark-brown (7.5YR 4/4) sandy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and faint, dark-brown (7.5YR 4/2) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, clay films on ped surfaces and clay bridgings between sand grains; common, fine pebbles; neutral; gradual, wavy boundary.

B22t—24 to 33 inches, dark-brown (10YR 4/3) sandy clay loam; common, distinct, yellowish-brown (10YR 5/6) and common to few, fine, faint, dark grayish-brown (10YR 4/2) mottles; weak, medium, subangular blocky structure; firm; thin, very patchy clay films and clay bridgings between sand grains; common fine pebbles; neutral; abrupt, wavy boundary.

C—33 to 60 inches, yellowish-brown (10YR 5/4), pale-brown (10YR 6/3), and grayish-brown (10YR 5/2), poorly sorted sand and fine gravel; considerable fine material; loose; moderately alkaline; calcareous.

The Ap horizon ranges from dark brown (10YR 4/3) or dark yellowish brown (10YR 4/4) to dark grayish brown (10YR 4/2) or brown (10YR 5/3) in color. The Ap horizon ranges from sandy loam to loam in texture. The matrix of the Bt horizon is dark brown to dark yellowish brown in 10YR or 7.5YR hues. The Bt horizons range from sandy clay loam to loam. Content of gravel is 2 to 15 percent in the upper part of the solum and 10 to 40 percent in the lower part of the solum. Depth to low-chroma mottles ranges from 12 to 20 inches. The solum ranges from very strongly acid to slightly acid in the upper part and slightly acid to neutral in the lower part. The depth to calcareous, poorly sorted sand and gravel is most commonly between 27 and 40 inches.

The Haney soils are the moderately well drained members of a drainage sequence that includes well-drained Belmore soils, somewhat poorly drained Digby soils, and very poorly drained Millgrove soils. Haney soils are commonly adjacent to these soils. They differ from Belmore soils in having low-chroma mottles in the upper part of the Bt horizon. They have brighter colors than the Digby soils. They have a lighter colored surface layer than the Millgrove soils, and they have less gray B horizons. They differ from the moderately well drained Rawson soils in that they lack till or lacustrine material within a depth of 40 inches.

Haney sandy loam, 0 to 2 percent slopes (HaA).—This soil is on the crest of the beach ridges and outwash terraces. This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand. It dries more quickly than that of Haney loams, and germination of seeds may be slowed during prolonged dry periods or windy weather. Surface runoff is slow, and erosion is a slight hazard.

Included in mapping were some areas of the wetter, somewhat poorly drained Digby soils. Also included were a few small areas that have a darker surface layer of very dark brown or very dark grayish brown.

The limitations of this soil for most commonly grown crops and for nonfarm uses are few. Weeds are more of a problem on this soil than on Haney loam, 2 to 6 percent slopes. (Capability unit I-1)

Haney sandy loam, 2 to 6 percent slopes (HaB).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand. Some exposed areas of this soil blow during dry periods. Surface runoff is moderate.

Included in mapping were some areas that have a fine sandy loam surface layer and a few small areas of well-drained Belmore soils and somewhat poorly drained Digby soils. Also included were areas that have a very dark gray or very dark grayish-brown surface layer.

The major limitation for crops is the hazard of erosion. Weeds are more of a problem on this soil than on Haney loam. The surface layer dries more quickly than that of Haney loam, and germination of seeds may be slowed during prolonged dry periods or windy weather. A few seep areas, where wet-weather springs in the gravel come to the surface, require drainage. For some nonfarm uses, slope is a limitation. (Capability unit IIe-2)

Haney loam, 0 to 2 percent slopes (HdA).—This soil occurs as elongated areas on the crest of beach ridges. Surface runoff is slow.

Included in mapping were a few areas that have a very dark brown or very dark grayish-brown surface layer. These areas are generally in low-lying depressions where surface runoff accumulates and organic-matter content of the surface layer is higher than normal. Also included were a few areas of somewhat poorly drained Digby soils.

There are few or no limitations to the use of this soil for most crops commonly grown in the county. It has good tilth and dries early in spring. The limitations for many nonfarm uses are few. (Capability unit I-1)

Haney loam, 2 to 6 percent slopes (HdB).—This soil lies on the side slopes of the beach ridges and stream terraces. A profile of this soil is described as representative for the Haney series. There are seep spots where wet-weather springs come to the surface. Surface runoff is medium.

Included in mapping were a few small areas of well-drained Belmore soils and somewhat poorly drained Digby soils. Also included were a few areas that have a darker colored surface layer of very dark brown or very dark grayish brown.

The major limitation for farm crops is the hazard of erosion. Tile drainage is not generally needed, except for the seep spots. For some nonfarm uses, slope is a limitation. (Capability unit IIe-2)

Haskins Series

The Haskins series consists of soils that are deep and somewhat poorly drained. These soils formed partly in loamy outwash deposits 24 to 40 inches thick and partly in underlying clay, silty clay loam, or clay loam glacial till or lake deposits. They are nearly level to gently sloping and occupy terraces, outwash areas, and secondary beach ridges in the lake plain and till plain areas throughout the county.

A representative Haskins soil that is cultivated has a dark grayish-brown loam plow layer. The upper part of the subsoil, at depths between 9 and 28 inches, is brown sandy clay loam, grayish-brown clay loam, and brown clay loam. At depths between 28 and 30 inches, a thin dark grayish-brown loam layer that contains some fine pebbles separates the upper part of the subsoil from the more dense and compact lower part of the subsoil. This lower part of the subsoil, at depths between 30 and 34 inches, is gray clay loam. Underlying the subsoil is very dense, calcareous, brown clay loam glacial till that extends to a depth of 60 inches.

Haskins soils have a seasonally high water table for significant periods of time. They are slow to dry out unless they are artificially drained. Establishing effective drainage is more difficult if the depth to dense clay till or lacustrine material is less than 30 inches than if it is greater. Haskins soils have moderate permeability in the upper part and slow permeability in the underlying finer textured material. They have medium available moisture capacity. Reaction is strongly acid in the upper part of the subsoil, but it is less acid with increasing depth. The rooting zone is generally moderately deep to the underlying compact glacial till material.

Almost all areas of these soils have been cleared and are cultivated. All of the cultivated crops commonly grown in the county are grown. Artificial drainage has been installed in most areas of these soils for better plant growth and for convenience in farming.

Representative profile of Haskins loam, 0 to 2 percent slopes, in the NE¼SE¼ sec. 22, T. 2 N., R. 9 E., Pleasant Township:

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

B1t—9 to 18 inches, brown (10YR 5/3) sandy clay loam; many, medium, faint, gray (10YR 5/1) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, dark-gray (10YR 4/1) clay films and clay bridgings between sand grains; slightly acid; gradual, wavy boundary.

B21t—18 to 24 inches, grayish-brown (10YR 5/2) clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; very firm; thin, continuous, dark-gray (10YR 4/1) clay films; slightly acid; clear, wavy boundary.

B22t—24 to 28 inches, brown (10YR 5/3) clay loam; many, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, dark-gray (10YR 4/1) clay films; neutral; abrupt, clear boundary.

B23t—28 to 30 inches. dark grayish-brown (10YR 4/2) loam; few, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable; 5 percent, by volume, of fine igneous pebbles; thin, patchy, dark-gray (10YR 4/1) clay films and clay bridgings between sand grains; neutral; abrupt, smooth boundary.

IIB24t—30 to 34 inches, gray (10YR 5/1) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; very firm; thin, patchy, dark-gray (10YR 4/1) clay films; neutral; clear, wavy boundary.

IIC—34 to 60 inches, brown (10YR 5/3) clay loam glacial till; many, medium, gray (10YR 6/1) mottles; massive; very firm; moderately alkaline; calcareous.

The Ap horizon ranges from dark grayish brown (10YR 4/2) or dark brown (10YR 4/3) to brown (10YR 5/3) in color. The content of organic matter ranges from 2 to 4 percent. In some places there is a thin A2 horizon that is light brownish gray (10YR 6/2), grayish brown (10YR 5/2), or pale brown (10YR 6/3) in color. The B horizon has a grayish-brown (10YR 5/2), brown (10YR 5/3), or dark grayish-brown (10YR 4/2 or 2.5Y 4/2) matrix and dark-brown (7.5YR 4/4), dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/4 or 5/6), and light olive-brown (2.5YR 5/4) mottles. The B horizon ranges from loam and clay loam to sandy clay loam. In some places the B horizon contains pockets and layers of sandy loam. In some places fine pebbles are common on the surface and throughout the upper part of the solum down to the

IIB horizon. In some places immediately above the finer textured IIB horizon is a layer of sandy and fine gravelly material that is generally less than 6 inches thick. The depth to the calcareous IIC horizon ranges from 24 to 40 inches and is slightly greater where Haskins soils occur on the till plain than where they occur on the lake plain. In some places lenses of silt are in the lower part of the profile.

The Haskins soils are somewhat poorly drained members of the drainage sequence that includes moderately well drained Rawson soils and very poorly drained Mermill soils. They have a grayer B2 horizon than Rawson soils. They are adjacent to the Mermill soils in many places, and they have a lighter colored A horizon than those soils. The Haskins soils resemble the Digby soils in the upper part of the solum but have a finer textured C horizon.

Haskins fine sandy loam, 0 to 2 percent slopes (HkA).—This soil is on the crests of ridges on the till plain and on low rises on the lake plain. It has a profile similar to the one described as representative of the series, but the surface layer contains more fine sand. Surface runoff is slow, and the soil tends to dry slowly in spring. This soil is subject to blowing if the surface is dry and bare of vegetation.

Included in mapping were a few areas that have a very dark-gray to very dark grayish-brown surface layer. Also included were areas where the depth to the underlying till or lacustrine material is as deep as 48 inches and as shallow as 18 inches.

The major limitation of this soil is seasonal wetness. Weed control is more of a problem on this soil than on Haskins loam. The surface layer dries rapidly and warms early in the spring causing rapid germination of weed seeds. Cultivated crop seeds also germinate rapidly, but the seedlings are damaged during early growth by the droughtiness in dry periods. For some nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIw-3)

Haskins fine sandy loam, 2 to 6 percent slopes (HkB).—This soil is on the till plain and in a few areas on the lake plain adjacent to streams and waterways. This soil has a profile similar to the one described as representative for the series, but the surface layer contains more fine sand. Surface runoff is medium, and erosion is a moderate hazard.

Included in mapping were a few areas that have a darker colored surface layer than normal. Also included were areas where the depth to the underlying till or lacustrine material is as much as 48 inches and as little as 18 inches.

Weed control is more of a problem on this soil than on the Haskins loams. The surface layer dries rapidly and warms early in spring causing rapid germination of weed seeds. The seeds of cultivated crops also germinate rapidly. Damage from droughtiness during early growth is more severe than on Haskins fine sandy loam, 0 to 2 percent slopes, because of the more rapid surface runoff.

The major limitation for farming is seasonal wetness. For many nonfarm uses, seasonal wetness, slope, and slow permeability are limitations. (Capability unit IIw-3)

Haskins loam, 0 to 2 percent slopes (HnA).—This soil is on the lake plain and the till plain. A profile of this soil is described as representative for the Haskins series. Included in mapping were a few small areas that have a darker colored surface layer than normal.

The major limitation for farming is seasonal wetness. The loam surface layer permits cultivation of the soil over a wide range of moisture content. For many nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIw-3)

Haskins loam, 2 to 6 percent slopes (HnB).—This soil is on the till plain or along drainageways on the lake plain. Surface runoff is medium, and erosion is a hazard.

Included in mapping were a few areas that have a darker colored surface layer than normal. Also included were areas where the depth to the underlying till or lacustrine material is as much as 48 inches and as little as 18 inches.

The major limitation for cultivated crops is seasonal wetness. A secondary limitation is the hazard of erosion. For many nonfarm uses, seasonal wetness, slow permeability, and slope are limitations. (Capability unit IIw-3)

Hoytville Series

The Hoytville series consists of dark-colored, deep soils that are very poorly drained. These soils formed in water-worked glacial till having a 37 to 45 percent content of clay. They are nearly level and are on the lake plain. The Hoytville soils occupy broad areas along the northern edge of the county.

A representative Hoytville soil that is cultivated has a very dark grayish-brown clay plow layer. The subsoil, at depths between 8 and 34 inches, is dark-gray and gray clay that contains yellowish-brown mottles. The lower part of the subsoil, at depths between 34 and 40 inches, is grayish-brown clay. Below the subsoil is firm, dark grayish-brown heavy clay loam glacial till that is mottled with yellowish brown and that extends to a depth of 50 inches.

The Hoytville soils have slow permeability in the underlying glacial till. They have a seasonally high water table and high available moisture capacity. They are slightly acid to mildly alkaline. Hoytville soils have a high shrink-swell potential and crack during dry periods. The rooting zone is deep in summer or if the soil is drained.

Most areas of Hoytville soils have been cleared and are farmed. Only a few small woodlots remain. These soils are suited to all crops commonly grown in the county. Tile drains are effective in removing excess water from the subsoil.

Representative profile of Hoytville clay in the NE¼ NW¼ sec. 22, T. 2 N., R. 9 E., Pleasant Township:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) clay; medium, fine, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

B1g—8 to 13 inches, dark-gray (10YR 4/1) clay; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; medium, fine, angular blocky structure; firm; neutral; clear, smooth boundary.

B21tg—13 to 17 inches, gray (10YR 5/1) clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, continuous, dark-gray (10YR 4/1) clay films; neutral; abrupt, smooth boundary.

B22tg—17 to 22 inches, gray (10YR 5/1) clay; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; thin, continuous, gray (10YR 5/1) clay films; neutral; gradual, wavy boundary.

B23tg—22 to 34 inches, gray (10YR 5/1) clay; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; firm, thin, continuous, gray (10YR 5/1) clay films on vertical faces; thin patchy clay films on horizontal faces; few pebbles; neutral; gradual, wavy boundary.

B3—34 to 40 inches, grayish-brown (10YR 5/2) clay; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; firm; thin, patchy, gray (10YR 5/1) clay films on vertical faces; mildly alkaline; diffuse, smooth boundary.

C1—40 to 44 inches, dark grayish-brown (10YR 4/2) and gray (10YR 5/1) heavy clay loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; massive; firm; moderately alkaline; calcareous; diffuse, wavy boundary.

C2—44 to 50 inches, dark grayish-brown (10YR 4/2) heavy clay loam; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; massive; firm; moderately alkaline; calcareous glacial till.

The Ap horizon has organic-matter content that ranges from 4.0 to 6.5 percent and is commonly more than 5 percent. The A horizon is clay or clay loam. The Ap horizon ranges from very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) to very dark brown (10YR 2/2) in color. It averages 7 to 9 inches in thickness. It is slightly acid to neutral. The B horizon has matrix colors that range from gray to dark grayish brown and are 10YR, 2.5Y, and 5Y in hue, 4 or 5 in value, and 1 or 2 in chroma. It has mottles in various shades of brown, yellowish brown, and brownish yellow in a hue of 10YR and 7.5YR and olive colors in a hue of 2.5Y or 5Y. The B horizon commonly has moderate, medium, prismatic structure parting to moderate, medium and coarse, subangular and coarse, subangular and angular blocky. In some profiles, structure is weak in the lower part of the B horizon. The B horizon is slightly acid to mildly alkaline. The C horizon is generally at a depth of 36 to 44 inches. In the C horizon the content of clay ranges from 37 to about 45 percent.

The Hoytville soils are the very poorly drained members of a drainage sequence that includes somewhat poorly drained Nappanee soils which commonly occur as low knolls or rises. The Hoytville soils are darker colored than the Nappanee soils. They are commonly adjacent to Mermill soils. The upper part of the B horizon of the Hoytville soils is finer textured than the upper part of the B horizon of the Mermill soils. The Hoytville soils are similar to Pewamo soils except that the dark-colored upper part of their solum is thinner. The till underlying Hoytville soils is generally higher in content of clay than the till underlying Pewamo soils. Hoytville soils are on the lake plain, and Pewamo soils are on the till plain. They differ from Toledo soils in having a Bt horizon and in having formed in till material in contrast to lacustrine material.

Hoytville clay loam (Ho).—This soil is commonly near sandy beach ridges, and blowing sand has altered the texture of the surface layer. It has a profile similar to the one described as representative for the series, but the surface layer contains more sand and less clay.

Included in mapping were a few small areas that have a surface layer of sandier texture. Also included were a few slight rises that have a lighter colored surface layer.

This soil is not so difficult to maintain in good tilth as Hoytville clay. The higher content of sand in the surface layer permits tillage throughout a wider range of moisture content without deterioration of the soil structure. The major limitation of this soil for crops is seasonal wetness. For many nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIw-7)

Hoytville clay (Hv).—This soil is in broad flat areas. A profile of this soil is described as representative for the series.

Included in mapping were small areas that have a light-colored surface layer. Also included were a few small areas of lighter colored Nappanee soils.

The major limitation of this soil for crops is seasonal wetness. The range of moisture content under which this soil may be properly tilled is very narrow. Artificial drainage is important to the timeliness of tillage operations. For some nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIw-7)

Joliet Series

The Joilet series consists of dark-colored, shallow soils that are poorly drained. These soils formed in loamy material underlain by limestone bedrock at a depth of 10 to 20 inches. They are nearly level, and they are most commonly along drainageways. Most areas of the Joliet soils are in the central and southern parts of the county.

A representative Joilet soil that is cultivated has a black silty clay loam plow layer. The subsoil, at depths between 9 and 17 inches, is very dark-gray clay loam mottled with dark grayish brown. A layer of thin, dark grayish-brown fine sandy loam is between the subsoil and limestone bedrock. Bedrock is at a depth of 18 inches.

Joilet soils have a seasonally high water table. They are difficult to drain artificially because their shallowness to limestone bedrock hinders installation of tile. Permeability is moderate, and the available moisture capacity is very low. Reaction is generally neutral. The rooting zone is shallow.

Most areas of the Joilet soils have been cleared, but very little acreage is used for crops. The largest areas of Joilet soils are within the city limits of Findlay. In rural areas the major use of this soil is permanent pasture.

Representative profile of Joilet silty clay loam in the SW¼SE¼ sec. 33, T. 1 N., R. 10 E., Liberty Township:

Ap—0 to 9 inches, black (10YR 2/1) silty clay loam; very dark gray (10YR 3/1) when crushed; weak, medium, subangular blocky structure; friable; slightly hard when dry; many roots; neutral; abrupt, wavy boundary.

B2g—9 to 17 inches, very dark gray (10YR 3/1) clay loam; common, medium, faint, dark grayish-brown (10YR 4/2) mottles; moderate, medium, subangular blocky structure; firm when moist, hard when dry; common roots; neutral; abrupt, wavy boundary.

IIC—17 to 18 inches, dark grayish-brown (10YR 4/2) fine sandy loam; massive; friable; few roots; mildly alkaline; abrupt, smooth boundary.

IIR—18 inches +, unweathered dolomitic limestone bedrock.

The A horizon ranges from very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) to black (10YR 2/1) in color. The surface layer has a high organic-matter content. The B horizon ranges from clay loam to silty clay loam in texture and from slightly acid to neutral. In places it has various shades of olive color that are 2.5Y or 5Y in hue. A thin IIC horizon occurs in most profiles. The lower part of the profile generally contains igneous and dolomitic pebbles and cobblestones. In places glacial stones and pebbles and limestone slabs are on the surface and in the profile.

Joilet soils are generally near or adjacent to well-drained Romeo soils and very poorly drained Millsdale soils. They are poorly drained and are deeper to limestone than Romeo soils. They are shallower to bedrock than Millsdale soils, and they lack a B horizon that has clay accumulation.

Joliet silty clay loam (Jo).—This soil has a surface layer that is high in organic-matter content. It is shallow to limestone bedrock that has an uneven surface. Some areas of this soil are subject to flooding and ponding.

Included in mapping were some areas that are more clayey throughout than typical Joilet soil. Also included were a few small areas that have a loam surface layer and a few areas of Romeo and Millsdale soils.

The major limitation of this soil for crops and for many nonfarm uses is seasonal wetness. Surface drains can be used to remove ponded water. A secondary limitation is the shallowness to bedrock. (Capability unit IVw-1)

Kibbie Series

The Kibbie series consists of soils that are deep and somewhat poorly drained. These soils formed in stratified silt, very fine sand, and fine sand. They are nearly level to gently sloping, and they are on delta plains or terraces, principally along the Blanchard River and in the Findlay Basin.

A representative Kibbie soil that is cultivated has a dark grayish-brown fine sandy loam plow layer. At depths between 11 and 14 inches is a thin, brown, fine sandy loam subsurface layer. The upper part of the subsoil, at depths between 14 and 25 inches, is yellowish-brown fine sandy loam mottled with pale brown. The lower part of the subsoil, at depths between 25 and 44 inches is brown sandy clay loam mottled with strong brown. Below the subsoil is dark yellowish-brown and brown stratified fine sand and silt that extends to a depth of 60 inches.

Kibbie soils have a seasonally high water table. They have high available moisture capacity and moderate permeability. They are normally neutral or slightly acid throughout, but in some places the upper 1½ feet is medium acid. The rooting zone is deep when the water table is low.

Almost all areas of Kibbie soils are drained, and consequently timely tillage operations are possible. Tile drains function well. All crops common to the area are grown.

Representative profile of Kibbie fine sandy loam, 0 to 2 percent slopes, in the NW¼NW¼ sec. 32, T. 1 N., R. 9 E., Blanchard Township:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

A2—11 to 14 inches, brown (10YR 5/3) fine sandy loam; common, fine, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; weak, fine, granular structure; very friable; slightly acid; gradual, wavy boundary.

B1t—14 to 25 inches, yellowish-brown (10YR 5/4) fine sandy loam; common, medium, faint, pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; very friable; coatings of grayish brown (10YR 5/2) on peds; thin patchy clay films; neutral; clear, wavy boundary.

B2t—25 to 44 inches, brown (10YR 5/3) sandy clay loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; firm; thin, continuous, grayish-brown (10YR 5/2) clay films; neutral; gradual, wavy boundary.

C—44 to 60 inches, dark yellowish-brown (10YR 4/4) and brown (10YR 5/3) stratified fine sand and silt; gray (10YR 6/1) mottles or lime coatings; massive in place; very friable; moderately alkaline; calcareous.

The Ap horizon ranges from dark brown (10YR 4/3) to dark gray (10YR 4/1) or dark grayish brown (10YR 4/2) in color. It is commonly 8 to 11 inches thick. The A2 horizon is brown (10YR 5/3), pale brown (10YR 6/3), or grayish brown (10YR 5/2) in color. It is lacking in some cultivated fields as a result of mixing with the plow layer. The B horizon ranges from sandy clay loam to fine sandy loam. The solum ranges from medium acid to neutral. The depth to the C horizon ranges from 40 to 60 inches. The C horizon is dominantly silt, fine sand, and very fine sand.

The Kibbie soils in this county differ from Kibbie soils in other survey areas in that they have a thicker solum and the surface color is not so dark. This slight difference does not greatly affect the use and management of these soils. The profile described as representative for the series is on the coarse side of the texture range of the series and in this respect is less than representative for the series in the county.

The Kibbie soils are the somewhat poorly drained members of a drainage sequence that includes moderately well drained Tuscola soils and very poorly drained Colwood soils. Kibbie soils have a grayer B horizon and are mottled at lesser depths than the Tuscola soils. They lack the dark-colored A horizon that is characteristic of Colwood soils. Kibbie soils are less clayey than the somewhat poorly drained Fulton soils, and they have a higher content of silt and very fine sand throughout than Haskins soils. They lack the IIB horizon that is characteristic of the Haskins soils.

Kibbie fine sandy loam, 0 to 2 percent slopes (KfA).—A profile of this soil is described as representative for the Kibbie series. Surface runoff is slow.

Included in mapping were a few areas that have a surface layer of loamy fine sand that dries readily and is droughty.

Weed control is a greater problem on this soil than on the Kibbie loams and Kibbie silt loams. The surface of this soil dries quickly, and germination of weed seeds is enhanced. The major limitation of this soil for farming and for many nonfarm uses is a seasonal high water table in winter and early in spring. (Capability unit IIw-3)

Kibbie fine sandy loam, 2 to 6 percent slopes (KfB).—Surface runoff is medium on this soil. The hazard of erosion is moderate, but it is less than on gently sloping Kibbie loam and Kibbie silt loam.

Included in mapping were a few areas that have a surface layer of loamy fine sand. Also included were small areas that have a darker surface layer than Kibbie fine sandy loam.

Weed control is a greater problem on this soil than on Kibbie loam and Kibbie silt loam. The surface layer dries quickly, and early germination of weed seeds is enhanced. The major limitation for farming is the seasonal high water table. For many nonfarm uses a seasonal high water table and slope are limitations. (Capability unit IIw-3)

Kibbie loam, 0 to 2 percnt slopes (KlA).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains less sand and the subsoil is generally more clayey. The surface layer is friable and easy to till. Surface runoff is slow, and there is little or no hazard of erosion.

Included in mapping were small areas that have a darker colored surface layer than Kibbie loam.

The major limitation for farming and nonfarm uses is a seasonal high water table. (Capability unit IIw-3)

Kibbie loam, 2 to 6 percent slopes (KlB).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains less sand and the subsoil is generally finer textured. Surface runoff is medium, and erosion is a moderate hazard.

Included in mapping were small areas that have a darker colored surface layer than this Kibbie soil.

The major limitation for farming is a seasonal high water table. For some nonfarm uses, the seasonal high water table and the slope are limitations. (Capability unit IIw-3)

Kibbie silt loam, 0 to 2 percent slopes (KsA).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more silt. In most areas this soil is also more silty throughout the profile and has a finer textured subsoil. Surface runoff is slow.

Included in mapping were small areas that have a darker colored surface layer than Kibbie silt loam.

This soil is more difficult to maintain in good tilth than Kibbie fine sandy loams and Kibbie loams, and because it has higher content of silt, it is subject to soil crusting, which hinders seedling emergence. The major limitation of this soil for farming and some nonfarm uses is the seasonal high water table. (Capability unit IIw-3)

Kibbie silt loam, 2 to 6 percent slopes (KsB).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more silt. This soil has a higher content of silt, and consequently it is subject to crusting that hinders seedling emergence. Surface runoff is medium, and erosion is a hazard.

Included in mapping were small areas that have a darker colored surface layer than Kibbie silt loam.

Maintenance of good tilth is more difficult on this soil than on the Kibbie fine sandy loams and Kibbie loams. The major limitation for farming is the seasonal high water table. For many nonfarm uses, slope and a seasonal high water table are limitations. (Capability unit IIw-3)

Lenawee Series

The Lenawee series consists of dark-colored soils that are deep and very poorly drained. These soils formed in stratified water-deposited silty clay loam and clay loam material. They are in level areas or in depressions of the lake plain in the Findlay Basin.

A representative Lenawee soil that is cultivated has a very dark gray silty clay loam plow layer. The upper part of the subsoil, at depths between 10 and 15 inches, is dark-gray heavy silty clay loam. The middle part of the subsoil, at depths between 15 and 38 inches, is grayish-brown heavy clay loam mottled with yellowish brown. The lower part of the subsoil, at depths between 38 and 46 inches, is grayish-brown clay loam mottled with yellowish brown. Below the subsoil is stratified gray silty clay loam, clay, clay loam, and silt loam mottled with yellowish brown and extending to a depth of 60 inches. This material is firm and calcareous.

The Lenawee soils have a seasonally high water table and require artificial drainage to remove excess water if optimum crop growth is expected. Tile drains function well in removing excess internal water. Surface ponding is likely in undrained areas. Lenawee soils have moderately slow permeability and high available moisture capacity. The organic-matter content of the surface layer is high. Reaction is mostly slightly acid to mildly alkaline in the upper 30 inches. The rooting zone is deep in summer when the water table is low or in areas that have been drained.

Most areas of the Lenawee soils are farmed. General farm crops and special crops of tomatoes and sugar beets are grown. Most areas are artificially drained to permit more timely tillage operations.

Representative profile of Lenawee silty clay loam, in the SE¼NE¼ sec. 23, T. 1 N., R. 9 E., Blanchard Township:

Ap—0 to 10 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; firm; slightly acid; abrupt, smooth boundary.

B1tg—10 to 15 inches, dark-gray (10YR 4/1) heavy silty clay loam; common, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; firm; thin, very patchy, gray (10YR 5/1) clay films on peds; slightly acid; clear, wavy boundary.

B21tg—15 to 28 inches, grayish-brown (2.5Y 5/2) heavy clay loam; many, medium, distinct, yellowish-brown (10YR 5/4 to 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, patchy, dark-gray (10YR 4/1) clay films on ped surfaces; slightly acid; gradual, wavy boundary.

B22tg—28 to 38 inches, grayish-brown (2.5Y 5/2) heavy clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; firm; thin, very patchy, dark grayish-brown (10YR 4/2) clay films on surfaces; neutral; gradual, wavy boundary.

B3g—38 to 46 inches, grayish-brown (2.5Y 5/2) clay loam; common, medium, distinct, light yellowish-brown (2.5Y 6/4) and yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

Cg—46 to 60 inches, gray (N 5/0) stratified silty clay loam, clay loam, clay, and silt loam; common, distinct, olive-brown (2.5Y 4/4) and yellowish-brown (10YR 5/6) mottles; massive; firm; moderately alkaline; calcareous.

The thickness of the solum ranges from 40 to 60 inches. The Ap horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2) in color. It is silty clay loam or loam. In the B horizon the matrix color ranges from dark gray (10YR 4/1) to dark grayish brown (10YR 4/2 or 2.5Y 4/2) or grayish brown (10YR 5/2 or 2.5Y 5/2). The mottles are yellowish brown and dark yellowish brown in a hue of 10YR and light olive brown and olive brown in a hue of 2.5Y. The B horizon is dominantly heavy silty clay loam or clay loam, but thin layers as fine as clay or as coarse as loam or silt loam occur in some places. These layers are the result of stratification. Reaction in the A horizon and upper part of the B horizon is mostly slightly acid; it is neutral in the lower part of the B horizon. The C horizon is generally stratified and calcareous.

The Lenawee soils in this county differ from Lenawee soils in other survey areas in that they have a Btg horizon in contrast to a Bg horizon, and the solum is thicker than that of Lenawee soils elsewhere.

The Lenawee soils are similar in natural drainage to the Colwood, Toledo, Mermill, and Millgrove soils. Lenawee soils have a higher average content of clay in the B horizon than Colwood soils. They have silty clay loam or clay loam textures in the B horizon in contrast to the dominantly clayey B horizon of the Toledo soils. They differ from Mermill soils by not having a contrasting finer textured IIB horizon within a depth of 40 inches. The Lenawee soils are generally free of coarse fragments and lack the sand and fine gravel in the C horizon that is typical of the Millgrove soils.

Lenawee loam (Le).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand.

The tilth of this soil is generally good, and drained areas can be tilled throughout a fairly wide range of moisture content. The major limitation for crops is seasonal wetness. For many nonfarm uses, a seasonal high water table and moderately slow permeability are limitations. (Capability unit IIw-5)

Lenawee silty clay loam (Ln).—A profile of this soil is described as representative for the Lenawee series. Lenawee silty clay loam is adjacent to Toledo silty clay loam in many areas.

Included in mapping were a few small areas of Toledo soils.

Maintenance of good tilth is more difficult on this soil than on Lenawee loam. The higher content of clay in the surface layer of this soil narrows the range of optimum moisture content at which the soil may be tilled. The major limitation of this soil for crops is seasonal wetness. For many nonfarm uses, a seasonal high water table and moderately slow permeability are limitations. (Capability unit IIw-5)

Linwood Series

The Linwood series consists of dark-colored, organic muck soils that are very poorly drained. These soils formed in organic materials 16 to 42 inches thick overlying loamy mineral material. They are in level to depressional areas in Biglick Township.

A representative Linwood soil has a black muck surface layer 13 inches thick. At depths between 13 to 20 inches is dark reddish-brown peat. Below a depth of 20 inches is loamy mineral material. This mineral material, to a depth of 30 inches, is gray sandy clay loam that has yellowish-red and dark reddish-brown mottles. Below a depth of 30 inches and extending to a depth of 60 inches, is light olive-brown and grayish-brown sandy loam.

Linwood soils have a high water table most of the year unless they are artificially drained. Artificial drainage of excess water is necessary for crop production. Permeability is moderately rapid in the organic layer and moderate in the loamy substratum. The available moisture capacity is high. The rooting zone is moderately deep to deep when the water table is low. The organic layer is generally strongly acid or medium acid, and the substratum is slightly acid to mildly alkaline. Trace element deficiencies, as well as low levels of phosphorus and potash, are common. The concentration of sodium and magnesium sulfate reaches levels that are toxic for some crops.

Most areas of this soil are artificially drained and are farmed. Corn is the major crop.

Representative profile of Linwood muck in the NE¼ NW¼ sec. 26, T. 1 N., R. 12 E., Biglick Township:

1—0 to 13 inches, black (10YR 2/1) muck; moderate, medium, granular structure; very friable; many roots; medium acid; clear, smooth boundary.

2—13 to 20 inches, dark reddish-brown (5YR 3/3) peat; strong, coarse, granular structure; friable; plant remains can be identified; common roots; medium acid; clear, wavy boundary.

IIC1g—20 to 26 inches, gray (5Y 6/1) sandy clay loam; yellowish-red (5YR 4/6) mottles; weak, medium, subangular blocky structure; firm; few roots; slightly acid; gradual, wavy boundary.

IIC2g—26 to 30 inches, gray (5Y 5/1) sandy clay loam; dark reddish-brown (5YR 3/4) mottles; weak, fine, subangular blocky structure; firm; few roots; slightly acid; clear, wavy boundary.

IIC3—30 to 36 inches, light olive-brown (2.5Y 5/4) sandy loam; yellowish-red (5YR 5/8) mottles; weak, fine, granular structure; friable; few roots; neutral; clear, wavy boundary.

IIC4—36 to 48 inches, grayish-brown (2.5Y 5/2) sandy loam; weak, fine, granular structure; friable; moderately alkaline; calcareous.

IIC5—48 to 60 inches, light olive-brown (2.5Y 5/4) sandy loam; friable; moderately alkaline; calcareous.

The thickness of the layer of organic material ranges from 16 to 42 inches. The organic matter in the upper part is well decomposed. Analysis of six samples indicated an average organic content of 66.5 percent and a range of 40 to 90 percent. The reaction in six samples of the surface soil ranged from a pH of 3.6 to a pH of 6.2; the average pH was 4.9. The thickness of the peat layer is variable and is lacking in some profiles. The texture of the underlying material ranges from sandy loam to sandy clay loam or clay loam, but strata of loam, silt loam, clay, or fine gravel occur in places.

The Linwood soils are near or adjacent to the very poorly drained Millgrove and Mermill mineral soils. Linwood soils are underlain by loamy mineral material in contrast to Adrian soils which are underlain by sandy mineral material.

Linwood muck (Lw).—In some places this soil has a marl layer 4 to 6 inches thick in the upper part of the substratum.

Included in mapping were small areas of Granby, Mermill, Millgrove, and Adrian soils. Also included were areas in which the layer of muck is less than 16 inches thick.

The major limitation of this soil for farming is a high water table. This soil is subject to subsidence if it is drained, but if the water table level is carefully regulated, the subsidence can be controlled. For most nonfarm uses, the softness and unstableness of this soil are serious limitations. (Capability unit IIw-6)

Mermill Series

The Mermill series consists of dark-colored soils that are deep and very poorly drained. These soils formed partly in 18 to 40 inches of loamy outwash material and partly in underlying finer textured glacial till or lake-deposited material. They mainly are level to nearly level, and they are in areas on the lake plain and the till plain. The areas are widely scattered; a few occur in every township.

A representative Mermill soil that is cultivated has a black loam plow layer. The upper part of the subsoil, at depths between 9 and 25 inches, is dark-gray and gray sandy clay loam mottled with strong brown. The subsoil, at depths between 25 and 30 inches, is gray, gravelly sandy clay loam. The lower part of the subsoil, at depths between 30 and 40 inches, is gray clay loam mottled with yellowish brown. Below the subsoil, to a depth of 60 inches, is gray clay loam mottled with strong brown.

Mermill soils have a seasonally high water table. Artificial drainage is needed to remove excess water for good plant growth and to permit timely tillage operations. The Mermill soils have moderate permeability in the upper part of the subsoil and very slow permeability in the lower part of the subsoil and in the underlying material. The available moisture capacity is high. Organic-matter content of the surface layer is high. The uppermost 18 inches of the profile is mostly neutral to slightly acid. Below this, it is neutral to mildly alkaline. The rooting zone is moderately deep to deep in summer when the water table is low or in areas where the soils have been drained.

Most areas of Mermill soils in the county are used for cultivated crops. Some special crops of tomatoes and sugar beets are also grown.

Representative profile of Mermill loam in the NE¼ NW¼ sec. 21, T. N., R. 11 E., Marion Township:

Ap—0 to 9 inches, black (10YR 2/1) loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1g—9 to 12 inches, dark-gray (10YR 4/1) sandy clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

B21tg—12 to 25 inches, gray (10YR 6/1) sandy clay loam; many, coarse, distinct, strong-brown (7.5YR 5/8) mottles; weak, coarse, subangular blocky structure; firm; thin, patchy, gray (10YR 5/1) clay films; neutral; gradual, wavy boundary.

B22tg—25 to 30 inches, gray (10YR 6/1) fine gravelly sandy clay loam; many, coarse, distinct, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; thin, patchy, gray (10YR 5/1) clay films and clay bridgings between sand grains; neutral; abrupt, wavy boundary.

IIB23tg—30 to 40 inches, gray (10YR 5/1) clay loam; many, coarse, distinct, yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; firm; thin, patchy, dark-gray (10YR 4/1) clay films on ped surfaces; neutral; gradual, wavy boundary.

IIC—40 to 60 inches, gray (10YR 6/1) clay loam; many, coarse, distinct, strong-brown (7.5YR 5/8) mottles; massive; firm; neutral grading to moderately alkaline; calcareous in the lower part.

The A horizon ranges from very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2) to black (10YR 2/1) in color. It is slightly acid to neutral. The A horizon ranges from 6 to 9 inches in thickness. In the B horizon the matrix is very dark gray (10YR 3/1), dark gray (10YR 4/1), gray (10YR 5/1 or 6/1), light brownish gray (2.5YR 6/2), or grayish brown (10YR 5/2 or 2.5YR 5/2) in color, and the mottles are brownish yellow (10YR 6/6), strong brown (7.5YR 5/6 to 5/8), or yellowish brown (10YR 5/6 to 5/8). The B horizon ranges from neutral to mildly alkaline. It ranges from loam to sandy clay loam in texture but is commonly sandy clay loam. It contains thin lenses and pockets of sandy loam. The depth to the finer textured underlying IIB horizon ranges from 20 to 40 inches and is commonly 24 to 30 inches. In places, a layer of fine gravelly material, generally less than 6 inches thick, is above the IIB horizon. The IIB horizon ranges from heavy clay loam to clay in texture. Fine gravel is common on the surface and throughout the solum down to the finer textured underlying material.

Mermill soils are the very poorly drained members of a drainage sequence that includes moderately well drained Rawson soils and somewhat poorly drained Haskins soils. Mermill soils have a darker colored A horizon than the Rawson soils or Haskins soils. The Mermill soils are similar in natural drainage to the Hoytville, Pewamo, Lenawee, and Toledo soils, but they differ from these soils in that the upper part of the B horizon is coarser textured. Mermill soils have a finer textured C horizon than the Millgrove soils.

Mermill loam (Me).—A profile of this soil is described as representative for the series. This soil has high organic-matter content in the plow layer and a favorable texture for tillage. Surface runoff is slow. In spring the soil dries slowly unless it is artificially drained.

Included in mapping were some areas where the depth to the finer textured subsoil is as much as 48 inches.

The major limitation of this soil for most uses is seasonal wetness. For some nonfarm uses, very slow permeability is a limitation. (Capability unit IIw-5)

Mermill clay loam (Mf).—This soil has a profile similar to the one described as representative for the series, but the surface layer has a higher content of clay. This soil has a narrower range of optimum moisture content within which tillage can take place without deterioration of good tilth. The plow layer is cloddy if the soil is plowed when too wet. In spring this soil dries slowly unless it is artificially drained.

Included in mapping were some areas where the depth to the finer textured subsoil is as much as 48 inches.

The major limitation to the use of this soil is seasonal wetness. For many nonfarm uses, very slow permeability is a limitation. (Capability unit IIw-5)

Millgrove Series

The Millgrove series consists of dark-colored soils that are deep and very poorly drained. These soils formed in loamy outwash material over poorly stratified fine gravel and sand containing some silt and clay. They are nearly level to level, and they occupy outwash plains and terraces throughout the county. On the lake plain, they are generally near or adjacent to the beach ridges.

A representative Millgrove soil that is cultivated has a very dark grayish-brown loam plow layer. At depths between 10 and 16 inches, the upper part of the subsoil is very dark grayish-brown sandy clay loam. Below this, at depths between 16 and 36 inches, the subsoil is grayish-brown and dark grayish-brown sandy clay loam. The lower part of the subsoil, to a depth of 40 inches, is dark grayish-brown clay loam. The subsoil has grayish-brown, brown, dark-brown, and light olive-brown mottles. Below the subsoil is loose, calcareous olive-brown sand and fine gravel that extends to a depth of 48 inches.

The Millgrove soils have a seasonally high water table. Artificial drainage is needed for good crop growth and to permit timely tillage operations. Surface runoff is slow to ponded. Millgrove soils have moderate permeability and high available moisture capacity. The organic-matter content of the surface layer is high. The A horizon and upper part of the subsoil are neutral to slightly acid. The rooting zone is deep when the water table is low in summer.

Most areas of the Millgrove soils are drained and farmed. All crops commonly grown in the county are grown on these soils as well as special crops of tomatoes and sugar beets.

Representative profile of Millgrove loam in the NW¼ SE¼ sec. 9, T. 1 N., R. 10 E., Liberty Township:

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) loam; strong, medium, granular structure; very friable; many roots; neutral; abrupt, smooth boundary.

B1g—10 to 16 inches, very dark grayish-brown (2.5Y 3/2) sandy clay loam; few, fine, faint, grayish-brown (2.5Y 5/2) mottles; weak, fine, subangular blocky structure; friable; common roots; neutral; clear, wavy boundary.

B21tg—16 to 25 inches, grayish-brown (10YR 5/2) sandy clay loam; common, medium, faint, brown (10YR 5/3) mottles; weak, medium, subangular blocky structure; friable; thin, patchy, dark-gray (10YR 4/1) clay films and bridgings between sand grains; common roots; neutral; gradual, wavy boundary.

B22tg—25 to 36 inches, dark grayish-brown (2.5Y 4/2) sandy clay loam; many, medium, distinct, dark-brown (10YR 4/3) mottles; weak, medium, subangular blocky structure; friable; thin, continuous, dark grayish-brown (10YR 4/2) clay films and clay bridgings between sand grains; few roots; neutral; gradual, wavy boundary.

B23tg—36 to 40 inches, dark grayish-brown (10YR 4/2) clay loam; common, medium, distinct, light olive-brown (2.5Y 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, continuous, dark grayish-brown (10YR 4/2) clay films; few roots; mildly alkaline; gradual, wavy boundary.

C—40 to 48 inches, olive-brown (2.5Y 4/4) sand and fine pebbles; single grain; loose; few roots; moderately alkaline; calcareous.

The depth to carbonates ranges from 30 to 40 inches. The A horizon ranges from 4.0 to 7.0 percent and averages 5.0 percent in organic-matter content. It ranges from very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2) or black (10YR 2/1) in color. The Ap horizon is slightly acid to neutral. The thickness of the A horizon ranges from 10 to 16 inches, but commonly it is 11 to 14 inches thick. The dominant matrix colors in the B horizon range from gray (10YR 5/1), (10YR 6/1), or (5Y 5/1), dark gray (10YR 4/1), or grayish brown (2.5Y 5/2) to dark grayish brown (2.5Y 4/2). In some profiles, the Blg horizon is very dark grayish brown (10YR 3/2). The mottles are yellowish brown (10YR 5/4 or 5/6), dark yellowish brown (10YR 4/4), light olive brown (2.5Y 5/6), grayish brown (2.5Y 5/2), dark grayish brown (10YR 4/2), brown (10YR 5/3), dark brown (10YR 4/3), or strong brown (7.5YR 5/6). The upper part of the B horizon is commonly sandy clay loam, but it ranges to loam. The lower part of the B horizon is sandy clay loam to clay loam. The B horizon contains thin layers and pockets of sandy loam. It ranges from slightly acid to mildly alkaline. The C horizon consists of a variable amount of silt and clay mixed with the gravelly and sandy deposits. The gravelly and sandy material consists of limestone and igneous fragments.

The dark-colored Millgrove soils are the very poorly drained members of a drainage sequence that includes the light-colored, well-drained Belmore soils, moderately well drained Haney soils, and somewhat poorly drained Digby soils Millgrove soils and the very poorly drained Mermill soils have similar textures in the upper part of the B horizon, but the Mermill soils are underlain by finer textured material. Millgrove soils have a coarser textured C horizon than the very poorly drained Colwood soils.

Millgrove fine sandy loam (Mg).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand.

Maintaining tilth is not a problem on this soil. Weed control is more of a problem on this soil than on Millgrove loam or Millgrove clay loam. The surface layer dries rapidly in the spring causing rapid germination of weed seeds. The major limitation of this soil for farming and nonfarm uses is a seasonal high water table. (Capability unit IIw-5)

Millgrove loam (Mh).—A profile of this soil is described as representative for the Millgrove series. Maintaining tilth is not a problem on this soil, because of the favorable texture of the surface layer. This soil can be tilled throughout a wide range of moisture content.

The major limitation of this soil for farm and nonfarm uses is a seasonal high water table. (Capability unit IIw-5)

Millgrove clay loam (Mk).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more clay. This soil has a narrow range of optimum moisture content within which it can be tilled without deterioration of the soil structure. It is cloddy if it is tilled when wet. The major limitation of this soil for farm and nonfarm uses is a seasonal high water table. (Capability unit IIw-5)

Millsdale Series

The Millsdale series consists of dark-colored soils that are moderately deep and very poorly drained. These soils formed mainly in glacial till 20 to 40 inches thick overlying limestone bedrock. They are nearly level, and they are in areas on the till plain where limestone bedrock is relatively close to the surface. Some of these areas are subject to minor flooding.

A representative Millsdale soil that has been cultivated has a very dark gray silty clay loam plow layer. The upper part of the subsoil, at depths between 9 and 16 inches, is very dark-brown clay. Below this, to a depth of 23 inches, the subsoil is dark-gray clay. The lower part of the subsoil, at depths between 23 and 31 inches, is dark-gray clay loam. Limestone bedrock is a depth of 31 inches.

The Millsdale soils have a seasonally high water table and a moderately slow permeability. They have a medium available moisture capacity, but they are seldom droughty because they are subject to seepage from nearby soils. The organic-matter content of the surface layer is high. Reaction is slightly acid to neutral and is less acid with increasing depth. The rooting zone is moderately deep in summer when the water table is low.

Artificial drainage helps to remove excess water from the soil and aids root development and timely tillage operations. Limestone bedrock, at a depth of 20 to 40 inches, is a hazard to the machinery used to install tile drainage systems.

Most areas of the Millsdale soils are farmed. They are difficult and expensive to drain with tile because of the limited depth to limestone bedrock. Surface drains are used in some places. If Millsdale soils are drained and intensively managed, they are well suited to crops commonly grown in the county.

Representative profile of Millsdale silty clay loam in the SW¼NW¼ sec. 7, T. 1 S., R. 11 E., Jackson Township:

Ap—0 to 9 inches, very dark-gray (10YR 3/1) silty clay loam; moderate, medium and fine, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

B21t—9 to 16 inches, dark-gray (10YR 4/1) clay; common, fine, prominent, strong-brown (7.5YR 5/6) mottles; weak, coarse, prismatic structure parting to strong, medium, subangular blocky; very firm; thin continuous clay films on ped surfaces; neutral; gradual, wavy boundary.

B22tg—16 to 23 inches, dark-gray (10YR 4/1) clay; many, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, coarse, prismatic structure parting to strong, medium, subangular blocky; very firm; thin continuous clay films on ped surfaces; neutral; clear, wavy boundary.

B31tg—23 to 29 inches, dark-gray (10YR 4/1) clay loam; many, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine and medium, subangular blocky structure; firm; thin, patchy clay films on ped surfaces; small igneous and shale rock fragments; neutral; clear, wavy boundary.

IIB32g—29 to 31 inches, light brownish-gray (10YR 6/2) clay loam; common, fine, distinct, gray (N 5/0) and very pale brown (10YR 7/3) mottles; weak, coarse, subangular blocky structure; firm; many partly weathered limestone fragments; mildly alkaline; weakly calcareous.

R—31 inches +, limestone bedrock.

The Ap horizon ranges from very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2) in color. It is loam, silt loam, or silty clay loam. The Ap horizon is medium acid to neutral. In the B horizon the matrix is 10YR or 2.5Y in hue, 4 to 6 in value, and 2 or less in chroma, and the mottles range from reddish brown (5YR 4/4), yellowish red (5YR 4/6), or dark reddish brown (5YR 3/4) to yellowish brown (10YR 5/4, or 5/6) and strong brown (7.5YR 5/8 or 7.5YR 4/6) in color. The B horizon ranges from clay loam or silty clay loam to clay in texture. It ranges from neutral to mildly alkaline. In some places a layer of light brownish-gray (10YR to 2.5Y 6/2) or light yellowish-brown (2.5YR 6/4) to brown (10YR 5/3) silt loam, clay loam, or silty clay loam, 1 or 2 inches thick, formed in place above the unweathered bedrock. In some places there are a few igneous pebbles, boulders, and loose limestone slabs on the surface and throughout the profile. The depth to limestone bedrock ranges from 20 to 40 inches.

The dark-colored Millsdale soils are the very poorly drained members of a drainage sequence that includes the lighter colored, well-drained Milton soils and somewhat poorly drained Randolph soils. These soils are commonly adjacent to Millsdale soils. Nearby soils are the dark-colored Pewamo, Joilet, and Sloan soils. The Millsdale soils have limestone bedrock within a depth of 40 inches in contrast to the deeper Pewamo soils and Sloan soils. The Millsdale soils are deeper to bedrock than the Joliet soils.

Millsdale loam (Mm).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand and less clay. The characteristics of the surface layer or plow layer in this soil are much more desirable for plant growth than those in the other Millsdale soils. If this soil is drained, it dries readily in spring, and it is easy to till. Surface crusting and cloddiness are minimal.

The major limitation for farming is a seasonal high water table. For many nonfarm uses, the seasonal high water table and moderately slow permeability are limitations. (Capability unit IIIw-2)

Millsdale silt loam (Mn).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more silt and less clay. Surface crusting is likely on this Millsdale soil if it is intensively cultivated. If this soil is tilled when wet, the condition of the plow layer deteriorates and becomes cloddy. Some areas of this soil are subject to flooding.

Included in mapping were a few small areas of very poorly drained Sloan soil along streams.

The major limitation for farming is a seasonal high water table. For many nonfarm uses, seasonal wetness and moderately slow permeability are limitations. (Capability unit IIIw-2)

Millsdale silty clay loam (Mo).—A profile of this soil is described as representative for the Millsdale series. Some areas of this soil are subject to occasional flooding. Ponding is more likely on this Millsdale soil than on other Millsdale soils.

Included in mapping were a few small areas of Sloan soil that are adjacent to streams.

Good tilth is difficult to maintain. Because drainage systems are difficult to establish, the soil is often tilled when it is too wet. The major limitation of this soil for farming is a seasonal high water table. For many nonfarm uses, the seasonal high water table and moderately slow permeability are limitations. (Capability unit IIIw-2)

Milton Series

The Milton series consists of soils that are moderately deep. In most places they are well drained, but in some places they are moderately well drained. These soils formed in loamy glacial till 20 to 40 inches thick over limestone bedrock. They are nearly level to gently sloping, and they are on the till plain.

A representative Milton soil that has been cultivated has a dark-brown silt loam plow layer. The upper part of the subsoil, at depths between 6 and 11 inches, is yellowish-brown silt loam. Below this, to a depth of 26 inches, the subsoil is yellowish-brown clay. Limestone bedrock is at a depth of 26 inches.

Milton soils have moderately slow permeability. They have a medium to low available moisture capacity, depending upon the depth to bedrock. The rooting zone is moderately deep and, in places, is medium acid to neutral in the upper part.

Most areas of the Milton soils are farmed. They are well suited to small grain. Long-season crops, such as corn or soybeans, commonly lack sufficient moisture late in summer.

Representative profile of a Milton silt loam in the SE¼ sec. 35, T. 1 N., R. 12 E., Biglick Township:

Ap—0 to 6 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; neutral; clear, smooth boundary.

B1—6 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, angular blocky structure; friable; neutral; clear, smooth boundary.

B2t—11 to 26 inches, yellowish-brown (10YR 5/4) clay; moderate, medium, angular blocky structure; firm; thin, continuous, dark-brown (7.5YR 4/4) or dark yellowish-brown (10YR 4/4) clay films on ped surfaces; neutral; abrupt, wavy boundary.

IIR—26 inches +, limestone bedrock.

The Ap horizon ranges from dark brown (10YR 4/3) to dark grayish brown (10YR 4/2) in color. It is medium acid to neutral. An A2 horizon occurs in undisturbed areas. It is pale brown (10YR 6/3) to brown (10YR 5/3) in color and 3 to 4 inches thick. The B horizon ranges from yellowish brown (10YR 5/4) and dark brown (10YR 4/3) to brown (10YR 5/3) and dark brown (7.5YR 4/4) in color. The B2 horizon ranges from clay loam or heavy silty clay loam to clay. The B horizon ranges from medium acid to neutral in the upper part and neutral to mildly alkaline in the lower part. In the lower part of the B horizon, typically, the number of igneous pebbles, weathered shale fragments, and limestone fragments increases. In some profiles the lower 2 to 4 inches of the B2t horizon formed in residuum weathered from limestone bedrock. In some places the upper part of the bedrock is highly fractured. The depth to bedrock ranges from 20 to 40 inches which is also the thickness of the solum.

Milton soils are the well-drained members of a drainage sequence that includes somewhat poorly drained Randolph soils and very poorly drained Millsdale soils. These soils commonly are adjacent to the Milton soils. Milton soils are less mottled in the B horizon than Randolph soils and are lighter colored than Millsdale soils. They are similar to Ritchey soils, but they do not have limestone bedrock at a depth of 10 to 20 inches. Milton soils lack the dark colored A horizon that is characteristic of the Romeo soils, and they are deeper to bedrock.

Milton silt loam, 0 to 2 percent slopes (MrA).—A profile of this soil is described as representative for the Milton series. This soil is droughty if used for long-season crops. Surface runoff is slow, and surface crusting is a limitation.

Included in mapping were a few areas of the shallower Romeo and Ritchey soils.

The major limitations for farming are the shallowness to bedrock and subsequent droughtiness. For many nonfarm uses, the shallowness to bedrock is a limitation. (Capability unit IIs-2)

Milton silt loam, 2 to 6 percent slopes (MrB).—Surface runoff is medium, and surface crusting is a limitation on this soil.

Included in mapping were a few areas that have a loam surface layer. Also included were a few small areas of the Romeo and Ritchey soils that are shallower than this Milton soil. Another inclusion is a few small areas that have slopes of more than 6 percent.

The major limitation for farming is a moderate hazard of erosion. For some nonfarm uses, slope and shallowness to bedrock are limitations. (Capability unit IIe-5)

Morley Series

The Morley series consists of soils that are deep and moderately well drained. These soils formed in moderately fine textured glacial till. They are on the crests of moraines and in the more sloping areas adjacent to the major drainageways. They are gently sloping to moderately steep.

A representative Morley soil that is cultivated has a dark grayish-brown silt loam plow layer. A subsurface layer, at depths between 6 and 9 inches, is brown silt loam. The subsoil, at depths between 9 and 33 inches, is yellowish-brown silty clay loam, brown silty clay, and brown heavy silty clay loam. Below the subsoil is firm, limy, dark yellowish-brown clay loam glacial till that extends to a depth of 60 inches.

The Morley soils have slow permeability and medium available moisture capacity. The organic-matter content in the surface layer is medium. Artificial drainage is generally not required on these soils except in seep areas or in areas where runoff tends to concentrate. Morley soils are strongly acid or medium acid in the upper part of the subsoil but less acid with increasing depth. In most places the rooting zone is moderately deep and is limited by dense calcareous till that is within a depth of 40 inches.

Most areas of Morley soils have been cleared. The less steep areas are used for crops. The more sloping areas are used for meadows, pasture, and woodlands. Most areas have been tilled at some time. Morley soils are suited to the crops commonly grown in the county.

Representative profile of Morley silt loam, 2 to 6 percent slopes, in the NW¼SE¼ sec. 15, T. 1 S., R. 12 E., Amanda Township:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A2—6 to 9 inches, brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

B1t—9 to 12 inches, yellowish-brown (10YR 5/4) silty clay loam; weak, fine, subangular blocky structure; firm; thin, patchy, dark-brown (10YR 4/3) clay films; many roots; strongly acid; clear, smooth boundary.

B21t—12 to 20 inches, brown (10YR 5/3) heavy silty clay; common, medium, distinct, strong-brown (7.5YR 5/8) and brown (7.5YR 5/2) mottles; moderate, medium, subangular blocky structure; thin, continuous, dark-brown (10YR 4/3) clay films; firm; common roots; strongly acid; clear, wavy boundary.

B22t—20 to 33 inches, brown (10YR 5/3) heavy silty clay loam; common, medium, faint, yellowish-brown (10YR 5/6) mottles; strong, medium, subangular blocky structure; thin, continuous, dark-gray (10YR 4/1) clay films along root channels and on ped surfaces; firm; common roots; slightly acid; gradual, wavy boundary.

C—33 to 60 inches, dark yellowish-brown (10YR 4/4) clay loam glacial till; common, medium, distinct, gray (10YR 5/1) mottles; gray (10YR 6/1) lime coatings; massive; firm; few roots; moderately alkaline; calcareous.

The Ap horizon ranges from dark grayish-brown (10YR 4/2) to dark brown (10YR 4/3) or dark gray (10YR 4/1) in color. The organic-matter content of the surface layer ranges from 1.5 to 3.5 percent. The Ap horizon is slightly acid to neutral. An A2 horizon is not always apparent in cultivated areas. The B1 horizon ranges from silty clay loam to clay in texture and from medium acid to strongly acid. The B2 horizon is brown (10YR 5/3) or dark brown (10YR 4/3 and has strong-brown (7.5YR 5/8), yellowish-brown (10YR 5/6), and brown, (7.5YR 5/2) mottles. The upper 10 inches of the Bt horizon has low-chroma mottles. The B2 horizon ranges from heavy silty clay loam to silty clay and clay and from strongly acid to slightly acid. The C horizon is brown (10YR 5/3), dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), or dark grayish brown (10YR 4/2) and has yellowish-brown (10YR 5/6), yellowish-red (5YR 5/6), or gray (10YR 5/1-6/1) mottles. It has gray (10YR 6/1) or light-gray (10YR 7/1) lime coatings. The C horizon is typically silty clay loam or clay loam. The thickness of the solum ranges from 20 to 33 inches.

The Morley soils in this county differ from Morley soils in other survey areas in having low-chroma mottles in the upper 10 inches of the Bt horizon. This slight difference does not greatly alter their usefulness or behavior.

The Morley soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Blount soils and very poorly drained Pewamo soils. Morley soils are commonly adjacent to Blount soils. They are brighter colored in the upper part of the B horizon than the Blount soils and are lighter colored than the Pewamo soils. They are similar in natural drainage to Shinrock soils and Tuscola soils. Morley soils have a higher content of sand and coarse fragments than Shinrock soils and are underlain by glacial till instead of stratified deltaic or lacustrine sediments. They have a higher content of clay in the B horizon than Tuscola soils.

Morley loam, 2 to 6 percent slopes (MsB).—This soil has a profile similar to the one described as representative for the series, but the surface layer contains more sand. In places, the loam surface layer is as much as 18 inches thick, but it is generally only 9 or 10 inches thick. Surface runoff is medium, and there is a moderate hazard of erosion if the soil is cultivated.

Included in mapping were a few areas of Rawson soils which occur where the loam surface layer is thicker than 18 inches.

Maintaining good tilth is not a serious problem on this soil. For some nonfarm uses, slow permeability and slope are limitations. (Capability unit IIe-4)

Morley silt loam, 2 to 6 percent slopes (MyB).—A profile of this soil is described as representative for the Morley series. Surface runoff is medium. This soil is susceptible to surface crusting, which hinders seedling emergence. The high content of silt and medium content of organic matter make it difficult to maintain good tilth.

Included in mapping were a few areas of the somewhat poorly drained Blount soils that are generally in lower areas where runoff concentrates.

The major limitation for cultivated crops is the hazard of erosion. For some nonfarm uses, slow permeability and slope are limitations. (Capability unit IIe-4)

Morley silt loam, 2 to 6 percent slopes, moderately eroded (MyB2).—This soil has a profile similar to the one described as representative for the series, but part of the original silt loam surface layer has been removed by erosion. The plow layer is a mixture of the original surface soil and some of the finer textured upper part of the subsoil. The mixing of these soils has adversely affected the tilth by increasing the content of clay and reducing the content of organic matter in the plow layer. The surface runoff of this soil is medium, and the hazard of erosion is severe.

Included in mapping were a few small areas of somewhat poorly drained Blount soils that are in lower areas where runoff concentrates.

The major limitation for farming is past erosion and the severe hazard of further erosion. For many nonfarm uses, slow permeability and slope are limitations. (Capability unit IIIe-2)

Morley silt loam, 6 to 12 percent slopes (MyC).—This soil is on the side slopes of the moraine crests and along the major drainageways. It is susceptible to surface crusting, which hinders seedling emergence. The high content of silt and medium content of organic matter make it difficult to maintain good tilth. The surface runoff is rapid.

The major limitation for crops is a severe hazard of erosion. For many nonfarm uses, slope and slow permeability are limitations. (Capability unit IIIe-2)

Morley silt loam, 6 to 12 percent slopes, moderately eroded (MyC2).—This soil is on the side slopes of the moraine crests and along the major drainageways. This soil has a profile similar to the one described as representative for the series, but part of the original silt loam surface layer has been removed by erosion. The plow layer is a mixture of the original surface soil and the finer textured upper part of the subsoil. The mixing of these layers has adversely affected the tilth by increasing the content of clay and reducing the content of organic matter in the plow layer. Surface runoff is rapid unless a thick plant cover is maintained.

Included in mapping were a few areas of soils that have a surface layer of silty clay loam.

The major limitations for crops are past erosion and the severe hazard of further erosion. For many nonfarm uses, slope and slow permeability are limitations. (Capability unit IIIe-2)

Morley silt loam, 12 to 18 percent slopes, moderately eroded (MyD2).—This soil occurs on the slopes adjacent to the major drainageways. This soil has a profile similar to the one described as representative for the series, but part of the original silt loam surface layer has been removed by erosion. The plow layer is a mixture of the original surface soil and the finer textured subsoil. The mixing of these layers has adversely affected the tilth by increasing the content of clay and reducing the content of organic matter in the plow layer. Surface runoff is very rapid.

Included in mapping were a few uneroded or only slightly eroded areas.

The major limitation for cultivated crops is the very severe hazard of erosion. For nonfarm uses, slope is a dominant limitation. (Capability unit IVe-1)

Nappanee Series

The Nappanee series consists of soils that are deep, nearly level to sloping, and somewhat poorly drained. These soils formed in moderately fine textured glacial till on the lake plain. They occur on low knolls or rises on the lake plain or as narrow bands adjacent to drainageways.

A representative Nappanee soil that is cultivated has a dark grayish-brown loam plow layer. The subsoil, at depths between 7 and 22 inches, is grayish-brown clay mottled with yellowish brown. Below the subsoil is mottled dark-brown heavy clay loam glacial till that is very firm and calcareous and extends to a depth of 60 inches.

Nappanee soils have a seasonally high water table and slow to very slow permeability. The dense clay subsoil and underlying till restrict the movement of water. Artificial drainage helps remove excess water and permits optimum crop growth. These soils have medium to low available moisture capacity. Reaction is strongly acid in the upper part of the subsoil but less acid with increasing depth. The rooting zone is moderately deep because the dense underlying till limits root development.

Almost all areas of the Nappanee soils have been cleared and are used for crops. Many areas are artificially drained. If drained, these soils are suited to the field crops commonly grown in the county.

Representative profile of Nappanee loam, 0 to 2 percent slopes, in the SW¼SW¼ sec. 3, T. 2 N., R. 10 E., Portage Township.

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

B21tg—7 to 12 inches, grayish-brown (10YR 5/2) clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; very strongly acid; clear, wavy boundary.

B22tg—12 to 18 inches, grayish-brown (2.5Y 5/2) clay; many, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; very firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; few, fine, black (10YR 2/1) manganese or iron stains or coatings; very firm; medium acid; diffuse, wavy boundary.

B23tg—18 to 22 inches, grayish-brown (10YR 5/2) clay; common, medium, faint, yellowish-brown (10YR 5/4) mottles; strong, medium, angular blocky structure; very firm; thin, patchy, dark grayish-brown (10YR 4/2) clay films; few, fine, distinct, black (10YR 2/1) oxide stains or coatings; neutral; gradual, wavy boundary.

C1—22 to 29 inches, dark-brown (10YR 4/3) heavy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; massive; very hard when dry, very firm when moist; very pale brown (10YR 7/3) lime coatings; moderately alkaline; calcareous; gradual, wavy boundary.

C2—29 to 35 inches, dark-brown (10YR 4/3) heavy clay loam; common, medium, distinct, gray (10YR 6/1) and yellowish-brown (10YR 5/8) mottles; massive; very hard when dry, very firm when moist; common, black (10YR 2/1) shale fragments; moderately alkaline; calcareous; gradual, smooth boundary.

C3—35 to 43 inches, dark-brown (10YR 4/3) heavy clay loam; common, distinct, light-gray (10YR 7/1) and strong-brown (7.5YR 5/8) mottles; massive; extremely hard when dry, extremely firm when moist; moderately alkaline; calcareous; gradual, smooth boundary.

C4—43 to 60 inches, brown (10YR 5/3) heavy clay loam; gray (10YR 5/1) mottles; massive; very hard when dry, very firm when moist; moderately alkaline; calcareous.

The Ap horizon ranges from brown (10YR 5/3) to dark grayish brown (10YR or 2.5Y 4/2) in color. An A2 horizon that is light brownish-gray (10YR 6/2) or grayish-brown (10YR 5/2) and 2 to 4 inches thick is common where the soil has not been cultivated. The A2 horizon and the upper part of the B horizon range from strongly acid to medium acid. The B horizon has mottles in various shades of grayish brown, brown, and yellowish brown. Its structure is weakly prismatic parting to various sizes and grades of angular blocky and subangular blocky. The thickness of solum ranges from 20 to 30 inches but is typically 22 to 26 inches.

Nappanee soils are the somewhat poorly drained members of a drainage sequence that includes the very poorly drained Hoytville soils. They are adjacent to the Hoytville soils, which are darker colored. Nappanee soils have natural drainage similar to that of Blount, Fulton, and Randolph soils. Generally they have a thinner solum, and are more abrupt to a clayey B horizon than Blount soils. The till material underlying Nappanee soils generally has a higher content of clay than that underlying Blount soils. Nappanee soils generally have more coarse fragments and a higher content of sand than the somewhat poorly drained Fulton soils, which formed in lacustrine material. They differ from Randolph soils in lacking limestone bedrock within a depth of 40 inches.

Nappanee loam, 0 to 2 percent slopes (NaA).—A profile of this soil is described as representative for the Nappanee series. The loam surface layer is the result of the deposition of sandy material on the till on the lake plain, and it is not more than 10 inches thick in most places. Surface runoff is slow to ponded. Ponding occurs in low depressions.

Included in mapping were a few areas of Haskins soils.

The major limitation of this soil for farming is a seasonal high water table. Tilth and crusting are not generally limitations. For many nonfarm uses, a seasonal high water table and very slow permeability are limitations. (Capability unit IIIw-3)

Nappanee loam, 2 to 6 percent slopes (NaB).—Surface runoff is medium, and erosion is a hazard. The major limitations for farming are a seasonal high water table and the hazard of erosion. Tilth is not generally a limitation. For many nonfarm uses, a seasonal high water table and very slow permeability are limitations. (Capability unit IIIw-3)

Nappanee silt loam, 0 to 2 percent slopes (NpA).—This soil has a profile similar to the one described as representative for the series, but the surface layer of this soil contains more silt. This soil is subject to surface crusting. Surface runoff is slow, and ponding occurs in low undrained areas.

Included in mapping were a few areas that have a clayey surface layer and a few areas that have a surface layer of loam.

The major limitation for crops is a seasonally high water table. For many nonfarm uses, very slow permeability and the seasonal high water table are limitations. (Capability unit IIIw-3)

Nappanee silt loam, 2 to 6 percent slopes (NpB).—This soil has a profile similar to the one described as representative for the series, but the surface layer of this soil contains more silt. Surface runoff is medium, and erosion is a hazard.

Surface crusting is a hazard. The range of optimum moisture content within which the soil can be tilled without damage to the soil structure is narrower than that for Nappanee loams. The major limitation for farming and for many nonfarm uses is a seasonal high water table. For many nonfarm uses very slow permeability is an additional limitation. (Capability unit IIIw-3)

Nappanee silt loam, 4 to 10 percent slopes, moderately eroded (NpC2).—This soil occurs on elevated knolls and as narrow bands along the major drainageways on the lake plain. This soil has a profile similar to the one described as representative for the series, but the surface layer contains more silt. Also, some of the original surface layer has been removed by erosion and the plow layer now contains some of the finer textured material from the upper part of the subsoil. The mixing of these layers has adversely affected the tilth and has reduced the organic-matter content of the plow layer.

Included in mapping were a few moderately well drained areas and areas that have a silty clay loam surface layer.

The major limitation of this soil for farming is a hazard of erosion. Surface runoff is rapid unless a thick plant cover is maintained. For many nonfarm uses, slope and very slow permeability are limitations. (Capability unit IVe-1)

Ottokee Series

The Ottokee series consists of deep, nearly level to gently sloping soils that are sandy and moderately well drained. These soils formed in water-deposited fine sand. They occupy discontinuous beach deposits in the Findlay Basin, scattered areas in Biglick Township, and areas on the Defiance end moraine as well as other areas.

A representative Ottokee soil that is cultivated has a dark grayish-brown loamy fine sand plow layer. The subsoil, at depths between 10 and 38 inches, is yellowish-brown and pale-brown loamy fine sand. Below this is brown and pale-brown loamy fine sand that contains thin, discontinuous bands of clay enriched, strong-brown loamy fine sand and extends to a depth of 55 inches. Below the subsoil is loose, calcareous, gray fine sand that extends to a depth of 65 inches.

Ottokee soils have rapid permeability and low available moisture capacity. The organic-matter content of the surface layer is low. Seep areas occur during prolonged wet periods. These soils are medium acid in the upper part of the profile but are less acid with increasing depth. The rooting zone is deep.

Most areas of Ottokee soils have been cleared and are used for farming. Some areas have been used for sources of fine sand for filling and grading purposes. These soils are seldom used for long-season crops because they tend to be droughty.

Representative profile of Ottokee loamy fine sand, 0 to 4 percent slopes, in the NE¼NE¼ sec. 25, T. 1 N., R. 12 E., Biglick Township:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy fine sand; massive in place, but parts to single gain; very friable to loose; slightly acid; abrupt, irregular boundary.

B21—10 to 14 inches, yellowish-brown (10YR 5/8) loamy fine sand; massive in place, but parts to single grain; loose; slightly acid; clear, wavy boundary.

B22—14 to 20 inches, pale-brown (10YR 6/3) loamy fine sand; many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive in place, but crushes to single grain; loose; slightly acid; clear, wavy boundary.

B23—20 to 25 inches, pale-brown (10YR 6/3) loamy fine sand; few, fine, distinct, dark-brown (10YR 4/3) mottles; single grain; loose; slightly acid; clear, wavy boundary.

B24—25 to 38 inches, yellowish-brown (10YR 5/4) loamy fine sand; common, medium, faint, dark-brown (10YR 4/3) mottles; single grain; loose; slightly acid; clear, wavy boundary.

B25—38 to 55 inches, brown (10YR 5/3) and pale-brown (10YR 6/3) loamy fine sand; single grain; loose; a few, thin (¼ to ½ inch), discontinuous, strong-brown (7.5YR 5/6) loamy fine sand lamellae in which some clay has accumulated; slightly acid; clear, wavy boundary.

C—55 to 65 inches, gray (10YR 5/1) fine sand; single grain; loose; mildly alkaline; calcareous.

The Ap horizon ranges from dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), or dark brown (10YR 4/3) to yellowish brown (10YR 5/4) in color. The yellowish-brown color is exposed in places where the original A horizon has been altered by soil blowing. The A horizon ranges from loamy fine sand to fine sand in texture. The B21 horizon has hues of 7.5YR or 10YR, values of 5 or 6, and chromas of 4 to 8. The lower part of the B horizon generally has a hue of 10YR, values of 4 to 6, and chroma of 2 to 4. The lamellae range from ⅛ to ½ inch in thickness, and many are discontinuous. They tend to be closer together and thicker with increasing depth, but their combined thickness is less than 6 inches. In places there is much mingling of mottles and lamellae, making separation difficult. In some places the profile has thin layers and pockets of fine gravelly material.

Ottokee soils are the moderately well drained members of a drainage sequence that includes the darker colored, very poorly drained Granby soils. Ottokee soils are adjacent to Granby soils in many places. They are similar in drainage to Tuscola and Seward soils. In most places the Ottokee soils have a coarser textured B horizon than the Tuscola soils. They differ from the Seward soils in the lack of a contrasting finer textured material at a depth of 20 to 40 inches.

Ottokee loamy fine sand, 0 to 4 percent slopes (OtB).—This soil is droughty during dry periods. It is subject to soil blowing, especially late in winter and in spring.

Included in mapping were a few areas of somewhat poorly drained soils and well-drained soils.

The major limitation for farming is low available moisture capacity. Crops are often damaged by blowing sand early in spring and by droughtiness in midsummer. Texture of the surface layer is a limitation to some nonfarm uses. (Capability unit IIIs-1)

Pewamo Series

The Pewamo series consists of deep, dark-colored soils that are very poorly drained. These are nearly level soils, and they are on the till plain. They formed in clay loam or clayey glacial till.

A representative Pewamo soil that is cultivated has a black silty clay loam plow layer. The upper part of the subsoil, at depths between 8 and 13 inches, is very dark-gray clay. Below this, the subsoil is gray clay that is mottled with yellowish brown and that extends to a depth of 44 inches. Below the subsoil is compact, calcareous, gray and dark-brown clay loam glacial till that extends to a depth of 60 inches.

Pewamo soils have a seasonally high water table. Available moisture capacity is high, and permeability is moderately slow. The rooting zone is deep in summer when the water table is low and in areas that have been drained. Organic-matter content of the surface layer is high. Reaction is slightly acid to neutral in the upper part of the profile. The lower part of the profile is mildly alkaline or moderately alkaline.

Most of the acreage has been cleared and is used for crops. Unless drained these soils are generally too wet for crops, and some artificial drainage has been installed on almost all the acreage. A few potholes are difficult to drain because they are lower than the outlet ditches or require deep cuts to connect to the outlets. If drained, these soils are well suited to crops, and all the crops commonly grown in the county are produced.

Representative profile of a Pewamo silty clay loam in the NW¼NW¼ sec. 13, Washington Township:

Ap—0 to 8 inches, black (10YR 2/1) silty clay loam; weak, fine, granular structure; firm; many roots; few igneous pebbles; neutral; abrupt, smooth boundary.

B21tg—8 to 13 inches, very dark-gray (10YR 3/1) clay; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; few, thin, patchy, dark-gray (10YR 4/1) clay films; common roots; few igneous pebbles; neutral; gradual, wavy boundary.

B22tg—13 to 20 inches, gray (10YR 5/1) clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; thin, continuous, dark-gray (10YR 4/1) clay films; few roots; some igneous pebbles; neutral; clear, wavy boundary.

B23tg—20 to 38 inches, gray (N 5/0) clay; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm to very firm; thin, continuous, dark-gray (10YR 4/1) clay films; common igneous pebbles; some shale fragments; neutral; diffuse, wavy boundary.

B3t—38 to 44 inches, gray (10YR 5/1) clay; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; thin, patchy, dark-gray (10YR 4/1) clay films on vertical faces; neutral; gradual, wavy boundary.

C1—44 to 50 inches, gray (10YR 5/1) clay loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; moderately alkaline; calcareous; gradual, wavy boundary.

C2—50 to 60 inches, dark-brown (10YR 4/3) clay loam till; gray (10YR 5/1) mottles; massive; firm; moderately alkaline; calcareous.

The Ap horizon ranges from 3 to 5 percent in organic-matter content. It is very dark brown (10YR 2/2), very dark gray (10YR 3/1), or black (10YR 2/1) in color. Matrix colors in the B horizon below the dark-colored upper part are gray (10YR or 2.5Y 5/1), gray or dark gray (N 5/0 or N 4/0), or dark gray (10YR 4/1). The B horizon has dark grayish-brown (10YR 4/2), brown (10YR 5/3), and yellowish-brown (10YR 5/4, or 5/6) mottles. The B horizon is clay, silty clay loam or silty clay. Thin layers of clay loam may occur in the B horizon. The upper part of the B horizon is slightly acid to neutral and is less acid with increasing depth. The depth of solum and the depth to carbonates range from 35 to 55 inches.

Pewamo soils are the very poorly drained members of a drainage sequence that includes somewhat poorly drained Blount soils and moderately well drained Morley soils. They are adjacent to Blount and Morley soils, but they are more poorly drained than these soils and have a darker colored surface layer. Pewamo soils have natural drainage similar to that of Hoytville, Toledo, Millgrove, and Millsdale soils. They have a thicker, dark-colored upper part of the solum than the Hoytville and Toledo soils. The Pewamo soils are on the till plain, and the Hoytville soils are on the lake plain. They have more sand and less clay than Toledo soils. They are generally finer textured throughout than the Millgrove soils, which are underlain by sand and fine gravel. They differ from Millsdale soils by lacking limestone bedrock within a depth of 40 inches.

Pewamo silty clay loam (Pm).—This soil is nearly level. A profile of this soil is described as representative for the series. It has a plow layer that is high in organic-matter content. This soil dries slowly in spring unless it is artificially drained. Ponding occurs in low places, especially in areas that are not drained. If it is plowed when too wet, the plow layer becomes cloddy.

The major limitation for farming is a seasonally high water table. For many nonfarm uses, a seasonal high water table and moderately slow permeability are limitations. (Capability unit IIw-7)

Pewamo clay (Po).—This soil is nearly level. It has a profile similar to the one described as representative for the series, but the surface layer contains more clay. This soil is commonly in potholes or narrow waterways where ponding occurs. It is commonly difficult to drain because of its position on the landscape. Good tilth is difficult to maintain, and large cracks form in this clayey soil during dry periods. Tillage is often necessary under less than optimum moisture conditions and causes a cloddy surface. Surface drainage is generally effective and helps permit more timely tillage operations.

The major limitations for farming are a seasonally high water table and a clayey surface layer. For many nonfarm uses, the seasonal high water table and moderately slow permeability are limitations. (Capability unit IIw-7)

Quarry

Quarry (Qu) consists of open excavations from which all the soil material has been removed to expose the underlying limestone bedrock. The limestone is excavated, and most of it is crushed and used in construction work. This land type is associated with the Milton, Ritchey, Randolph, Romeo, Joliet, and Millsdale soils.

Almost the entire acreage is southwest of the city of Findlay, but there are a few local quarries in the southern part of the county. Care has been taken to keep these excavations free of water so that quarrying can continue.

A few abandoned quarries have filled with water, and their acreage is included with bodies of water.

The quarry excavations are generally quite deep. They have a potential for recreational use if abandoned for commercial use. (Not placed in a capability unit)

Randolph Series

The Randolph series consists of moderately deep, somewhat poorly drained soils that overlie limestone bedrock. These soils formed mostly in glacial till that is 20 to 40 inches thick, but the lower part of the profile formed in residuum weathered from limestone. They are nearly level to gently sloping, and they are in the southern part of the county.

A representative Randolph soil that is cultivated has a dark grayish-brown silt loam plow layer. The upper part of the subsoil, at depths between 8 and 16 inches, is light brownish-gray silty clay loam. Below this, to a depth of 22 inches, the subsoil is brown clay. The lower part of the subsoil is dark yellowish-brown clay. There is an abrupt contact with limestone bedrock at a depth of 27 inches.

Randolph soils have a seasonally high water table. They have moderately slow permeability. Randolph soils dry slowly in the spring, unless they are artificially drained. Tile drainage is difficult to establish in many places because of the limited depth to bedrock. Reaction in the upper part of the subsoil is dominantly slightly acid to neutral, but in places is strongly acid. It is less acid with increasing depth. The rooting zone is moderately deep and has medium to low available moisture capacity depending on the depth to limestone.

Most areas of Randolph soils have been cleared and are cultivated. If these soils are artificially drained, they are suited to crops commonly grown in the county. If undrained, they dry slowly in spring, and planting is generally delayed.

Representative profile of Randolph silt loam, 0 to 2 percent slopes, in the SW¼SE¼ sec. 27, T. 1 N., R. 10 E., Liberty Township:

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

B21t—8 to 16 inches, light brownish-gray (10YR 6/2) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak to moderate, fine, subangular blocky structure; firm; many fine roots; thin, very patchy, very dark grayish-brown (10YR 3/2) clay films on ped surfaces; strongly acid; clear, wavy boundary.

B22t—16 to 22 inches, brown (7.5YR 5/4) clay; common, distinct, yellowish-brown (10YR 5/8) and medium, distinct, gray (10YR 5/1) mottles; moderate, coarse, subangular blocky structure; very firm; few fine roots; thin, patchy, dark grayish-brown (10YR 4/2) clay films on ped surfaces; neutral; gradual, wavy boundary.

IIB23t—22 to 27 inches, dark yellowish-brown (10YR 4/4) clay; common, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, coarse, subangular blocky structure; very firm; few roots; moderate, patchy, dark-gray (10YR 4/1) clay films on ped surfaces; few quartz and limestone pebbles; mildly alkaline; abrupt, wavy boundary.

R—27 inches +, limestone bedrock.

The Ap horizon ranges from dark gray (10YR 4/1) or dark grayish brown (10YR 4/2) to dark brown (10YR 4/3) in color. It is medium acid to neutral. An A2 horizon, 2 to 6 inches thick, occurs in undisturbed areas. It is pale brown (10YR 6/3) to light gray (10YR 7/1) and has yellowish-brown (10YR 5/6) and brownish-yellow (10YR 6/6) mottles. The B horizon has matrix colors ranging from light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) to dark brown (10YR 4/3) or light olive brown (2.5Y 5/4) to brown (7.5YR 5/4). It has mottles of gray (10YR 5/1), dark grayish brown (2.5Y 4/2), grayish brown (10YR 5/2), yellowish brown (10YR 5/4, 5/6, 5/8), and strong brown (7.5YR 5/8). The B horizon is dominantly slightly acid to neutral but ranges to strongly acid in the upper part. It ranges from heavy clay loam or heavy silty clay loam to silty clay or clay in texture. In most areas there is a IIB horizon of clay, 2 to 5 inches thick, that formed in material weathered from limestone immediately above bedrock. Igneous pebbles and limestone fragments occur on the surface and in the solum. The depth to bedrock is generally less than 30 inches, but it ranges from 20 to 40 inches. In some places the upper part of the bedrock is highly fractured and, in some places, is intermixed with soil material. but in other places it is very dense and only slightly fractured or mixed with soil material.

Randolph soils are the somewhat poorly drained members of a drainage sequence that includes well-drained Milton and Ritchey soils and very poorly drained Millsdale soils. All of these soils are underlain by limestone. Randolph soils are deeper to bedrock than Ritchey soil, have a more mottled B horizon than Milton soils, and are lighter colored than Millsdale soils. They are similar in natural drainage to Haskins, Nappanee, Blount, and Digby soils, but they differ from these soils in being underlain by limestone at a depth of 20 to 40 inches.

Randolph loam, 0 to 2 percent slopes (RbA).—This soil is in areas of the lake plain and till plain. It has a profile similar to the one described as representative for the series, but the surface layer contains less silt and more sand. The tilth of this soil is generally good. Surface runoff is slow.

Included in mapping were small adjacent areas of Blount, Digby, Haskins, and Nappanee soils. Also included was a small acreage where the bedrock occurs at a depth less than 20 inches.

The major limitation for crops and for nonfarm uses is a seasonal high water table. Moderately slow permeability is an additional limitation for many nonfarm uses. (Capability unit IIIw-3)

Randolph silt loam, 0 to 2 percent slopes (RlA).—This soil is in areas of the lake plain and till plain. A profile of this soil is described as representative for the Randolph series. Surface runoff is slow.

Included in mapping were small near or adjacent areas of Blount, Digby, Haskins, and Nappanee soils. Also included were a few areas of Shoals silt loam, which is subject to flooding where it is adjacent to the flood plains. Another inclusion is a small acreage where the bedrock is at a depth of less than 20 inches.

Good tilth is more difficult to maintain than on Randolph loam, 0 to 2 percent slopes, because this soil is more subject to surface crusting. The major limitation of this soil for farming and for many nonfarm uses is a seasonal high water table. Moderately slow permeability is an additional limitation for many nonfarm uses. (Capability unit IIIw-3)

Randolph silt loam, 2 to 6 percent slopes (RlB).—The surface layer of this soil is subject to crusting. Because surface runoff is medium, this soil is subject to erosion.

Included in mapping were small adjacent areas of poorly drained Blount, Digby, Haskins, and Nappanee soils.

The major limitation for farming and for many nonfarm uses is a seasonal high water table. Moderately slow permeability and slope are additional limitations for many nonfarm uses. (Capability unit IIIw-3)

Rawson Series

This series consists of deep, nearly level to gently sloping soils that are moderately well drained. These soils formed in loamy material that had been deposited over glacial till or silty and clayey lacustrine material. This underlying contrasting material occurs at a depth of 22 to 40 inches. These soils occupy terraces, outwash areas, and areas on the lake plain or beach ridges. They occur throughout the county.

A representative Rawson soil has a dark grayish-brown loam plow layer. At depths between 8 and 10 inches is a thin, light yellowish-brown loam subsurface layer. The upper part of the subsoil, to a depth of 23 inches, is brown and dark-brown clay loam. At depths between 23 and 32 inches, the subsoil is brown sandy clay loam. The lower part of the subsoil is yellowish-brown clay loam that extends to a depth of 36 inches. Below the subsoil is compact, calcareous, brown clay loam glacial till that extends to a depth of 60 inches.

Rawson soils have a seasonally high water table for relatively short periods of time. They generally do not need artificial drainage. There are, however, some seepy areas which can be improved for farming by artificial drainage. Permeability is moderate in the upper part of the soil but is slow in the underlying material. Reaction in the upper part of the subsoil is very strongly acid and is less acid with increasing depth. The rooting zone is mostly moderately deep. Root growth is restricted in the underlying calcareous material. The rooting zone has medium available moisture capacity.

Nearly all areas of Rawson soils have been cleared and are cultivated. They are suited to all of the field crops commonly grown in the county.

Representative profile of Rawson loam, 2 to 6 percent slopes, in the NE¼NE¼ sec. 36, T. 2 N., R. 9 E., Pleasant Township:

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

A2—8 to 10 inches, light yellowish-brown (10YR 6/4) loam; weak, fine, subangular blocky structure; friable; many roots; medium acid; clear, wavy boundary.

B1t—10 to 17 inches, brown (10YR 5/3) clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, dark-brown (10YR 4/3) clay films; common roots; medium acid; clear, smooth boundary.

B21t—17 to 23 inches, dark-brown (7.5YR 4/4) clay loam; common, medium, distinct, brown (10YR 5/3) and strong-brown (7.5YR 5/8) mottles; moderate, coarse, subangular blocky structure; very firm; thin, continuous, dark-brown (10YR 4/3) clay films; common roots; medium acid; clear, wavy boundary.

B22t—23 to 32 inches, brown (7.5YR 5/4) sandy clay loam; few, fine, prominent, light brownish-gray (2.5Y 6/2) mottles and few, fine, distinct, yellowish-red (5YR 4/6) mottles; weak, fine, subangular blocky structure; friable; fine gravel is 5 percent, by volume; thin, patchy, dark-brown (7.5YR 4/4) clay films and clay bridgings between sand grains; few roots; neutral; abrupt, wavy boundary.

IIB23t—32 to 36 inches, yellowish-brown (10YR 5/4) clay loam; few, fine, faint, pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; firm; thin, patchy, dark-brown (10YR 4/3) clay films on vertical faces; few roots; neutral; clear, wavy boundary.

IIC—36 to 60 inches, brown (10YR 5/3) clay loam; few, medium, faint, pale-brown (10YR 6/3) mottles; massive; very firm; common, gray (10YR 6/1) lime coatings; moderately alkaline; calcareous.

The Ap horizon ranges from dark brown (10YR 4/3) to brown (10YR 5/3) or dark grayish brown (10YR 4/2) in color. The B horizon has matrix colors ranging from brown (10YR 5/3 or 7.5YR 5/4) or dark brown (7.5YR 4/4) to yellowish brown (10YR 5/4) and mottles of yellowish red (5YR 4/6), pale brown (10YR 6/3), brown (10YR 5/3), yellowish brown (10YR 5/4-5/6), strong brown (7.5YR 5/8), and light brownish gray (2.5Y 6/2). It ranges from silty clay loam to sandy clay loam. In some profiles there are thin layers of loam or fine sandy loam. In some places fine pebbles are on the surface and throughout the profile. The upper part of the B horizon ranges from very strongly acid to slightly acid. The depth to mottling ranges from 16 to 26 inches. The depth to the calcareous IIC horizon ranges from 22 to 40 inches but is commonly 30 to 40 inches. The IIC horizon ranges from clay loam to clay.

Rawson soils are the moderately well drained members of a drainage sequence that includes somewhat poorly drained Haskins soils and poorly drained Mermill soils. Rawson soils lack the dark-colored surface layer that is typical of the Mermill soils, and they lack the dark-gray clay films in the B horizon that are typical in Haskins soils. Rawson soils are similar in natural drainage to Seward soils. The upper part of the solum in Rawson soils is less sandy than that in Seward soils. Rawson soils have a finer textured C horizon than the moderately well drained Haney soils.

Rawson loam, 0 to 2 percent slopes (RmA).—This soil is on terraces, outwash deposits, the lake plain, and the beach ridges. The surface runoff is slow. This soil is generally easy to cultivate, and tilth problems are few.

Included in mapping were areas that have a fine sandy loam surface layer. Also included were small areas where the depth to the underlying finer textured material is as much as 48 inches.

There are few or no limitations for cultivated crops. For some nonfarm uses slow permeability in the substratum is a limitation. (Capability unit I-1)

Rawson loam, 2 to 6 percent slopes (RmB).—This soil is on terraces, outwash deposits, the lake plain, and the beach ridges. A profile of this soil is described as representative for the Rawson series. Because the surface runoff is medium, this soil is subject to erosion if it is cultivated and not protected. This soil is generally easy to cultivate, and tilth problems are few if any.

Included in mapping were a few small areas that have a fine sandy loam or silt loam surface layer. Also included were small areas where the underlying finer textured material is as deep as 48 inches.

The major limitation for farming is a moderate hazard of erosion. For some nonfarm uses, slope and slow permeability in the substratum are limitations. (Capability unit IIe-3)

Rimer Series

The Rimer series consists of deep, nearly level to gently sloping soils that are somewhat poorly drained. These soils formed partly in sandy material 20 to 40 inches thick and partly in underlying, contrasting, finer textured glacial till or lacustrine material. They are on relatively small sand ridges and knolls. These ridges and knolls are generally in a rather complex pattern on the lake plain and glacial till plain.

A representative Rimer soil has a dark grayish-brown loamy fine sand plow layer. At depths between 12 and 22 inches is a brown and yellowish-brown loamy fine sand subsurface layer. The upper part of the subsoil, to a depth of 26 inches, is strong-brown fine sandy loam. The lower part of the subsoil, at depths between 26 and 34 inches, is grayish-brown clay loam. Below the subsoil is calcareous grayish-brown clay loam glacial till that extends to a depth of 60 inches.

The permeability is rapid in the upper part of Rimer soils and slow to very slow in the underlying material. The Rimer soils have a seasonally high water table for significant periods of time. These soils dry slowly in spring unless they are artificially drained. In places they are strongly acid in the upper part of the subsoil. The rooting zone of Rimer soils is moderately deep in most places. Root growth is inhibited in the underlying calcareous material. The rooting zone has a low available moisture capacity.

Most areas of Rimer soils have been cleared and are cultivated. They are used mainly for the field crops that are commonly grown in the county.

Representative profile of Rimer loamy fine sand, 0 to 2 percent slopes, in the NW¼ sec. 33, T. 1 S., R. 9 E., Union Township:

Ap—0 to 12 inches, dark grayish-brown (10YR 4/2) loamy fine sand; single grain; loose; strongly acid; abrupt, wavy boundary.

A2—12 to 14 inches, brown (10YR 5/3) loamy fine sand; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, thick, platy structure in place parting to single grain; very friable; medium acid; abrupt, wavy boundary.

A3—14 to 22 inches, yellowish-brown (10YR 5/4) loamy fine sand; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; single grain; very friable; tongues of material from this horizon extend into B2t horizon; medium acid; clear, wavy boundary.

B21t—22 to 26 inches, strong-brown (7.5YR 5/6) fine sandy loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; weak to moderate, medium, subangular blocky structure; friable; thin, very patchy, dark-brown (7.5YR 4/4) clay films; slightly acid; clear, smooth boundary.

IIB22t—26 to 34 inches, grayish-brown (10YR 5/2) clay loam; many, medium, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; hard when dry, firm when moist; thin, patchy, dark yellowish-brown (10YR 4/4) clay films; few limestone "ghosts" and a few igneous pebbles; neutral; abrupt, wavy boundary.

IIC1—34 to 38 inches, grayish-brown (10YR 5/2) clay loam; many, coarse, faint, yellowish-brown (10YR 5/4) mottles; light brownish-gray (10YR 6/2) lime coatings; moderate, coarse, subangular blocky structure; firm; mildly alkaline; calcareous; clear, wavy boundary.

IIC2—38 to 60 inches, grayish-brown (10YR 5/2) clay loam; many, coarse, faint, yellowish-brown (10YR 5/4) and few, fine, distinct, yellowish-red (5YR 5/6) mottles; massive; firm; moderately alkaline; calcareous.

The Ap horizon ranges from dark gray (10YR 4/1) to dark brown (10YR 4/3) in color. The A2 horizon is brown (10YR 5/3) and light brownish gray (10YR 6/2) in color. The upper part of the B horizon is fine sandy loam or sandy loam. The B horizon ranges from strongly acid to neutral. The IIB horizon is 4 to 12 inches thick. In some places it contains thin layers and pockets of silt. Depth to the IIB horizon ranges from 22 to 40 inches. The thickness of the solum ranges from 24 to 48 inches. The texture of the IIC horizon commonly is clay loam, but in places it is heavy clay loam, heavy silty clay loam, silty clay, or clay. In places the IIC horizon formed in till or lacustrine material.

Rimer soils are the somewhat poorly drained members of a drainage sequence that includes moderately well drained Seward soils. They are less mottled throughout than the Seward soils. They are similar in natural drainage to Haskins soils but are coarser textured above the contrasting IIB and IIC horizons. They are also similar in natural drainage to Kibbie soils. They differ from Kibbie soils in that they formed partly in sandy materials and partly in contrasting underlying finer textured soil materials rather than in deposits of stratified silts and very fine and fine sand.

Rimer loamy fine sand, 0 to 2 percent slopes (RnA).—This soil is on sand ridges and knolls. It occupies small areas on the lake plain and glacial till plain. A profile of this soil is described as representative for the Rimer series. Surface runoff is slow.

Included in mapping were small areas where the color of the surface layer is darker than typical. Also included were areas where the surface layer is fine sandy loam.

Weed control is a problem on this sandy soil, especially in areas that are artificially drained. These areas warm up in early spring. This soil is easy to till. The major limitation of this soil for farming is a seasonally high water table. For many nonfarm uses, a seasonally high water table and slow to very slow permeability are limitations. (Capability unit IIw-2)

Rimer loamy fine sand, 2 to 6 percent slopes (RnB).—This soil is on sand ridges and knolls and occurs as small areas on the lake plain and glacial till plan. Surface runoff is slow, but erosion is a hazard. Soil blowing is a hazard in spring if the surface is bare of cover and the soil is dry.

Included in mapping were small areas where the color of the surface layer is darker than typical. Also included were some areas where depth to the contrasting finer textured material is as much as 48 inches. Another inclusion in some areas is where the B horizon contains a firm cemented layer, but this layer is not continuous over large areas.

Weed control is more of a problem on this soil than on finer textured soils because the surface warms early in spring. Tilth is not a problem, and the soil is easy to cultivate. The major limitation of this soil for farming is a seasonally high water table. For many nonfarm uses, a seasonally high water table and slow to very slow permeability are limitations. (Capability unit IIw-2)

Ritchey Series

The Ritchey series consists of well-drained soils that are shallow to limestone bedrock. These soils formed in thin deposits of glacial till over limestone.

A representative Ritchey soil has a dark-brown silt loam plow layer. The upper part of the subsoil, at depths between 8 and 13 inches, is yellowish-brown clay loam. The lower part of the subsoil, to a depth of 17 inches, is dark-brown clay. Below the subsoil is a thin layer of yellow loamy fine sand. Limestone bedrock is at a depth of 18 inches.

Ritchey soils have moderate permeability and low to very low available moisture capacity. They have a shallow rooting zone. In some places they are medium acid in the upper 12 inches of the profile.

Areas of Ritchey soils are mostly used for pasture and are of little importance to farming in the county.

Representative profile of Ritchey loam, 1 to 5 percent slopes, in the SW¼ sec. 36, T. 1 N., R. 12 E., Biglick Township:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; many roots; some igneous pebbles; neutral; abrupt, smooth boundary.

B1t—8 to 13 inches, yellowish-brown (10YR 5/4) clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy, dark yellowish-brown (10YR 4/4) clay films; common roots; few igneous pebbles; neutral; clear, wavy boundary.

B2t— 13 to 17 inches, dark-brown (7.5YR 4/4) clay; strong, fine, subangular blocky structure; very firm; thin, continuous, dark yellowish-brown (10YR 4/4) clay films; common roots; few igneous pebbles; neutral; abrupt, wavy boundary.

IIC—17 to 18 inches, yellow (10YR 7/6) loamy fine sand; single grain; loose; moderately alkaline; abrupt, wavy boundary.

IIIR—18 inches +, unweathered limestone bedrock.

The Ap horizon ranges from dark brown (10YR 4/3) to dark grayish brown (10YR 4/2) in color and from slightly acid to mildly alkaline. In undisturbed areas there is a 1- to 2-inch pale-brown (10YR 5/3) A2 horizon, and in some cultivated areas there are remnants of an A2 horizon under the Ap horizon. The B horizon ranges from yellowish brown (10YR 5/4 or 5/6) and dark yellowish brown (10YR 4/4) to dark brown (7.5YR 4/4 or 10YR 4/3) in color. The B horizon ranges from medium acid to mildly alkaline. The upper part of the B horizon ranges from loam to clay loam in texture, and the lower part ranges from heavy clay loam to clay. In some areas there is a 2- to 4-inch layer of clayey IIB2 material immediately above the bedrock that appears to have been derived from material that weathered from limestone bedrock. Few to common limestone fragments and igneous pebbles occur on the surface and in the solum. In some areas the depth to bedrock is variable within short distances but ranges from 10 to 20 inches. In some places the upper part of the bedrock is highly fractured and is intermixed with soil material.

Ritchey soils are members of a drainage sequence that includes the well-drained Milton soils, the somewhat poorly drained Randolph soils, and the very poorly drained Millsdale soils. Ritchey soils are shallow, but the other soils are deeper. They are lighter colored than the Romeo soils, which are very shallow, and Joliet soils, which are shallow.

Ritchey silt loam, 1 to 5 percent slopes (RrB).—This soil is in areas where the depth to limestone bedrock is only 10 to 20 inches. Consequently, it is droughty. Surface runoff is medium. Cultivated areas of this soil are subject to surface crusting.

Included in mapping were small areas of Milton, Dunbridge, and Romeo soils, all of which are near or adjacent to this Ritchey soil.

The principal limitations for crops are a hazard of erosion and droughtiness. For many nonfarm uses, slope and shallowness to bedrock are limitations. (Capability unit IIIe-1)

Romeo Series

This series consists of dark-colored, nearly level to sloping, well-drained soils that are very shallow to limestone. These soils formed in a thin layer of till mixed with residuum that had weathered from limestone. They occupy areas mostly in Biglick and Liberty Townships.

A representative Romeo soil has a thin, very dark grayish-brown silt loam surface layer. Fractured limestone bedrock is at a depth of about 5 inches, and solid rock is at a depth of 9 inches.

Romeo soils have very low available moisture capacity and are very droughty. Surface runoff is slow to rapid, depending on slope. Permeability is moderate. These soils are slightly acid to mildly alkaline.

Nearly all areas of Romeo soils are used for permanent pasture or woodland. Most areas are too shallow to plow.

Representative profile of Romeo silt loam, 0 to 10 percent slopes, in the SE¼ sec. 34, T. 1 N., R. 12 E., Biglick Township:

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; many roots; few igneous pebbles and limestone pebbles; neutral; abrupt, smooth boundary.

IIR—5 to 9 inches +, fractured limestone bedrock; slabs or fragments can be removed to a depth of 9 inches, below which is solid bedrock.

The A horizon ranges from black (10YR 2/1) to very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) in color. In many areas the organic matter occurs as coatings on the soil particles and the color of crushed material is about one chroma lighter than uncrushed material. In cultivated areas the color of the Ap horizon ranges from very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2). Limestone fragments and igneous pebbles are common on the surface and in the solum. Glacial pebbles are common in areas where these soils occur. In places limestone bedrock crops out on the surface. In other places the depth to bedrock is nearly as much as 10 inches, although it is variable within short distances. In some places the upper part of the bedrock is highly fractured and may be intermixed with soil material; in other places it is dense and is only slightly fractured or mixed with soil material.

The Romeo soils in Ohio differ from Romeo soils in other States. In Ohio they are considered well-drained as they show little or no evidence of wetness.

Romeo soils are darker colored and shallower to limestone than Ritchey soils or Milton soils. They are better drained and shallower to limestone than the Joliet soils.

Romeo silt loam, 0 to 10 percent slopes (RsC).—This soil is near or adjacent to areas of Milton, Ritchey, and Dunbridge soils. The surface runoff is slow to rapid.

Included in mapping were small areas of Milton, Ritchey, and Dunbridge soils.

It is not practical to raise cultivated crops on this soil because of the shallowness to bedrock. The major limitation to the use of this soil for any purpose is the shallowness to bedrock. (Capability unit VIs-1)

Seward Series

The Seward series consists of deep, nearly level to gently sloping soils that are moderately well drained. These soils formed in 18 to 40 inches of sandy material that overlies compact glacial till or moderately fine textured to fine textured lake plain sediment. They are on sandy ridges and knolls which are slightly elevated above the surrounding landscape. They occur in all sections of the county except for Madison, Orange, and Van Buren Townships.

A representative Seward soil has a dark yellowish-brown loamy fine sand plow layer. At depths between 6 and 25 inches is a brown and yellowish-brown loamy fine sand subsurface layer. At depths between 25 and 30 inches, the upper part of the subsoil is brown sandy loam. The lower part of the subsoil is yellowish-brown clay loam to a depth of 37 inches. Below the subsoil is firm, dark-brown, heavy silty clay loam glacial till that extends to a depth of 50 inches.

Seward soils have a seasonally high water table for relatively short periods of time. The permeability is rapid in the upper part of the soil and slow in the lower part. These soils generally do not need artificial drainage. There are, however, seepy areas that can be improved for farming by artificial drainage. Plant nutrients tend to leach rapidly from the upper part of the profile. Reaction in the upper part of the soil is strongly acid to neutral but less acid with increasing depth. The rooting zone of Seward soils is moderately deep in most places. Root growth is restricted in the calcareous lower part of the soil. The rooting zone has low to medium available moisture capacity.

Seward soils occur generally as small areas. Most of the areas have been cleared and are cultivated.

Representative profile of Seward loamy fine sand, 2 to 6 percent slopes, in the SW¼ sec. 32, T. 2 N., R. 9 E., Pleasant Township:

Ap—0 to 6 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; single grain, and weak, fine, granular structure; very friable; many roots; medium acid; abrupt, smooth boundary.

A2—6 to 16 inches, brown (10YR 5/3) loamy fine sand; single grain; loose; many roots; strongly acid; diffuse, irregular boundary.

A3—16 to 25 inches, yellowish-brown (10YR 5/4) loamy fine sand; single grain; loose; common roots; medium acid; gradual, wavy boundary.

B21t—25 to 30 inches, brown (10YR 5/3) sandy loam; many, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5Y 5/8) mottles; weak, medium, subangular blocky structure; firm; thin, patchy, dark yellowish-brown (10YR 4/4) clay films and clay bridgings between sand grains; few roots; neutral; gradual, irregular boundary.

IIB22t—30 to 37 inches, yellowish-brown (10YR 5/4) clay loam; few, medium, distinct, gray (10YR 5/1) mottles in lower part; weak, medium, subangular blocky structure; firm; thin, patchy, dark yellowish-brown (10YR 4/4) clay films; few roots; neutral; gradual, irregular boundary.

IIC—37 to 50 inches, dark-brown (10YR 4/3) heavy silty clay loam; few, fine, distinct, gray (10YR 5/1) and brownish-yellow (10YR 6/8) mottles; massive; firm; moderately alkaline; calcareous.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) or dark brown (10YR 4/3) in color. The A2 horizon is brown (10YR 5/3), dark brown (10YR 4/3), yellowish brown (10YR 5/4), or brownish yellow (10YR 6/6) in color. Sandy horizons extend to a depth of 20 to 32 inches. The depth to a contrasting IIB horizon is less than 20 to 40 inches. The solum ranges from 24 to 48 inches in thickness. The sandy part of the solum ranges from strongly acid to slightly acid. The Bt horizon ranges from slightly acid to neutral. The IIBt horizon is heavy silty clay loam, clay loam, or clay.

Seward soils are the moderately well drained members of a drainage sequence that includes the somewhat poorly drained Rimer soils. They are less mottled throughout than Rimer soils. Seward soils are similar in natural drainage to Rawson soils, but they are sandier in the upper part of the solum. They differ from moderately well drained Tuscola soils by being coarser textured in the upper part of the solum and by having a 11B horizon and a 11C horizon. Seward soils are similar to the Ottokee soils, except that the Ottokee soils formed in thicker deposits of sandy material and have a B horizon that has bands or lamellae.

Seward loamy fine sand, 0 to 2 percent slopes (SdA).—This soil is on sandy ridges or knolls on the lake plain, till plain, terraces, or beach ridges. Surface runoff is slow. This soil is commonly droughty. Where this soil is on exposed ridges or knolls, it is subject to soil blowing, especially in spring.

Included in mapping were a few areas that have a very dark grayish-brown or darker colored surface layer. Also included were areas that have a fine sandy loam surface layer and areas where the depth to underlying finer textured material is as much as 48 inches.

Tile drainage is not normally needed except for some wet spots or seep areas at the base of the sandy ridges. Crops that require large amounts of water are damaged during prolonged dry periods. The major limitation for farming is low to medium available moisture capacity. For some nonfarm uses, slow permeability in the lower part of the profile is a limitation. (Capability unit IIs-1)

Seward loamy fine sand, 2 to 6 percent slopes (SdB).—This soil is on sand ridges or knolls on the lake plain, till plain, terraces, or beach ridges. A profile of this soil is described as representative for the series. Surface runoff is slow to medium, and erosion is a moderate hazard if the soil is cultivated and not protected. The available moisture capacity of the sandy layers is low. Where the soil is on exposed ridges or knolls, it is subject to soil blowing, especially in spring.

Included in mapping were a few areas that have a very dark grayish-brown or darker surface layer. Also included were areas that have a fine sandy loam surface layer. Other inclusions are areas where the underlying finer textured material is as deep as 48 inches.

Tile drainage is normally not needed, except in some wet spots or seep areas at the base of the sandy ridges. Crops that require large amounts of water are damaged during prolonged dry periods. For many nonfarm uses, slope and slow permeability are limitations. (Capability unit IIe-3)

Shinrock Series

This series consists of deep, nearly level to sloping soils that are moderately well drained. These soils formed in stratified deltaic or lacustrine deposits. They occur mainly in Blanchard Township between the Defiance end moraine and the Blanchard River.

A representative Shinrock soil has a dark-brown silt loam plow layer. The upper part of the subsoil, at depths between 9 and 18 inches, is yellowish-brown silty clay loam. The lower part of the subsoil is dark yellowish-brown and yellowish-brown heavy silty clay loam and extends to a depth of 39 inches. Below the subsoil is dark yellowish-brown silt loam that extends to a depth of 60 inches.

Shinrock soils have a seasonally high water table for relatively short periods of time in winter and spring. Permeability is moderately slow. Artificial drainage is generally not necessary, except for some scattered seep spots. The upper part of the subsoil is medium acid to strongly acid. The rooting zone of these soils is deep, and available moisture capacity is medium.

All areas of Shinrock soil in this county are cultivated.

Representative profile of Shinrock silt loam, 2 to 6 percent slopes, in the NE¼ sec. 16, T. 1 N., R. 9 E., Blanchard Township:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B1—9 to 18 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; firm; many roots; strongly acid; clear, wavy boundary.

B21t—18 to 29 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles and common, fine, distinct, light brownish-gray (10YR 6/2) mottles; strong, coarse, subangular blocky structure; firm; thin, patchy, brown (10YR 5/3) clay films; few roots; medium acid; diffuse, wavy boundary.

B22t—29 to 39 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; strong, coarse, subangular blocky structure; firm; thin, patchy, light brownish-gray (10YR 6/2) clay films; few roots; medium acid; clear, wavy boundary.

C—39 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; common, medium, faint, yellowish-brown (10YR 5/8) mottles; massive; friable; neutral.

The Ap horizon ranges from dark brown (10YR 4/3) or dark grayish brown (10YR 4/2) to brown (10YR 5/3) in color. The Ap horizon ranges from 6 to 10 inches in thickness, but the average thickness is 7 inches. An A2 horizon of yellowish-brown (10YR 5/4) silt loam 2 inches thick is in some profiles. The B1 horizon ranges from yellowish brown (10YR 5/6) to dark brown (10YR 4/4) in color. The matrix of the B2 horizon ranges from dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4) to brownish-yellow (10YR 6/8) in color, and the mottles range from strong brown (7.5YR 5/8) or light yellowish brown (10YR 6/4) to light brownish gray (10YR 6/2) in color. The depth to mottling ranges from 17 to 21 inches. The B horizon is dominantly silty clay loam, but in some areas there are thin strata of heavy silt loam, clay loam, or silty clay. The upper part of the B horizon is strongly acid or medium acid, and the lower part is medium acid to neutral. The C horizon ranges from neutral to moderately alkaline.

Shinrock soils are moderately well drained members of a drainage sequence that includes the dark-colored, very poorly drained Lenawee soils. They differ from the moderately well drained Morley soils by being underlain by stratified deltaic or lacustrine sediments rather than glacial till. They have a lower average content of clay in the Bt horizon than Morley soils. They have a higher content of clay in the B horizon than the moderately well drained Tuscola soils, which formed in less clayey sediments.

Shinrock silt loam, 2 to 6 percent slopes (SeB).—Surface runoff is medium. Surface crusting is a hazard because the organic-matter content is low.

Included in mapping were some areas of Morley and Tuscola soils and several areas of a Shinrock soil that has slopes of more than 6 percent and that is moderately eroded.

The major limitation to farming is a moderate hazard of erosion. For many nonfarm uses, slope and moderately slow permeability are limitations. (Capability unit IIe-4)

Shoals Series

The Shoals series consists of deep, nearly level, somewhat poorly drained soils that are subject to flooding. These soils formed in materials washed from uplands in the drainage area. They occur throughout the county, except for Portage Township.

A representative Shoals soil has a dark-brown silt loam plow layer. The subsoil, at depths between 9 and 36 inches, is dark grayish-brown loam. The lower part of the subsoil is light brownish-gray silt loam that extends to a depth of 48 inches. The subsoil is gray silt loam that extends to a depth of 60 inches.

Shoals soils have a seasonally high water table in winter and spring. This water table is generally high for long periods of time. Flooding commonly occurs in winter and spring. Surface runoff is slow, available moisture capacity is high, and permeability is moderate. These soils generally are slightly acid to neutral. They have a deep rooting zone in summer if the water table is low. Shoals soils dry out and warm up readily in spring if they are artificially drained.

Most areas of Shoals soil are used for permanent pasture or woodland, but they are suited to row crops if they are drained.

Representative profile of Shoals silt loam in the SE¼ sec. 35, T. 1 S., R. 11 E., Jackson Township:

Ap—0 to 9 inches, dark-brown (10YR 3/3) silt loam; dark brown (10YR 4/3) when crushed; moderate, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

B21g—9 to 13 inches, dark grayish-brown (10YR 4/2) loam; common, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B22g—13 to 21 inches, dark grayish-brown (10YR 4/2) loam; common, fine, faint, dark-brown (7.5YR 4/4) mottles, and few, faint, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; neutral; clear, diffuse boundary.

B23g—21 to 36 inches, dark grayish-brown (10YR 4/2) loam; many, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, coarse, subangular blocky structure; friable; neutral; clear, wavy boundary.

B24g—36 to 48 inches, light brownish-gray (10YR 6/2) silt loam; many, medium, faint, pale-brown (10YR 6/3) mottles and few, fine, distinct, yellowish-red (5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

Cg—48 to 60 inches, gray (10YR 5/1) silt loam; common, medium, faint, yellowish-brown (10YR 5/6) mottles; weak, medium, platy structure; friable; neutral.

The Ap horizon ranges from very dark gray (10YR 3/1) or dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) or dark brown (10YR 3/3) in color. The B horizon has a matrix of dark gray (10YR 4/1), gray (10YR 5/1), dark grayish brown (10YR 4/2), light brownish gray (10YR 6/2), or dark brown (7.5YR 4/4) and mottles of grayish brown (10YR 5/2), light brownish gray (10YR 6/2), yellowish brown (10YR 5/4 or 5/6), pale brown (10YR 6/3), dark brown (10YR 4/3 or 7.5YR 4/4), yellowish red (5YR 5/6 or 5/8), and reddish yellow (7.5YR 6/8). The B horizon is dominantly light silty clay loam or light clay loam, silt loam, or loam. In some places there are thin strata of sandy clay loam or sandy loam at depths ranging from 3 to 4 feet. The profile ranges from slightly acid to neutral.

Shoals soils are the somewhat poorly drained members of a drainage sequence that includes well drained Genesee soils, moderately well drained Eel soils, and very poorly drained Sloan soils. All of these soils are on the flood plains. Shoals soils have more gray in their B horizons than Genesee or Eel soils, and they have a lighter colored Ap horizon than Sloan soils.

Shoals silt loam (Sh).—This soil is on flood plains of streams. Surface runoff is very slow.

Included in mapping was a small acreage of soils that have a silty clay loam or loam surface layer and a few areas that have a fine sandy loam surface layer.

Tile drainage is beneficial to crops, but it is commonly difficult to establish because of inadequate outlets. Summer row crops are better suited to this soil than are small grains because of seasonal wetness and flooding. The major limitations for farming and for most nonfarm uses are seasonal wetness and flooding. (Capability unit IIw-1)

Sloan Series

The Sloan series consists of deep, nearly level, dark-colored, very poorly drained soils on flood plains. These soils formed in loamy sediments washed from uplands. They commonly occupy low areas adjacent to small streams or creeks or narrow meander channels of larger streams. Sloan soils occur throughout the county.

A representative Sloan soil has a very dark gray loam plow layer. The subsoil, at depths between 8 and 37 inches, is very dark-gray and gray clay loam that has prominent, distinct, reddish and yellowish mottles. At depths between 37 and 55 inches, it is mottled gray loam. Below the subsoil is gray sandy loam that extends to a depth of 60 inches.

Surface runoff is slow to ponded. These soils have moderate permeability and high available moisture capacity. The gray colors throughout the profile indicate that Sloan soils are saturated with water for long periods of time. The reddish and yellowish mottles in the soil indicate solution and resegregation of iron compounds. Sloan soils are too wet for the successful growth of most crops unless they are artificially drained. They are subject to flooding, particularly during winter and spring. They are slightly acid to mildly alkaline. They have a deep rooting zone in summer when the water table is low.

A large acreage of Sloan soils is used for permanent pasture or woodland. A smaller acreage is cultivated.

Representative profile of Sloan loam in the SE¼SW¼ sec. 15, T. 1 S., R. 12 E., Amanda Township:

Ap—0 to 8 inches, very dark gray (10YR 3/1) loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B21g—8 to 14 inches, very dark gray (10YR 3/1) clay loam; common, medium, prominent, reddish-brown (5YR 4/4) mottles; moderate, medium, subangular blocky structure; friable; neutral; gradual, wavy boundary.

B22g—14 to 29 inches, gray (10YR 5/1) clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; very friable; neutral; gradual, wavy boundary.

B23g—29 to 37 inches, gray (10YR 5/1) clay loam; many, coarse, faint, yellowish-brown (10YR 5/6) mottles and common, medium, prominent, yellowish-red (5YR 4/8) mottles; moderate, medium, subangular blocky structure; friable; neutral; abrupt, wavy boundary.

B24g—37 to 48 inches, gray (10YR 5/1) loam; common, medium, prominent, dark reddish-brown (5YR 3/4) motties; weak, medium, subangular blocky structure; very friable; pockets of sandy material; neutral; gradual, wavy boundary.

B25g—48 to 55 inches, gray (10YR 6/1) loam; common, medium, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; very friable; mildly alkaline.

Cg—55 to 60 inches, gray (10YR 5/1) sandy loam; common, coarse, faint, dark-brown (10YR 4/3) mottles; single grain; loose; mildly alkaline; calcareous.

The color of the Ap horizon ranges from very dark grayish brown (10YR 3/2) to very dark gray (10YR 3/1). The thickness of the dark-colored upper part of the solum ranges from 10 to 16 inches. The Ap horizon ranges from slightly acid to neutral. The B horizon has a matrix of very dark gray (10YR 3/1) to gray (10YR 6/1) and has mottles of yellowish brown (10YR 5/6 or 5/4), reddish brown (5YR 4/3), dark brown (10YR 4/3), or yellowish red (5YR 4/6). It has variable texture that includes silt loam, light silty clay loam, and light clay loam. The upper part of the C horizon has weak structure in some areas. Coarser material, such as sand or pebbles, occurs in lenses or pockets in the lower part of the profile. The B and C horizons range from slightly acid or neutral to mildly alkaline. The C horizon commonly is calcareous.

The Sloan soils are members of a drainage sequence that includes well drained Genesee soils, moderately well drained Eel soils, and somewhat poorly drained Shoals soils. Sloan soils are typically more gray throughout than any of these other soils.

Sloan loam (Sn).—This soil is on flood plains. A profile of this soil is described as representative for the Sloan series. This soil is subject to frequent flooding, and water stands after the flood has receded. Some areas are dissected by drainageways or sloughs, making cultivation and drainage difficult.

Included in mapping were a few areas that have a fine sandy loam surface layer. Also included were areas where, because of overwash, the surface layer is light clay loam and silt loam.

The major limitations for farm use and for most nonfarm uses are flooding and seasonal wetness. (Capability unit IIIw-1)

Sloan silty clay loam (So).—This nearly level soil is on flood plains. It has a profile similar to the one described as representative for the series, but the surface layer and the rest of the profile contain more clay. Because this soil contains more clay, it is generally more difficult to work than Sloan loam. This soil is subject to frequent flooding, and water stands after the flood has receded. It has a seasonally high water table and is generally too wet to farm unless it is artificially drained. Some areas are dissected by drainageways or sloughs that make cultivation and drainage difficult.

The major limitations for farming and nonfarming uses are flooding and seasonal wetness. (Capability unit IIIw-1)

Toledo Series

This series consists of deep, nearly level soils that are dark colored and very poorly drained. These soils formed in clayey and silty sediments in old glacial lakes. They are in old shallow lake areas on the till plains and in the Findlay Basin.

A representative Toledo soil has a very dark-gray silty clay loam plow layer. The subsoil, at depths between 9 and 46 inches, is silty clay that has distinct, strong-brown, yellowish-brown, and olive-yellow mottles. Below the subsoil is calcareous, light brownish-gray silty clay that extends to a depth of 60 inches.

Toledo soils have a seasonally high water table during winter and spring. They have slow permeability and dry slowly in spring unless they are artificially drained. They have a deep rooting zone in summer when the water table is low. The rooting zone has high available moisture capacity and is slightly acid to neutral.

Nearly all areas of Toledo soils have been cleared and drained and are cultivated. If these soils are drained, they are well suited to the field crops and special crops grown in the county.

Representative profile of Toledo silty clay loam in the SW¼ sec. 36, T. 2 N., R. 10 E., Portage Township:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silty clay loam; weak, medium, subangular blocky structure; very firm when moist, very hard when dry; many roots; slightly acid; abrupt, smooth boundary.

B21g—9 to 14 inches, gray (10YR 5/1) silty clay; common, distinct, medium, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very firm; common roots; neutral; clear, smooth boundary.

B22g—14 to 28 inches, gray (10YR 6/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/8) and strong-brown (7.5YR 5/8) mottles; moderate, coarse, subangular blocky structure; very firm; few roots; neutral; diffuse, smooth boundary.

B23g—28 to 46 inches, gray (10YR 6/1) silty clay; common, medium, distinct, olive-yellow (2.5Y 6/6) and strong-brown (7.5YR 5/6) mottles; strong, coarse, subangular blocky structure; very firm; few roots; neutral; clear, wavy boundary.

Cg—46 to 60 inches, light brownish-gray (10YR 6/2) to gray (N 5/0) silty clay; many, coarse, distinct, light olive-brown (2.5Y 5/4) and strong-brown (7.5YR 5/6) mottles; massive; firm; some lenses or pockets of silt and a few concretions of iron or manganese; moderately alkaline; calcareous.

The Ap horizon ranges from 3.5 to 5.0 percent in organic-matter content and from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2) in color. It is 7 to 9 inches thick. The B horizon has a matrix that ranges in color from gray (10YR 6/1) to dark gray (10YR 4/1) and mottles of yellowish brown (10YR 5/4 or 5/8), olive brown (2.5Y 4/4), olive yellow (2.5Y 6/6), and strong brown (7.5YR 5/6 or 5/8) in color. The B horizon is most commonly silty clay, but in some areas the upper part of the B horizon is silty clay loam. In some areas the lower part of the B horizon and the C horizon contain thin strata of sandy and silty material. The lower horizons commonly contain iron or manganese concretions. Depth to carbonates is as little as 36 inches but most commonly is more than 42 inches.

Toledo soils are in a drainage sequence that includes somewhat poorly drained Fulton soils. They have a darker colored surface layer than Fulton soils. Toledo soils differ from the very poorly drained Hoytville soils in that they lack a Bt horizon and formed in lacustrine material instead of glacial till. They are also distinguished from the very poorly drained Hoytville soils by an absence of coarse fragments and a lower content of sand throughout the profile. Toledo soils are finer textured in the B horizon than the very poorly drained Lenawee soils.

Toledo silty clay loam (To).—Surface runoff is very slow to ponded on this soil. The surface layer is high in organic-matter content but is subject to cracking in dry weather.

Included in mapping were small areas of somewhat poorly drained Fulton soils. Also included were small areas of the very poorly drained Lenawee soils. Other inclusions are small depressions that have a silty clay or clay surface layer.

The timeliness of farming operations is improved by surface and tile drains. Corn is the most extensive crop grown on this soil. If the soil is drained, it is well suited to soybeans, tomatoes, sugar beets, wheat, oats, and meadow or hay crops. Undrained areas are commonly too wet for good growth of crops. The major limitation for farming is very poor natural drainage. For many nonfarm uses, seasonal wetness and slow permeability are limitations. (Capability unit IIIw-2)

Tuscola Series

The Tuscola series consists of deep, nearly level to gently sloping soils that are moderately well drained. These soils formed in sediments consisting of silt, fine sand, and very fine sand. They are on the lake plain and in delta areas.

A representative Tuscola soil has a dark grayish-brown fine sandy loam plow layer. At depths between 9 and 16 inches is a dark yellowish-brown fine sandy loam subsurface layer. The upper part of the subsoil, to a depth of 28 inches, is dark yellowish-brown fine sandy loam. At depths between 28 and 40 inches, the subsoil is yellowish-brown and grayish-brown fine sandy loam. The lower part of the subsoil is dark-brown and dark yellowish-brown fine sandy loam that extends to a depth of 48 inches. Below the subsoil is calcareous, stratified, dark yellowish-brown and brown very fine sand and silt that extends to a depth of 60 inches.

Tuscola soils have moderate permeability and high available moisture capacity. Natural drainage is normally adequate, and artificial drainage is generally not required. The rooting zone is deep and, in some places, is medium acid. The soil is less acid with increasing depth.

Nearly all areas of the Tuscola soils have been cleared and are cultivated. All of the field crops common to the county are grown.

Representative profile of a Tuscola fine sandy loam, 2 to 6 percent slopes, in the NW¼ sec. 8, T. 1 N., R. 10 E., Liberty Township:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; very friable; medium acid; clear, wavy boundary.

A2—9 to 16 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, thick, platy structure; friable; slightly acid; abrupt, wavy boundary.

B21t—16 to 28 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable; clay bridgings between sand grains; slightly acid; clear, wavy boundary.

B22t—28 to 40 inches, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) fine sandy loam; strong-brown (7.5YR 5/6) streaks or mottles; weak, medium, subangular blocky structure; thin, patchy, dark-brown (10YR 4/3) clay films and clay bridgings between sand grains; friable; medium acid; clear, wavy boundary.

B3—40 to 48 inches, dark-brown (7.5YR 4/4) and dark yellowish-brown (10YR 4/4) fine sandy loam mottled with strong brown (7.5YR 5/6); massive; friable; neutral; clear, wavy boundary.

C—48 to 60 inches, dark yellowish-brown (10YR 4/4) and brown (10YR 5/3), stratified very fine sand and silt; common, medium, distinct, gray (10YR 6/1) lime coatings; massive in place parting to single grain; very friable to loose; moderately alkaline; calcareous.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to dark gray (10YR 4/1) in color. The A2 horizon ranges from dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/8) in color. The B horizon is sandy loam, fine sandy loam, sandy clay loam, light clay loam, loam, or silt loam. The sand fraction is dominated by fine sand and very fine sand. The solum ranges from medium acid to neutral. The depth to the mottling ranges from 19 to 30 inches. The depth to the C horizon ranges from 34 to 55 inches.

The Tuscola soils are the moderately well drained members of a drainage sequence that includes somewhat poorly drained Kibbie soils and the very poorly drained Colwood soils. Tuscola soils have a brighter colored B horizon than Kibbie soils, and they lack the dark-colored A horizon typical of Colwood soils. Tuscola soils have natural drainage similar to that of Haney, Morley, and Rawson soils. They have a higher content of silt and very fine sand throughout than Haney soils. They have less clay in the Bt horizon than Morley soils, and they lack the contrasting IIB and IIC horizons, at a depth of less than 40 inches, characteristic of Rawson soils.

Tuscola fine sandy loam, 0 to 2 percent slopes (TpA).—This soil has a profile similar to the one described as representative for the series. It generally has good tilth. Surface runoff is slow.

Included in mapping were some areas that have a loamy fine sand surface layer.

There are few or no limitations for farming and few limitations for many nonfarm uses. (Capability unit I-1)

Tuscola fine sandy loam, 2 to 6 percent slopes (TpB).—Surface runoff is slow to medium. Tilth is not a problem. A profile of this soil is described as representative for the Tuscola series.

Included in mapping were small areas that have a loamy fine sand surface layer and a limited acreage of Tuscola fine sandy loam that has 6 to 12 percent slopes.

The major limitation for cultivated crops is a moderate hazard of erosion. For some nonfarm uses, slope is a limitation. (Capability unit IIe-2)

Tuscola loam, 2 to 6 percent slopes (TsB).—This soil has a profile similar to the one described as representative for the series, but the plow layer contains less sand. Because it contains less sand, the plow layer of this soil is less droughty than that of Tuscola fine sandy loam. Surface runoff is slow to medium. Generally, this soil has good tilth and is easy to cultivate.

Included in mapping were a small acreage of a nearly level Tuscola loam and a limited acreage of Tuscola silt loam that has slopes more than 6 percent.

The major limitation for field crops is a moderate hazard of erosion. For some nonfarm uses, slope is a limitation. (Capability unit IIe-2)

Vaughnsville Series

The Vaughnsville series consists of deep soils that are moderately well drained to somewhat poorly drained. These soils formed mostly in loamy beach ridge material, but the lower layers consist of weathered, finer-textured till or lacustrine sediments. They are typically gently sloping and are on northern exposures at the base of beach ridges within the lake plain.

A representative Vaughnsville soil has a dark-red loam plow layer. This reddish layer is a striking contrast with that in adjacent soils. The upper part of the subsoil, at depths between 8 and 16 inches, is reddish-brown sandy clay loam. Below this the subsoil is dark-brown clay loam that extends to a depth of 26 inches. The lower part of the subsoil, at depths between 26 and 29 inches, is dark grayish-brown sandy loam. It is transitional to the underlying glacial till material . The underlying till material is firm, calcareous, yellowish-brown and brown clay loam that extends to a depth of 60 inches.

Vaughnsville soils receive seepage from adjacent soils, such as Belmore and Haney soils. They are reddish as a result of the iron compounds that precipitate from the seepage water. They have moderate permeability above the underlying glacial till or lacustrine material and slow permeability in it. They have medium available moisture capacity and are slightly acid or neutral. Their rooting zone is moderately deep in most places.

Most areas of Vaughnsville soils are cultivated, but they are of minor importance to farming because of their limited extent.

Representative profile of Vaughnsville loam, 1 to 4 percent slopes, in the NE¼SE¼ sec. 16, T. 2 N., R. 10 E., Portage Township:

Ap—0 to 8 inches, dark-red (2.5YR 3/6) loam; moderate, medium and coarse, granular structure; friable; neutral; abrupt, wavy boundary.

B1t—8 to 16 inches, reddish-brown (5YR 5/4) sandy clay loam; few, medium, distinct, yellowish-red (5YR 4/6) mottles; weak, medium, subangular blocky structure; firm; thin, patchy, dark-brown (7.5YR 4/4) clay films; neutral; clear, wavy boundary.

B2t—16 to 26 inches, dark-brown (7.5YR 4/4) clay loam; many, medium, prominent, dark-red (2.5YR 3/6) mottles and few, fine, distinct, brown (7.5YR 5/2) mottles; weak, medium, subangular blocky structure; slightly firm; thin, patchy, dark-brown (7.5YR 4/2) clay films; neutral; clear, wavy boundary.

B3—26 to 29 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, fine, granular structure; friable; common shale fragments, igneous pebbles, and cobblestones; mildly alkaline; calcareous; gradual, wavy boundary.

IIC1—29 to 35 inches, yellowish-brown (10YR 5/4) clay loam; many, medium, distinct, gray (10YR 5/1) mottles; light-gray (10YR 7/2) lime coatings; massive; firm; moderately alkaline; calcareous; gradual, wavy boundary.

IIC2—35 to 42 inches, brown (10YR 5/3) clay loam; yellowish-brown (10YR 5/6) mottles; massive; firm; moderately alkaline; calcareous; gradual, wavy boundary.

IIC3—42 to 60 inches, brown (10YR 5/3) clay loam; yellowish-brown (10YR 5/6) mottles; light brownish-gray (10YR 6/2) coatings; massive; firm; moderately alkaline; calcareous.

The Ap horizon ranges from 1.5 to 3.5 percent in organic-matter content. It is dark red (2.5YR 3/6), red (10YR 4/6), or reddish brown (5Y 4/4) in color. The B horizon is dominantly slightly acid to neutral but ranges to mildly alkaline in the lower part. Igneous pebbles are on the surface, and pebbles or cobblestones commonly occur throughout the profile. In some places the B2 horizon has black (10YR 2/1) manganese or iron stains. Above the till, generally, is a horizon of sandy loam, loam, or sandy clay loam that is 5 percent to 25 percent, by volume, fine gravel and coarse sand and that varies in thickness. The depth to carbonates ranges from 20 inches to more than 30 inches. Depth to the underlying finer textured material is variable, ranging from 25 to 40 inches, but it is generally about 30 inches, depending on the position of the soil relative to the main beach ridge.

Vaughnsville soils are redder than the adjacent Belmore soils, Digby soils, Haney soils, and Rawson soils, but they have similar textures. Vaughnsville soils differ from the Belmore, Digby, and Haney soils in not being underlain by glacial till or lacustrine material. Depth to till is generally less where the Vaughnsville soils are associated with Digby soils than where they are associated with Belmore soils.

Vaughnsville loam, 1 to 4 percent slopes (VaB).—This soil is most commonly adjacent to Belmore soils on the north slope of the beach ridges. It occurs mostly as long, relatively narrow strips. Surface runoff is slow, and available moisture capacity is medium. If adequately drained, this soil generally has good tilth. Seep spots are common, but the seepage can be corrected by artificial drainage.

Included in mapping were a few areas of Digby loam.

The major limitation for farming is wetness. For many nonfarm uses, seasonal wetness, seepage, and slow permeability are limitations. (Capability unit IIw-3)

Formation and Classification of the Soils

This section discusses the factors of soil formation and the classification of the soils. The classification of soils by higher categories is shown in table 9.

Factors of Soil Formation

The characteristics of a soil at any given place depend upon the composition of the parent material; the topography, or the lay of the land; the plants and animals in and on the soil; the climate under which the developing soil formed; and time. These are the five factors of soil formation. Soils differ from place to place because of differences in one or more of the factors of soil formation.

Climate and living organisms are the active factors in soil formation. The vegetation and animal and microbial life in and on the soil, influenced by the climate, act upon the parent material and slowly change it to a distinctive natural body that can be recognized as a soil. Soils differ on a regional basis, largely because of differences of climate and vegetation.

The effect of climate and vegetation upon soil development is modified by the nature of the parent material and by the topography. The parent material and topography influence the kind of soil profile that is formed, and in some places they are the dominant factors of soil formation.

Finally, time is required before parent material can be transformed into soil material. It takes time for weathering, leaching, translocation of minerals, and other processes of soil formation to produce distinct horizons in a developing soil.

The differences among the soils of this county are chiefly the result of differences of parent material and topography. The factors of climate, vegetation, and time have strongly influenced the overall development of the soils, but these factors were nearly uniform throughout the county during the period of soil development, and few differences in the soils can be attributed to them.

TABLE 9.—*Soil series classified by higher categories*

Series	Current classification			Great soil group (1938 classification)
	Family	Subgroup	Order	
Adrian	Sandy, euic, mesic	Terric Medisaprists	Histosols	Bog soils.
Belmore	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Blount	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Celina [1]	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Colwood [1]	Fine-loamy, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols	Humic Gley soils.
Crosby	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Digby	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Dunbridge	Fine-loamy, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Eel [1]	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols	Alluvial soils.
Fulton	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols	Alluvial soils.
Granby	Sandy, mixed, mesic	Typic Haplaquolls	Mollisols	Humic Gley soils.
Haney	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Haskins	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Hoytville	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Joliet	Loamy, mixed, noncalcareous, mesic.	Lithic Haplaquolls	Mollisols	Humic Gley soils.
Kibbie [1]	Fine-loamy, mixed, mesic	Aquollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Lenawee [1]	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Linwood	Loamy, euic, mesic	Terric Medisaprists	Histosols	Bog soils.
Mermill	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Millgrove	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Millsdale	Fine, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols	Humic Gley soils.
Milton	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Morley [1]	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Nappanee	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Ottokee	Mixed, mesic	Alfic Udipsamments	Entisols	Gray-Brown Podzolic soils.
Pewamo	Fine, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols	Humic Gley soils.
Randolph	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Rawson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Rimer	Loamy, mixed, mesic	Aeric Arenic Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Ritchey	Loamy, mixed, mesic	Lithic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Romeo [1]	Loamy, mixed, noncalcareous, mesic.	Lithic Haplaquolls	Mollisols	Rendzina soils.
Seward	Loamy, mixed, mesic	Arenic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Shinrock	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Shoals	Fine-loamy, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols	Alluvial soils.
Sloan	Fine-loamy, mixed, noncalcareous, mesic.	Fluvaquentic Haplaquolls	Mollisols	Alluvial soils.
Toledo	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Tuscola	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Vaughnsville	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.

[1] In this county these soils are taxadjuncts to the series for which they are named:
- *Celina soils* have grayish mottles that are generally at a greater depth than the defined range for the series.
- *Colwood soils* have a darker colored, generally sandier B horizon than the defined range for the series.
- *Eel soils* differ from the defined range for the series by lacking 2-chroma mottles within 24 inches of the surface.
- *Kibbie soils* have a coarser texture than the defined range for the series.
- *Lenawee soils* have a thicker solum than the defined range for the series and a Btg horizon instead of a Bg horizon.
- *Morley soils* differ from the defined range for the series in having low-chroma mottles in the upper 10 inches of the Bt horizon.
- *Romeo soils* are better drained than the defined range for the series; they are considered well drained and show little or on evidence of wetness.

Parent material

The parent material in which the soils of this county formed is largely of glacial origin (fig. 2). The county was covered by continental glaciers during several stages of the Pleistocene epoch. The present surficial material in the county is of the Wisconsin age. Before glaciation took place, the area that is now Hancock County was probably a nearly level plain, and limestone bedrock was near the surface. Now this bedrock is covered to variable depths with glacial till or glacial outwash.

The parent material of soils in the northern part of the county was affected by glacial lakes. The glacial till in this area is finer textured than elsewhere, and the surface has been leveled and modified by wave action. The nearly level Hoytville soils are dominant in this part of the county. These glacial lakes formed beach ridges against the north side of the Definance end moraine, which crosses the north-central part of the county in an east-west direction. Belmore, Haney, and Digby soils have formed on these ridges. The soils on the Defiance end moraine are dominantly Blount, Morley, and Pewamo soils. They formed in clay loam glacial till having a high content of carbonates.

The parent material in the central part of the county is an outwash area between the Defiance end moraine and Fort Wayne ground moraine. The soils here grade from coarser textured to finer textured as the distance increases from the eastern boundary of the county toward the western boundary. This grading was apparently the result of the sorting action of water. Tuscola, Kibbie, and Colwood soils are common in the eastern part of this area and Lenawee soil is common in the western part.

In the southern half of the county, the soils formed in ground moraine. The soils are dominantly Blount and Pewamo soils.

A till-smeared limestone bedrock area is in Biglick Township in the east-central part of the county. The dominant soils in this area are those of the Ritchey, Millsdale, and Milton series. A bog or swamp area lies at the base of this bedrock area. The dominant soils here are Linwood muck and Adrian muck.

Topography

Topography has affected the formation of soils in this county, chiefly through its effect on the action of water on or in the soil. The degree of profile development in a soil within a given time, in a given parent material, and under the same type of vegetation, depends largely on the amount of water that passes through the soil material. For example, runoff in the steeper areas removes the surface soil and precludes the formation of a deep soil. Topography controls and modifies the active factors of soil formation through its control of runoff, erosion, depth of water table, internal drainage, leaching, and accumulation and removal of organic matter. A large amount of organic matter in the very poorly drained soils is mainly a result of topographic position. These soils remain wet for long periods, and more organic matter accumulates.

In general, the topography in this county ranges from nearly level on the lake plain and on parts of the till plain to undulating in the morainic areas. There are some moderately steep areas on the moraines and along stream escarpments. These steeper soils generally have a thinner solum than soils in the same areas that are less sloping.

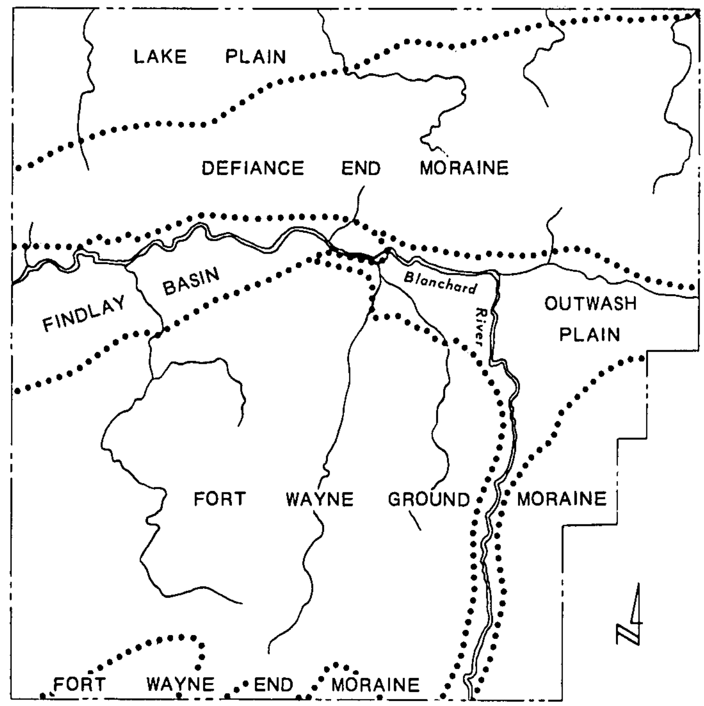

Figure 2.—**Topographic features.**

Plants and animals

The retreat of the Wisconsin glacier was followed by the reestablishment of vegetation in Hancock County. Spruce or spruce-fir forests grew quickly in the wake of the retreating ice front. This quick growth is indicated by evidence that there was no tundra (*5*). Approximately 8,500 years ago, the spruce and fir forests disappeared because of the wetter environment and were succeeded by a broad-leaved, mixed swamp-forest association as the climate ameliorated and became similar to the climate of the present.

The virgin vegetation of the Lake Basin was an aquatic community of marsh and wet prairie associations (*12*). On the flood plains it was characterized by alder, willow, and poplar that are associated stream valley bogs. Elm, black ash, and soft maple were the members of the virgin forests.

In the better drained, more sloping areas, the soils supported deciduous forest of such species as beech, basswood, white oak, red oak, and sugar maple. These species were dominant in the original stand.

Soils that formed under tree species, such as those mentioned, commonly have light-colored, acid surface layers. Among such soils are Belmore, Haney, Blount, and Morley soils, which are subject to leaching.

Less is known of the effect of micro-organisms, earthworms, and animals living in and on a soil than about the effects of vegetation on the development of soils. These organisms probably have as much influence on soil composition and supply of organic matter as vegetation. The calculated weight of earthworms, fungi, microbes, and animals can amount to hundreds of pounds per acre.

Man directly influences the development of large areas of soils by such practices as cultivating, fertilizing, draining, and irrigating.

Climate

The climate under which the soil material has accumulated and existed since deposition is an active factor in soil formation. It influences the kind of vegetation that grows, the rate of plant growth, the amount of water available to plants, the removal of material by leaching, and the temperature of the soils. This county has a temperate, humid, continental climate that through the years has been favorable to the growth of trees.

Climatic factors that are important in soil formation are precipitation, temperature, and the evapotranspiration ratio. In an area the size of this county, the climate is fairly uniform and has had little direct effect upon the variations among the soils of the county. Soil differences within a local area are determined more by differences in vegetation, parent material, relief and drainage, and the age of the soil material, than by differences in climate. On a regional basis the climatic factors are interrelated with the kinds of vegetation and determine the kinds of soil that develop. The leaching effect can be demonstrated in many of the soils in this county by the fact that calcium carbonate has been largely removed in the upper 2 feet of soil. Water moving through the soils has resulted in clay films accumulating in the subsoil of Haney, Morley, Hoytville, and other soils.

Time

The length of time required for the formation of horizons in a soil depends upon the other soil formation factors, particularly upon relief and parent material. Differences in weathering and development of soils cannot be correlated exactly with age in this county, because other soil formation factors affect or modify the rate of weathering and other processes.

The age of soils on the lake plain in the northern part of the county is believed to be about 13,000 years and that of soils on the till plain is about 15,000 years. The soils in this county have been in the process of development a relatively short time compared to those in other areas. This accounts, in part, for the shallowness of leaching, and also for the slight acidity or neutral reaction in many of the soils.

Classification of the Soils

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 *(3)* and later revised *(17)*. The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March 1967 *(19)*. This system is under continual study, and readers interested in the development of the system should refer to the latest literature available. Table 9 shows the classification of each soil series of Hancock County by family, subgroup, and order, according to the current system. It also shows the great soil group of the 1938 system.

The current system of classification defines classes in terms of observable or measurable properties of soils *(14)*. It has six categories. Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. The placement of some soil series, particularly in families, may change as more precise information becomes available. Some soils in this county do not fit a series that has been recognized, but recognizing a separate series for them would not serve a useful purpose. These soils have been placed in a series that they strongly resemble and from which they differ only in ways that do not significantly affect their usefulness or behavior. They are called taxadjuncts to the series for which they are named.

Following are brief descriptions of the six categories in the current system.

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: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic grouping of soils. Two exceptions, Entisols and Histosols, are in many different climates. The Entisols, Inceptisols, Mollisols, Alfisols, and Histosols are represented in Hancock County.

Entisols are recent soils in which there has been little, if any, horizon development. Inceptisols are on young land surfaces. Mollisols have a thick, dark-colored surface layer, moderate to strong structure, and a base saturation of more than 50 percent. Alfisols have a clay-enriched B horizon and a base saturation of more than 35 percent. Histosols have a high organic-matter content. They developed from plant remains and some mineral matter in water.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The soil properties used are mainly those that reflect either the presence or absence of waterlogging or differences in climate or vegetation. The climatic range of the suborders is narrower than that of the orders.

GREAT GROUP.—Each suborder is divided into great groups on the basis of uniformity in the kinds and sequence of major horizons and soil features. The horizons considered are those in which clay, iron, or humus has accumulated and those that have pans that interfere with the growth of roots or the movement of water. Some of the features considered are the self-mulching properties of clays, soil temperature, and chemical composition (mainly calcium, magnesium, sodium, and potassium).

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) segment of the group, and other groups, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order.

FAMILY.—Families are established within a subgroup primarily on the basis of properties that affect the growth of plants or the behavior of soils when used for engineering purposes. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement of the profile.

Laboratory Data

Laboratory data are given in table 10 for three soil series in Hancock County. These data were obtained by laboratory analysis at Ohio State University, Columbus, Ohio. The profiles of all these soils are described in the section "Descriptions of the Soils." In addition to these data, there are mechanical analysis data available for the following Hancock County soil series: Blount, Pewamo, Morley, Vaughnsville, Haskins, Nappanee, Milton, Celina, Lenawee, Joliet, Ritchey, Randolph, and Millsdale. These mechanical analysis data are on file in Columbus, Ohio, at the Agronomy Department, Ohio Agricultural Research and Development Center, Ohio Department of Natural Resources, Division of Lands and Soil, and the Soil Conservation Service State Office.

In addition, the published Wood County, Ohio, Soil Survey *(21)* contains recent data for Colwood, Digby, Eel, Fulton, Haney, Haskins, Hoytville, Kibbie, Mermill, Milton, Nappanee, and Toledo soils. The published Allen County, Ohio, Soil Survey *(20)* contains laboratory data for Belmont, Blount, Digby, Genesee, Haskins, Hoytville, Kibbie, Lenawee, Linwood, Millgrove, Morley, Pewamo, Rawson, and Seward soils.

The data for these soils in adjoining counties are applicable to these same soils in Hancock County.

The following paragraph indicates the procedures used to obtain the data shown in table 10.

Particle-size distribution was obtained by the pipette method *(15)*, except sodium hexametaphosphate was used for dispersion and a 10-gram soil sample was used for analysis. The organic-matter content was determined by the wet-oxidation procedures *(10)*. Exchangeable calcium and magnesium were determined by the EDTA method *(6)*. Potassium was determined by flame photometry. Exchangeable hydrogen (which also includes titratable aluminum was determined by the triethanolamine method *(10)*. Cation exchange capacities were obtained by summation of exchangeable cations. Calcium carbonate equivalent was determined titrimetrically by the procedure of Hutchison and MacLennan *(11)*. All pH measurements were made by using a 1:1 soil-water ratio.

Additional Facts About the County

Hancock County was created by an Act of the General Assembly in 1820 along with 14 other counties and became an organized political subdivision in 1828 *(9)*.

Hancock County is a farming and industrial community. The county is sixth in farm income in the State, and the income is derived equally from livestock and crops.

According to the U. S. Census of Agriculture, 92 percent of the land in the county was in farm use in 1964. Of the 340,480 acres in the county, 314,365 are used for farming. Each year 234,814 acres of crops are harvested. The average farm is 177 acres in size.

There are 1,777 farm operators in the county. About 21 percent of the farm operators are tenants and about 79 percent are full or part owners of farms. About 19 percent of the farmers in Hancock County work off the farm 100 days or more a year, which is much below the State average.

Twenty percent of the agricultural income in Hancock County was derived from sale of soybeans, 14 percent from corn, 16 percent from hogs, 11 percent from cattle, 11 percent from wheat, 9 percent from dairy, 7 percent from poultry, 3 percent from vegetables, and 9 percent from other farm enterprises.

The following trends in livestock and crop production indicate changes taking place in farming in Hancock County.

Crop:	*Acres in 1962*	*Acres in 1964*
Corn	73, 100	85, 291
Wheat	37, 000	40, 883
Oats	17, 000	10, 638
Soybeans	71, 100	62, 292
Hay	28, 700	22, 408

Livestock:	*Number in 1962*	*Number in 1964*
All cattle	31, 500	25, 525
Milk cows and heifers	6, 800	4, 468
Sheep and lambs	20, 100	21, 197
Hogs	64, 200	51, 158
Chickens	248, 000	192, 147

Crop:	*Average yield per acre in 1962*	*Average yield per acre in 1964*
Corn, bushels	78. 0	84. 0
Wheat, bushels	32. 0	40. 0
Oats, bushels	66. 0	78. 0
Soybeans, bushels	26. 0	26. 5
Hay, tons	1. 65	2. 1

Industrial development and manufactured products have increased greatly in the county since 1950, the greatest increase taking place in the city of Findlay. Approximately 80 major industrial manufacturing companies are in the county, and they employ more than 13,000 persons. The industries include the manufacture of rubber and rubber products, electronic equipment, earth-moving machinery, wire and wire products, and film processing. A large oil company has its home office and international headquarters in Findlay. A large quarry supplying crushed limestone is operated near the city limits of Findlay. Though some of the industries have shown fluctuations in their operations, the total figures for the county show continuous growth.

North- and south-bound traffic through the county is served by Interstate Route 75, U. S. Route 68, and U. S. Route 23. East- and west-bound traffic is served by U. S. Route 224 and U. S. Route 30N. Transportation is also provided by several good State routes, an excellent county highway system, the main lines of three railroads, and buses to destinations in any direction. Southwest of Findlay is a modern airport designed for day and night

TABLE 10.—*Physical and*

[Analysis is made by the Ohio State University, Columbus,

Soil and sample number	Depth from surface	Particle-size distribution					
		Very coarse sand (1 to 2 mm.)	Coarse sand (0.5 to 1.0 mm.)	Medium sand (0.25 to 0.5 mm.)	Fine sand (0.1 to 0.25 mm.)	Very fine sand (0.05 to 0.1 mm.)	Total sand (0.05 to 2 mm.)
	In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Millsdale silty clay loam, HK-40, sec. 7, Jackson Township.	0-9	0. 5	1. 6	2. 4	10. 5	11. 0	26. 0
	9-16	1. 0	2. 0	2. 2	9. 6	10. 0	24. 8
	16-23	. 7	1. 7	2. 2	9. 9	9. 4	23. 9
	23-29	. 8	2. 5	3. 0	12. 5	10. 3	29. 1
Randolph silt loam, HK-39, sec. 27, Liberty Township.	0-8	1. 7	4. 3	4. 3	11. 6	9. 0	30. 9
	8-16	. 9	3. 3	4. 0	11. 9	10. 0	30. 1
	16-22	1. 1	2. 6	3. 0	8. 3	8. 1	23. 1
	22-27	1. 3	2. 3	2. 8	8. 1	8. 1	22. 6
Rimer loamy fine sand, HK-35, sec. 33, Union Township.	0-12	1. 1	7. 0	11. 0	43. 4	13. 9	76. 4
	12-14	. 5	5. 6	11. 6	44. 2	13. 7	75. 6
	14-22	. 6	7. 3	11. 7	49. 0	14. 9	82. 5
	22-26	. 3	6. 4	9. 7	40. 1	14. 3	70. 3
	26-34	1. 1	3. 3	5. 2	17. 6	7. 8	35. 0
	34-38	1. 8	4. 0	3. 2	8. 9	7. 7	25. 6
	38-46	2. 3	3. 5	2. 5	6. 4	6. 1	20. 8

operation and capable of handling most twin-engined aircraft on its two hard-surface runways.

Geology [3]

Hancock County is within the southern limits of the Great Lakes till plain *(7)*. It has low to moderate relief, and nearly level or gently undulating topography is most prevalent. The steeper areas associated with rolling topography generally occur in isolated areas along the principal drainageways, the south-facing front of the Defiance end moraine, and the flanks of relic gravel beach ridges *(8)*. Elevation ranges from 720 feet in extreme northwestern part of Pleasant Township to 960 feet southwest of Williamstown in Madison Township.

The county is drained by two rivers. The central and southern parts of the county are drained by the Blanchard River and its tributaries, and part of the headwaters of the Portage River drain the northern border area of the county.

The soils of the county formed from till, lacustrine-modified till, outwash sand and gravel associated with Wisconsin Glaciation, and from recent alluvium.

The till of the Defiance end moraine is between 52 and 102 feet thick; the average thickness is approximately 80 feet *(4)*. The till of the Fort Wayne ground moraine is generally between 5 and 60 feet thick; the average thickness is approximately 25 feet *(4)*, but there are many places along the valleys in the Fort Wayne ground moraine where the till is less than 4 feet thick over the bedrock.

The underlying bedrock consists of calcareous sedimentary rocks of two groups of Paleozoic age. Both of these groups of rocks, the Niagara and the Bass Islands, are dolomitic *(16)*. The Niagara group, occurring over most of the eastern half of the county, is a part of the Silurian system. The Bass Islands group of the Silurian and Devonian systems occupies the western half of the county.

Climate [4]

The climate of any given area, such as Hancock County, is determined by the interaction of several factors. Among these factors are location within the continent, particularly in relation to large bodies of water and mountain ranges; the influences of topographic features in the area; and the small-scale influences peculiar to the area. The climate of Hancock County may be classified roughly as continental. A continental climate is characterized by a wide range between summer temperatures and winter temperatures and by moderate amounts of precipitation, the larger part of which falls during the warm season. Hancock County has a slightly cooler and drier climate than the average for the State because it is almost entirely in the northwestern part of the State and too far from Lake Erie to benefit from its moderating effect.

Table 11 shows temperature and precipitation data based on records kept at Findlay, and table 12 shows the probability of freezing temperatures after specified dates in spring and before specified dates in fall. These data are considered representative of Hancock County as a whole, but there may be small differences caused by local topography.

The average annual temperature in Hancock County is about 1.5° lower than the average for Ohio. This dif-

[3] JAMES R. BAUDER. SOIL PARENT MATERIAL OF THE MORLEY-BLOUNT SOILS OF HANCOCK COUNTY AND THEIR RELATIONSHIP TO GLACIAL FEATURES. Master of Science Thesis, Ohio State University, 1964.

[4] By L. T. PIERCE, climatologist for Ohio, National Weather Service, U.S. Department of Commerce.

chemical data for selected soils

Ohio. Dashes indicate that no determination was made]

Particle-size distribution—Continued			pH 1:1 (H_2O)	Organic matter	$CaCO_3$ equivalent	Extractable cations (meq. per 100 g.)						Base saturation
Silt (0.002 to 0.05 mm.)	Clay (<0.002 mm.)	Fine clay (<0.0002 mm.)				H	Ca	Mg	K	Sum of extractable cations	Sum of bases	
Pct.	*Pct.*	*Pct.*		*Pct.*	*Pct.*							*Pct.*
38.0	36.0	17.8	6.9	7.5	----------	6.8	20.8	8.4	0.42	36.4	29.6	81
30.6	44.6	23.9	7.0	3.7	----------	6.4	20.5	9.6	.26	36.8	30.4	83
35.3	40.8	22.0	7.3	2.3	----------	4.9	18.3	9.4	.46	33.1	28.2	85
33.8	37.1	20.0	7.3	1.9	1.0	------	------	------	------	----------	--------	--------
48.6	20.5	7.5	5.4	3.0	----------	8.3	5.8	2.4	.20	16.7	8.4	50
43.8	26.1	8.2	4.2	.7	----------	9.1	3.7	3.0	.15	16.0	6.9	43
37.1	39.8	19.0	6.6	.8	----------	3.9	13.5	10.8	.28	28.5	24.6	86
41.0	36.4	16.8	7.1	----------	.7	------	------	------	------	----------	--------	--------
18.0	5.6	.2	4.8	1.3	----------	5.5	1.3	.5	.05	7.4	1.9	26
18.5	5.9	.5	5.5	.4	----------	3.9	1.5	.4	.08	5.9	2.0	34
11.2	6.3	1.1	5.8	.3	----------	2.8	1.7	.7	.05	5.3	2.5	47
11.2	18.0	9.6	6.3	.3	----------	3.4	6.0	2.8	.15	12.4	9.0	73
31.6	33.4	12.4	7.0	----------	----------	3.0	6.0	6.2	.20	15.4	12.4	81
44.3	30.1	7.3	7.9	----------	13.9	------	------	------	------	----------	--------	--------
45.0	34.2	8.7	7.8	----------	19.8	------	------	------	------	----------	--------	--------

ference is brought about by higher latitude and is most noticeable in winter. In January and February, for example, the average temperature is 2.5 degrees cooler than the average for the State, but in summer the difference is only 0.5°. Compared with counties farther east and south, Hancock County more frequently lies within the cold sector of the many winter storms that cross the State from west to east, or travel up the Ohio Valley. Summer storms travel a more northerly route. On an average of 22 days in summer, the temperature reaches or exceeds 90° F.

Topography has a greater influence on precipitation than it does on temperature. Where moisture-bearing winds are forced to rise over hills and mountains, the amount of precipitation increases with increased elevation on windward slopes. In Hancock County there are no marked topographic features over which the wind must rise; consequently, the distribution of precipitation is quite uniform. The annual precipitation is 35.5 inches. Seventeen inches of this is rainfall that occurs from May through September. These amounts of precipitation are about average for the State, but they are about 2 inches more than the precipitation in areas around the western end of Lake Erie. On the average there are 13 days in July and August that have rainfall of 0.1 inch or more. Measurable precipitation occurs on about 135 days a year; 55 of these days are in May through September. Measurable snow falls on an average of about 16 days in winter.

At a given location, thunderstorms occur about 35 times a year, and on rare occasions they are accompanied by tornadoes. The exact frequency of tornadoes in Hancock County is not known, but it is estimated that a tornado occurs every 4 to 5 years. These tornadoes are generally less destructive than those occuring in areas farther west.

Relative humidity rises and falls daily. In summer and winter, the average high early in the morning is about 85 percent and the average low during the afternoon ranges from 70 percent in winter to 50 percent in summer. In fair, dry summer weather, the lowest relative humidity is reached about 3 p.m. and generally is in the 30 percent range, but sometimes it is as low as 28 percent. In a normal year there are 101 clear days, 114 partly cloudy days, and 150 cloudy days. Clear days are more numerous in September and October, and cloudy days are more numerous in December and January.

During the cold season, the moisture content of the soil is gradually replenished because the amount of moisture received as precipitation is greater than the amount lost through evaporation. By the end of March, not only is the moisture content at or above field capacity, but ground-water reserves have also been built up. From then on through the growing season, the level of soil moisture depends on the balance between the amount of moisture received as rainfall and that lost through evaporation and transpiration. In April and May small grains, meadow, and pastures need rapidly increasing amounts of water, and in the drier spring seasons the available moisture may be almost used up by the end of June. In contrast, spring-planted row crops need only a small amount of water until late in June, when they start their period of rapid growth. Their moisture needs reach a maximum in July and August when there is progressive drying of all soils because rainfall is almost always insufficient to meet the moisture needs. By the end of the growing season in late September or early October the soil moisture available to plants is at a minimum.

Although meager, current information about soil temperature is of considerable significance in farming. Soil temperatures go through a seasonal cycle in which the

TABLE 11.—*Temperature and precipitation data*

[All data from Findlay; elevation 767 feet]

Month	Temperature				Precipitation				Measurable snow on ground [2]	
	Average daily maximum [1]	Average daily minimum [1]	Two years in 10 will have at least 4 days with [2]—		Average total [1]	One year in 10 will have [2]—		Average snowfall [3]	Number of days	Average depth
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—			
	°F.	°F.	°F.	°F.	In.	In.	In.	In.		In.
January	36. 2	19. 3	53. 1	−0. 9	2. 42	0. 91	5. 85	5. 8	12. 6	2. 4
February	37. 8	19. 8	53. 2	1. 2	2. 11	. 79	4. 40	4. 4	9. 3	2. 2
March	46. 9	26. 5	66. 9	11. 4	3. 13	1. 45	4. 68	4. 8	3. 9	3. 1
April	59. 9	36. 9	78. 8	25. 5	3. 38	1. 60	5. 40	. 9	(4)	2. 4
May	72. 0	47. 3	84. 9	34. 9	3. 72	1. 56	5. 67	(5)	----------	----------
June	82. 2	57. 6	92. 1	45. 7	4. 20	1. 81	7. 20	0	----------	----------
July	86. 6	61. 2	93. 3	50. 4	3. 57	1. 09	5. 83	0	----------	----------
August	85. 2	59. 4	93. 5	47. 9	2. 86	1. 49	5. 03	0	----------	----------
September	78. 0	52. 0	91. 3	37. 7	2. 75	. 97	5. 38	0	----------	----------
October	66. 0	41. 4	82. 7	27. 8	2. 68	. 80	5. 32	(5)	----------	----------
November	49. 7	30. 9	67. 8	15. 7	2. 45	. 95	4. 48	2. 9	1. 6	3. 1
December	37. 9	22. 1	56. 9	−. 2	2. 15	. 89	3. 84	5. 3	11. 0	2. 7
Year	61. 5	39. 5	----------	----------	35. 42	28. 47	43. 41	24. 1	38. 4	2. 7

[1] Period of record: 1931–1960.
[2] Period of record: 1945–1964.
[3] Period of record: 1949–1960.
[4] Less than 1 day.
[5] Trace.

TABLE 12.—*Probability of freezing temperatures in spring and fall*

[Based on records kept at Findlay]

Probability	Dates for given probability and temperature					
	16°F. or lower	20°F. or lower	24°F. or lower	28°F. or lower	32°F. or lower	36°F. or lower
Spring:						
1 year in 10 later than	March 28	April 8	April 21	May 6	May 20	June 2
2 years in 10 later than	March 22	April 2	April 15	April 30	May 14	May 27
5 years in 10 later than	March 11	March 21	April 4	April 19	May 3	May 16
Fall:						
1 year in 10 earlier than	November 15	November 3	October 22	October 9	September 26	September 14
2 years in 10 earlier than	November 20	November 9	October 28	October 14	October 1	September 19
5 years in 10 earlier than	November 30	November 19	November 7	October 24	October 11	September 29

amplitude decreases rapidly with increasing depth. Consequently, the topsoil is colder than the subsoil in winter and warmer than the subsoil in summer. There is also a greater lag, with increasing depth of soil, in the amount of time required to reach both seasonal and daily extremes of soil temperature. For example, at the surface the soil reaches maximum temperature just after noon, but the soil material at a depth of 4 inches does not reach maximum temperature until 6 p.m. Similarly, at a depth of 5 feet the coldest temperatures are usually reached in March and the warmest in late September.

Soil temperature is profoundly affected by the nature and extent of the surface cover, including mulch. If the soil is protected by a cover of snow, heavy sod, or debris, the topsoil temperature seldom falls much below 25° F., even in below-zero weather. If the soil is not protected, the temperature is lower, and freezing can be expected to greater depth. Frost does not ordinarily penetrate to a depth of more than 10 to 15 inches, but under extreme conditions, it can penetrate to a depth of 3 feet. During periods of unseasonably warm weather in February and March, the air temperature rises rapidly enough to thaw the soil completely in 10 days to 2 weeks, even if the ground is frozen to a depth of 2 feet. As the weather warms up in spring the uppermost 4 inches of the soil is about the same temperature as the air. Consequently, air temperature can be used as an indication of soil temperature in the seedbed. On bright days the soil surface is heated to a much higher temperature than the air, not uncommonly to 120° in summer, but the excess temperature is confined to the uppermost inch or less and is transmitted downward slowly.

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Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

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 that 40 percent silt.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

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

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

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

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

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

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

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

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

Loess. A fine-grained eolian deposit consisting dominantly of silt-sized particles.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common, and many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark in color.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, value of 6, and a chroma of 4.

Parent material. The disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

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

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction. 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

Relief. The elevations or inequalities of a land surface, considered collectively.

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

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

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

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

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 principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

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

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. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

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 proportions 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."

Tile drain. Concrete or pottery pipe placed at suitable spacings and depths in the soil or subsoil to provide water outlets from the soil.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

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