# SOIL SURVEY

# Wood County Ohio

Surveyed by
Ohio Department of Natural Resources
Ohio Agricultural Experiment Station
United States Department of Agriculture

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In Cooperation with
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Lands and Soil
and
OHIO AGRICULTURAL EXPERIMENT STATION

Issued December 1966

Major fieldwork for this soil survey was done in the period 1954-59. Soil names and descriptions were approved in 1963. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1959-63. Soil mapping was done by the Division of Lands and Soil, Ohio Department of Natural Resources, in cooperation with the Soil Conservation Service and the Ohio Agricultural Experiment Station, as part of the technical assistance furnished to the Wood County Conservation District.

# HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Wood County will serve several groups of readers. It will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; add to soil scientists' knowledge of soils; and help prospective buyers, and others in appraising a farm or other tract.

## Locating the Soils

At the back of this report is an index map and a soil map consisting of many sheets. On the index map are rectangles numbered to correspond to sheets of the soil map so that the sheet showing any area can be located easily. On each map sheet, the soil boundaries are outlined and there is a symbol for each kind of soil. 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 it belongs.

## Finding and Using Information

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

Individual colored maps showing the relative suitability or limitations of soils for specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. 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 in the soil descriptions and in the discussions of the interpretative groupings.

*Game managers, sportsmen, and others concerned with wildlife* will find information about soils and wildlife in the subsection "Wildlife."

*Community planners and others concerned with suburban development* can learn about soil characteristics that affect choice of homesites, industrial sites, schools, and parks in the sections "Soils and Rural-Urban Developments" and "Use of the Soils for Recreation."

*Engineers and builders* will find in the subsection "Engineering Uses of the Soils" tables that give engineering descriptions of the soils in the county; that name soil features affecting engineering practices and structures; and that rate the soils according to their suitability for several kinds of work.

*Scientists and others who are interested* can read about how the soils were formed and how they were classified in the section "Genesis, Classification, and Morphology of the Soils."

*Students, teachers, and other users* will find information about soils and their management in various parts of the report.

*Newcomers in Wood County* will be especially interested in the section "General Soil Areas," 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: 1966

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# Contents



NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued December 1966

## EXPLANATION

### Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

- Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
- Series 1958, No. 34, Grand Traverse County, Mich.
- Series 1959, No. 42, Judith Basin Area, Mont.
- Series 1960, No. 31, Elbert County, Colo. (Eastern part)
- Series 1961, No. 42, Camden County, N.J.
- Series 1962, No. 13, Chicot County, Ark.
- Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

# SOIL SURVEY OF WOOD COUNTY, OHIO

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OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL, IN COOPERATION WITH UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, AND OHIO AGRICULTURAL EXPERIMENT STATION

WOOD COUNTY is in the northwestern part of Ohio (fig. 1). It has a total land area of approximately 618 square miles, or 395,520 acres. Bowling Green, the county seat, is located near the center of the county.

The county lies entirely within the area known as the Glacial Lake Plain. During the glacial period, ice sheets of both the Illinoian and Wisconsin age advanced and retreated over the area. As the ice sheet of the Wisconsin age retreated, a large lake formed. This lake leveled the till plain. Consequently, the county is now typified by level or nearly level expanses, broken only by sand ridges that formed during the glacial period, by high areas underlain by limestone, and by breaks along rivers and streams.

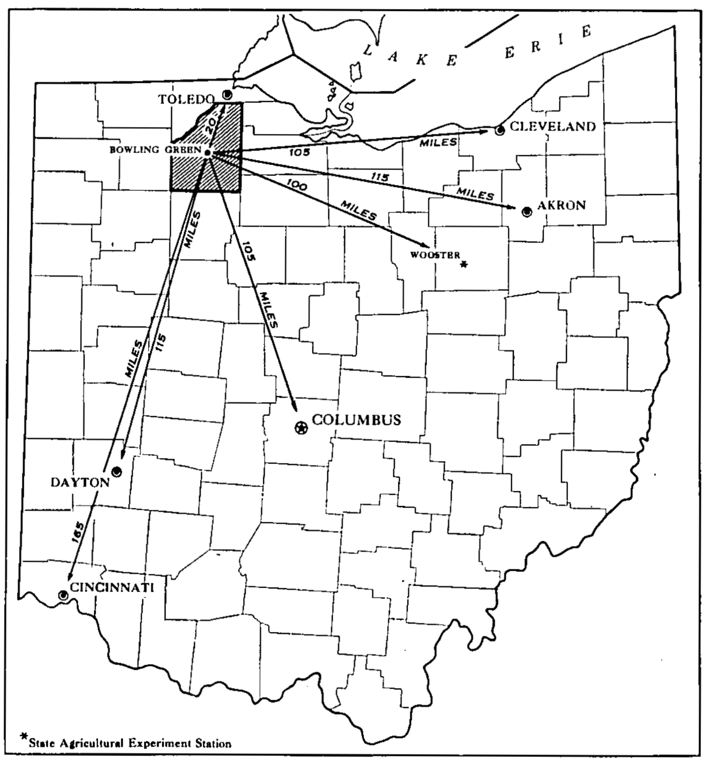


*Figure 1.*—**Location of Wood County in Ohio.**

## *How Soils Are Mapped and Classified*

Soil scientists made this survey to learn what kinds of soils are in Wood County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; 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 roots of plants.

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. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

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. Nappanee and Spinks, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Nappanee loam and Nappanee silty clay loam are two soil types in the Nappanee series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Spinks fine sand, 2 to 6 percent slopes, is one of several phases of Spinks fine sand, a soil type that ranges from gently sloping to moderately steep.

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 greatly help in drawing boundaries accurately. The detailed soil map in the back of this report 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 management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. 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 type or soil phase.

Occasionally, two or more recognized soils, which are not regularly associated geographically, may be mapped as a single unit, if their differences are not significant to the purpose of the survey or to soil management. Such a unit is called an undifferentiated mapping unit. A good example is the Dunbridge and Spinks loamy fine sands, over limestone. Also on most soil maps, areas are shown that are so rocky, so shallow, so frequently worked by wind and water, or so disturbed by man that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Made land and Borrow pits, and are called land types.

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 a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. On basis of the yield and practice tables and other data, the soil scientists set up trial groups, and test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists 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 Areas

After study of the soils in a locality and the way they are arranged, it is possible to make a general map that shows several main patterns of soils, called soil associations. The five soil associations in Wood County are shown on the colored general soil map at the back of this report. Each association, as a rule, contains a few major soils and several minor soils, in a pattern that is characteristic although not strictly uniform.

The soils within any one association are likely to differ from each other in some or in many properties; for example, slope, depth, stoniness, or natural drainage (fig. 2). Thus, the general soil map shows, not the kind of soil at any particular place, but patterns of soils, in each of which there are several different kinds of soil.

Each soil association is named for the major soil series in it, but, as already noted, soils of other series may also be present. The major soils of one association may also be present in another association, but in a different pattern.

The general soil map showing patterns of soils is useful to people who want a general idea of the soils, who want to compare different parts of a county, or who want to know the possible location of good-sized areas suitable for a certain kind of farming or other land use.[1]

The five soil associations in Wood County are discussed in the following paragraphs (*5, 14*).

## 1. Hoytville association

*Very poorly drained, dark-colored soils in fine-grained, gritty till on broad flats*

This association is a broad, flat, nearly treeless expanse of dark-colored soils and small, slightly higher areas of lighter colored soils. It covers about 80 percent of the county.

The nearly level, very poorly drained, dark-colored Hoytville soils make up about 80 percent of this association. These soils developed in glacial till. They are associated with the nearly level, very poorly drained, dark-colored Mermill soils, which developed in sandy material underlain by clay. Both soils are deep and are highly productive. Small areas of Nappanee, St. Clair, Digby, and Haskins soils also occur in this association.

The soils in this association are used primarily for cash crops. Grain is the principal crop, but some specialty crops are also grown.

Adequate drainage is the principal management need. Maintenance of good tilth is a problem on the Hoytville, Nappanee, and St. Clair soils. The sandy soils need additions of organic matter.

## 2. Toledo association

*Very poorly drained, dark-colored soils in fine-grained, highly sorted lake sediments on broad flats*

This association is a flat expanse of dark-gray soils and small, slightly higher areas of light-colored soils. It oc-

[1] The general soil map in this report is based on a published release by the Ohio Department of Natural Resources, Division of Lands and Soil (*16, 17, 18*).[2]

[2] Italic numbers in parentheses refer to Literature Cited, p. 95.

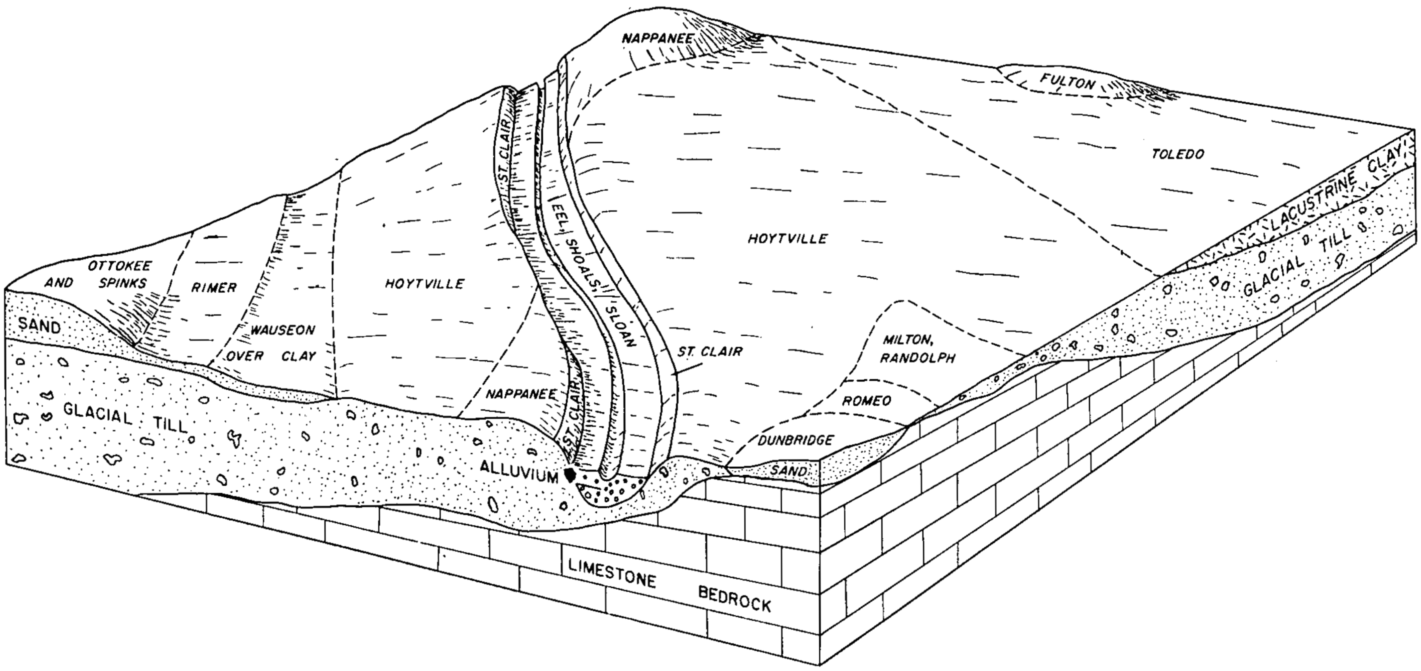


*Figure 2.*—**Relationship of some local soils to underlying material and relief.**

curs in the northern part of the county and makes up about 5 percent of the acreage.

About 80 percent of this association consists of the very poorly drained, dark-colored Toledo soils. These soils developed in lake-laid clay. They are deep and are highly productive. The somewhat poorly drained, light-colored Fulton soils occur as small, nearly level or gently sloping, slightly elevated areas. They also developed in lake-laid clay, but they are less productive and more difficult to drain than the Toledo soils, and they erode readily if cultivated.

The farms in this association are scattered among residential areas, commercial developments, and areas of idle land held for investment purposes. Grain is the principal cash crop, but specialty crops are also grown.

Adequate drainage is the principal management need. The maintenance of tilth is also important.

### 3. Belmore association

*Nearly level to gently sloping, well-drained to excessively drained, light-colored soils on elongated beach ridges*

This association is characterized by elongated ridges of sandy and gravelly soils on an otherwise flat landscape. It occurs in the southern part of the county and totals about 1 percent of the county.

About 95 percent of this association is occupied by the well-drained to excessively drained Belmore soils. The rest consists of small areas of the moderately well drained Haney soils and the somewhat poorly drained Digby soils. All of these soils are on narrow ridges, which are remnants of old lake beaches. They are underlain by material that contains a large amount of coarse sand and gravel. Their potential productivity is medium.

The soils in this association are high in content of sand and tend to be droughty. Thus, maintenance of the organic-matter content is important.

The ridges have good natural drainage, and the crests have been used as sites for roads and homes since the county was first settled. Truck and orchard crops are grown in addition to the other principal crops of the county.

### 4. Wauseon-Ottokee-Spinks association

*Nearly level, very poorly drained, dark-colored sandy soils and gently sloping, somewhat poorly drained, light-colored sandy soils*

This association is characterized by highly contrasting areas of rolling, light-colored sandy soils and nearly level, poorly drained, dark-colored soils. These soils formed in lake-laid sands. Most areas are scattered across the central part of the county, but there is a small area in the extreme northern part. This association covers about 12 percent of the county.

The soils in this association occur in complex patterns. The very poorly drained, dark-colored Wauseon soils, which occur in level or depressed areas, make up about 25 percent of the acreage; the well drained to moderately well drained, light-colored sandy Ottokee and Spinks soils make up about 25 percent; the somewhat poorly drained, light-colored Rimer and Tedrow soils, over clay, make up about 25 percent; and the Seward, Ottokee, and Colwood soils make up the rest. In places the Wauseon and Ottokee soils are underlain by clay. Potential productivity ranges from very high on the Wauseon and Colwood soils to low on the gently sloping Spinks soils.

The soils in this association are used primarily for cash grain crops. Spring grain generally is not grown on the light-colored soils, because of the hazard of wind erosion.

Most of these soils have low moisture-supplying capacity and are not highly productive, except during years of frequent rainfall. The dark-colored Colwood and Wauseon soils have higher moisture-supplying capacity than the other soils in this association and are more productive.

Adequate drainage is the principal management need, but the maintenance of the organic-matter content is also important. During long wet periods, there is a perched water table in most of these soils, mainly because of their shallowness to clay.

### 5. Millsdale-Randolph-Romeo association

*Gently sloping soils that are shallow to limestone*

This association consists of relatively small areas of shallow soils that are low in productivity and that are used principally for woods or pasture. These areas are scattered among larger areas of more productive soils in the eastern half of the county. The soils are well drained to very poorly drained and are underlain by limestone at a depth of 10 to 42 inches. There are numerous glacial stones and fragments of limestone on the surface. This association covers about 2 percent of the county.

The dark-colored, very poorly drained Millsdale soils make up about 20 percent of the association; the lighter colored, somewhat poorly drained Randolph soils about 20 percent; and the well-drained, moderately dark colored Romeo soils about 20 percent. The Milton, Joliet, Dunbridge, and Ritchey soils make up the rest. The Romeo soils are very shallow to bedrock.

Most of this association is used for pasture or woods. The deeper soils are used to grow cash grain crops, but crops are often damaged during periods of drought because of the low moisture-supplying capacity.

Shallowness to limestone is the most limiting factor in this association. Drainage is difficult because the soils are shallow.

# Use and Management of the Soils

This section has several main parts. First there is an explanation of the capability classification used by the Soil Conservation Service and a list showing the capability units in the county and the total acreage in each unit. Then the soils are grouped into capability units to show their relative suitability for agriculture. The next part consists mainly of a table showing the estimated yields of the principal crops grown in the county. This is followed by a discussion of the general management of the soils for specified crops, for irrigation, for pasture, and for woodland and wildlife. Finally, there is a discussion of the engineering properties of the soils and of the suitability of the soils for building sites and for recreation areas.

## Capability Groups of Soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated 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* means that water in or on the soil will interfere 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 country, indicates 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 or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils 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 identified by numbers assigned locally, for example, IIe-1 or IIIe-2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows:

Class I. Soils that have few limitations that restrict their use.

- Unit I-1. Deep, well drained or moderately well drained soils on flood plains.
- Unit I-2. Moderately well drained, level or nearly level loamy soils on beach ridges and gravelly outwash deposits.

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

- Subclass IIe. Soils subject to moderate erosion if they are not protected.
  - Unit IIe-1. Gently sloping, moderately well drained loamy soils.
- Subclass IIw. Soils that have moderate limitations because of excess water.

Unit IIw–1. Deep, somewhat poorly drained soils on flood plains.
Unit IIw–2. Level to gently sloping, somewhat poorly drained sandy soils.
Unit IIw–3. Level to gently sloping, somewhat poorly drained loamy soils on uplands.
Unit IIw–4. Level or nearly level, dark-colored, very poorly drained sandy soils.
Unit IIw–5. Level or nearly level, dark-colored, very poorly drained loamy soils.
Unit IIw–6. Level or nearly level, dark-colored, very poorly drained clayey soils.

Subclass IIs. Soils that have moderate limitations of moisture capacity or tilth.
Unit IIs–1. Level or nearly level, well-drained soils underlain by limestone.
Unit IIs–2. Nearly level or gently sloping, well drained or moderately well drained sandy soils.

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

Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.
Unit IIIe–1. Gently sloping, moderately deep, well-drained soils that are underlain by limestone.
Unit IIIe–2. Gently sloping, moderately well drained clayey soils.
Unit IIIe–3. Sloping to moderately steep, well-drained sandy soils.

Subclass IIIw. Soils that have severe limitations because of excess water.
Unit IIIw–1. Level or nearly level, dark-colored, very poorly drained soils on flood plains.
Unit IIIw–2. Level or nearly level soils that are underlain by limestone; on flood plains and uplands.
Unit IIIw–3. Gently sloping, somewhat poorly drained soils that have a clayey subsoil; on uplands.
Unit IIIw–4. Level or nearly level, dark-colored, very poorly drained clayey soils.
Unit IIIw–5. Level or nearly level, dark-colored, very poorly drained organic soils.

Subclass IIIs. Soils that have severe limitations of moisture capacity, tilth, or stoniness.
Unit IIIs–1. Nearly level or gently sloping, well-drained sandy soils underlain by limestone.
Unit IIIs–2. Nearly level or gently sloping, well drained or moderately well drained sandy soils.
Unit IIIs–3. Level to gently sloping, well-drained, shallow soils that are underlain by limestone.

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

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.
Unit IVe–1. Sloping, moderately well drained clayey soils.

Subclass IVw. Soils that have very severe limitations for cultivation, because of excess water.
Unit IVw–1. Level or nearly level, dark-colored, very poorly drained, shallow soils that are underlain by limestone.
Unit IVw–2. Level or nearly level, dark-colored, very poorly drained, highly organic loamy soils that are underlain by clay.

Class V. Soils not likely to erode that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture, woodland, or wildlife food and cover.

Subclass Vw. Soils too wet for cultivation; drainage or protection not feasible.
Unit Vw–1. Frequently overflowed soils on flood plains.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture, woodland, or wildlife food and cover.

Subclass VIe. Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.
Unit VIe–1. Moderately steep, moderately well drained clayey soils.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by their moisture capacity, stones, or other features.
Unit VIs–1. Very shallow soils or stony soils that are underlain by limestone.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIe. Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.
Unit VIIe–1. Steep, moderately well drained clayey soils.

Class VIII. Soils and landforms that, without major reclamation, have limitations that preclude their use for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes. (None in Wood County.)

The total acreage of Wood County, exclusive of made land and borrow pits, quarries, ponds, reservoirs, rivers, and urban areas, is about 367,000 acres. Only about 3,950 acres consists of class VI and class VII soils, which are steep and susceptible to erosion and, consequently, are not suited to cultivation. About 320,600 acres is made up of class II soils, and three-fourths of this acreage consists of Hoytville soils.

Wetness is the primary hazard on more than 96 percent of the total acreage of the county. Erosion is the primary hazard on about 3 percent of the acreage. Class I soils, which have few or no limitations that restrict their use, make up less than 1 percent. The following list shows the acreage in each of the capability units in the county.

| *Capability unit* | *Acreage* |
|---|---|
| I–1 | 3, 433 |
| I–2 | 395 |
| IIe–1 | 2, 963 |
| IIw–1 | 1, 244 |
| IIw–2 | 10, 640 |
| IIw–3 | 8, 281 |
| IIw–4 | 11, 123 |

| *Capability unit* | *Acreage* |
|---|---|
| IIw-5 | 38,788 |
| IIw-6 | 243,031 |
| IIs-1 | 1,078 |
| IIs-2 | 3,459 |
| IIIe-1 | 150 |
| IIIe-2 | 564 |
| IIIe-3 | 338 |
| IIIw-1 | 4,231 |
| IIIw-2 | 3,914 |
| IIIw-3 | 22,970 |
| IIIw-4 | 12,180 |
| IIIw-5 | 526 |
| IIIs-1 | 1,452 |
| IIIs-2 | 9,780 |
| IIIs-3 | 608 |
| IVe-1 | 344 |
| IVw-1 | 443 |
| IVw-2 | 244 |
| VIe-1 | 172 |
| VIs-1 | 3,409 |
| VIIe-1 | 364 |

## Management by Capability Units

Soils in one capability unit have about the same limitations and similar risks of damage. The soils in one unit, therefore, need about the same kind of management, though they may have formed from different kinds of parent material and in different ways. In the following pages the capability units are described, the soils in each group are listed, and management suitable for all the soils of one group is suggested.

### *Capability Unit I-1*

In this unit are deep, well drained or moderately well drained, light-colored soils on level or nearly level flood plains. The organic-matter content is medium, fertility is medium or high, permeability is moderate or moderately slow, and the moisture-supplying capacity is high. Flooding is a hazard, and surface water may collect in old stream channels and in scoured areas. The soils in this unit are—

Eel loam.
Eel silt loam.
Genesee loam.
Genesee silt loam.

Row crops can be grown continuously on these soils if management is good. Winter grain should not be grown in areas where winter floods are likely.

The maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Drainage generally is not needed. Shallow surface drains can be used to remove water that stands in low areas. Small, low areas can be eliminated by land smoothing. Diversion terraces along the base of slopes will divert runoff from higher areas.

Yields of forage crops are good, but these soils generally are not used for permanent pasture. Trees reproduce naturally if protected from fire and grazing. The planting of seedlings is seldom necessary.

Soils of this unit contain some areas that, 3 years or more out of 5, are flooded to such extent that yields are significantly reduced. These areas have the same limitations as soils in capability unit Vw-1.

### *Capability unit I-2*

This unit consists of moderately deep, moderately well drained, level or nearly level, light-colored soils on beach ridges and gravelly outwash deposits. In places, there is much gravel on the surface and in the soil material. The organic-matter content is medium, the capacity to store and release plant nutrients is medium, permeability is moderate, and the moisture-supplying capacity is medium. Erosion is not a hazard. The soils are—

Haney loam, 0 to 2 percent slopes.
Haney sandy loam, 0 to 2 percent slopes.

These soils are suited to all of the principal crops of the county. Small areas are used for truck crops. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain and a green-manure catch crop.

The maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Yields of legumes and grass are good, but these soils generally are not used for permanent pasture.

Trees of most species could be grown, but most of the acreage is used for crops.

### *Capability unit IIe-1*

In this unit are moderately deep, gently sloping, moderately well drained, light-colored soils on sandy or gravelly outwash deposits or adjacent to beach ridges. The organic-matter content is low or medium, capacity to store and release plant nutrients is low or medium, permeability is moderate or moderately rapid, and the moisture-supplying capacity is low or medium. The soils are—

Haney loam, 2 to 6 percent slopes.
Haney sandy loam, 2 to 6 percent slopes.
Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes.

The Seward soils are underlain at a depth of 18 to 36 inches by glacial till or lacustrine clay. The Haney soils, which are gravelly throughout, are also underlain by glacial till or lacustrine clay, but at a depth of more than 48 inches. If cultivated, the Seward and Ottokee soils are subject to wind erosion. All of these soils are droughty during long dry periods.

These soils are well suited to all of the principal crops in the county, but they are subject to both wind and water erosion. In most areas terracing and contour tillage are not feasible because the slopes are short and irregular. In these areas, a cropping system that includes a sod crop about a third of the time is needed to help control erosion. The hazard of erosion is especially severe if spring grain is grown.

The maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Although a perched water table may be present during long wet periods, drainage generally is not needed.

These soils are suited to permanent pasture but generally not used for this purpose.

Trees of most species are suitable, but most of the acreage is used for crops.

### *Capability unit IIw-1*

In this unit are deep, somewhat poorly drained, light-colored soils on level or nearly level flood plains. The organic-matter content is medium, the capacity to store and release plant nutrients is medium, permeability is slow or moderately slow, and the moisture-supplying capacity is high. Flooding is a hazard, and surface water may concentrate in old stream channels and in scoured areas. The soils in this unit are—

Shoals loam.
Shoals silt loam.
Shoals silty clay loam.

If management is good, row crops can be grown continuously in areas that are only occasionally flooded. Winter grain should not be grown in areas where winter floods are likely.

Tillage should be kept to the minimum necessary to provide satisfactory seedbeds, to control weeds, and to minimize crusting. The maintenance of good tilth is a problem on the silty clay loam. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains generally are needed to remove excess water. Water that stands in low areas can be removed by shallow surface drains. Small, low areas can be eliminated by land smoothing. Diversion terraces along the base of slopes will intercept runoff from higher areas.

Yields of forage crops are good, and much of the acreage is used for permanent pasture.

Trees reproduce naturally if protected from grazing and fire. The planting of seedlings is seldom necessary.

Soils of this unit contain some areas that, 3 years or more out of 5, are flooded to such extent that yields are significantly reduced. These areas have the same limitations as soils in capability unit Vw-1.

### *Capability unit IIw-2*

This unit consists of moderately deep or deep, level to gently sloping, somewhat poorly drained, light-colored soils on sandy deposits on the lake plain. These soils are underlain by glacial till or lacustrine clay at a depth of 18 to 48 inches or more. The organic-matter content is low, the capacity to store and release plant nutrients is low, permeability is moderately rapid, and the moisture-supplying capacity is medium. A perched or temporary high water table may be present during wet periods, and wind erosion is a hazard during long, dry periods. The soils in this unit are—

Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes.
Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes.
Tedrow loamy fine sand, 0 to 2 percent slopes.
Tedrow loamy fine sand, 2 to 6 percent slopes.

These soils are suited to the principal crops grown in the county. They can be used continuously for row crops. The preparation of seedbeds is difficult early in spring when the soils are wet. Consequently, spring grain is seldom grown.

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The maintenance of good tilth generally is not a problem if tillage is kept to the minimum required to provide satisfactory seedbeds and to control weeds. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests, but fertilization needs to be on a crop to crop basis because of the low capacity of these soils to store plant nutrients.

Tile drains are needed to remove excess water. The placements of tile is difficult in the Rimer and Tedrow soils, over clay, because of the range in depth to the underlying clay. Best results are obtained if the tile is placed just into the clay material. In the Tedrow soils the tile generally is placed in the sandy material (fig. 3).

Yields of forage crops are good on these soils, but mixtures should include deep-rooted legumes.

Most of the acreage is cleared. Trees of most species are suitable for planting.

*Figure 3.*—**Installation of tile drains in Tedrow loamy fine sand; fiberglass matting over tile helps to keep sand from seeping into tile line at joints.**

### *Capability unit IIw-3*

In this unit are moderately deep or deep, somewhat poorly drained, light-colored soils on level to gently sloping secondary beach ridges and outwash plains. The organic-matter content is medium, the capacity to store and release plant nutrients is medium, permeability is moderately rapid, and the moisture-supplying capacity is medium. The soils in this unit are—

Digby loam, 0 to 2 percent slopes.
Digby sandy loam, 0 to 2 percent slopes.
Haskins and Digby loams, over clay, 0 to 2 percent slopes.
Haskins and Digby loams, over clay, 2 to 6 percent slopes.
Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes.
Haskins and Digby fine sandy loams, over clay, 2 to 6 percent slopes.
Kibbie fine sandy loam, 0 to 2 percent slopes.
Kibbie fine sandy loam, 2 to 6 percent slopes.
Kibbie loamy fine sand, 0 to 2 percent slopes.

Fine gravel occurs in all of the soils in this unit, except the Kibbie soils. The Kibbie soils are underlain by stratified silt and fine sand. In places glacial till or lacustrine clay occurs at a depth of more than 48 inches. The water table is high in the Kibbie and Digby soils during long wet periods. A temporary water table occurs in the Haskins and Digby soils, over clay.

The soils in this unit are suited to the principal crops grown in the county. If row crops are grown, the cropping system should include a green-manure crop every 3 years or a sod crop every 4 years. A green-manure crop or a sod crop needs to be grown more frequently on the gently sloping soils to protect them from erosion. In some places contour tillage or terraces that have a slight gradient are needed to control erosion.

Tillage should be kept to the minimum needed to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains are needed to remove excess water. The placement of tile is difficult in the Haskins and Digby soils, over clay, because of the range in depth to the underlying clay. Best results are obtained if the tile is placed just into the clay material. In the Kibbie soils and the Digby soils, the tile generally is placed in the silty or sandy material. Land leveling and surface drainage are needed in some areas.

These soils are suitable for permanent pasture but are seldom used for this purpose. Legumes and grass are well suited and can be grown for either hay or pasture. The soils will be damaged if pastures are grazed during wet periods.

Most of the acreage is cleared. Trees of most species are suitable for planting.

### *Capability unit IIw-4*

In this unit are moderately deep or deep, very poorly drained, level or nearly level, dark-colored soils in low-lying areas on the lake plain. The organic-matter content is high, the capacity to store and release plant nutrients is medium, permeability is moderately rapid, and the moisture-supplying capacity is high. The water table commonly is high. The soils in this unit are—

Wauseon fine sandy loam.
Wauseon fine sandy loam, over clay.
Wauseon loamy fine sand.
Wauseon loamy fine sand, over clay.

These soils are suited to all of the principal crops of the county. Row crops can be grown continuously if management is good.

The maintenance of good tilth is not difficult if tillage is kept to the minimum needed to provide satisfactory seedbeds and to control weeds. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains are needed to remove excess water. The placement of tile is difficult in the Wauseon soils, over clay, because of the range in depth to the underlying clay. Best results are obtained if the tile is placed just into the clay material. In the other Wauseon soils, the tile generally can be placed in the sandy material.

These soils are suitable for permanent pasture but are seldom used for this purpose. Legumes and grass are well suited and can be grown for either hay or pasture.

Most of the acreage is cleared. If trees are planted, species that tolerate wetness should be selected.

### *Capability unit IIw-5*

This unit consists of moderately deep or deep, very poorly drained, level or nearly level, dark-colored soils in low-lying areas on outwash plains, on secondary beach ridges, and adjacent to streams. The organic-matter content is high, the capacity to store and release plant nutrients is high, permeability is moderately rapid, and the moisture-supplying capacity is high. The water table is high during wet periods (fig. 4). The soils in this unit are—

Colwood loam.
Colwood fine sandy loam.
Mermill fine sandy loam.
Mermill sandy clay loam.
Millgrove loam.

These soils are suited to all of the principal crops of the county. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain and a green-manure catch crop.

Maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains are needed to remove excess water. If possible, the placement of tile in the Mermill soils should be just into the underlying clay. In the Colwood soils and in Millgrove loam, the tile generally can be placed in the loamy material.

These soils are suitable for pasture but are seldom used for this purpose. Forage crops can be grown for hay or pasture.

Most of the acreage is cleared. If trees are planted, species that tolerate wetness should be selected.

### *Capability unit IIw-6*

This unit consists of deep, very poorly drained, dark-colored soils on broad flats on the lake plain. The organic-matter content is high, the capacity to hold and release plant nutrients is high, permeability is moderately slow, and the moisture-supplying capacity is high. The ponding of surface water is common in depressed areas (fig. 5).

*Figure 4.*—***Top,*** **shallow surface drains on Mermill soils.** ***Bottom,*** **shallow surface drain removing excess water from wheat during snow melt early in spring.**

The soils in this unit are—

Hoytville clay.
Hoytville clay, thin solum variant.
Hoytville clay loam.

Hoytville clay, thin solum variant, ranges considerably in depth to calcareous material. The availability of minerals is reduced if the soils are calcareous at or near the surface.

These soils are suited to all of the principal crops grown in the county, including sugar beets and tomatoes. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain and a green-manure crop.

The maintenance of good tilth is a serious problem, particularly on the clay soils. Consequently, tillage should be kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. Soil testing is more important on Hoytville clay, thin solum variant, than on the other soils in this unit.

*Figure 5.*—**Surface water ponding on Hoytville clay, showing need for surface drainage.**

Tile drains are needed to remove excess water from these soils. A system of shallow drains is needed in many areas to remove excess water during wet periods (fig. 6). Land smoothing will elminate small pockets in which water collects and will permit a more uniform production of crops.

Yields of forage crops are good, but these soils are seldom used for permanent pasture. The soils will be damaged if pastures are grazed during wet periods.

Most of the acreage is cleared. If trees are planted, species that tolerate wetness should be selected.

### *Capability unit IIs-1*

Milton loam, 0 to 2 percent slopes, is the only soil in this unit. This is a moderately deep, well-drained, light-colored soil on the lake plain where the depth to limestone is 20 to 42 inches. Fragments of igneous rock and various amounts of limestone are on the surface and throughout the soil material. The organic-matter content is medium, the capacity to store and release plant nutrients is medium, permeability is moderate, and the moisture-supply capacity is medium.

*Figure 6.*—**Rollover-type pan being used to construct shallow surface drain.**

This soil tends to be droughty during long dry periods. It is suited to most of the principal crops of the county, but crops that require large amounts of water late in the growing season may be damaged during dry periods. Winter grain is well suited. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain and a green-manure crop.

Maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. Drainage generally is not needed.

This soil is well suited to permanent pasture. Yields of legumes and grass are good but are reduced during long dry periods.

Most of the acreage is cleared. Trees of most species are well suited, but the establishment of trees may be difficult during dry periods.

### *Capability unit IIs-2*

In this unit are moderately deep or deep, well drained or moderately well drained, light-colored soils that formed in sandy and gravelly deposits on outwash plains and beach ridges. The organic-matter content is low, the capacity to store and release plant nutrients is low, permeability is moderately rapid, and the moisture-supplying capacity is low or medium. The soils in this unit are—

- Belmore loam, 1 to 4 percent slopes.
- Belmore sandy loam, 1 to 4 percent slopes.
- Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes.

The Seward and Ottokee soils are subject to wind erosion if cultivated. The Seward soils are underlain by glacial till or lacustrine clay at a depth of 18 to 36 inches. The Belmore soils are gravelly throughout. They are also underlain by glacial till or lacustrine clay, but at a depth of more than 48 inches.

The soils in this unit are suited to most of the crops grown in the county. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain and a green-manure crop. A green-manure crop seeded in small grain will help to control erosion on the gently sloping Belmore soils. The hazard of wind erosion is especially severe if spring grain is grown.

Tillage should be kept to the minimum necessary to provide a satisfactory seedbed, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. The fertilization of the Seward and Ottokee soils, over clay, on a crop to crop basis will minimize loss of nutrients through leaching. Drainage generally is not needed.

These soils are suited to permanent pasture. Legumes and grass grow well and can be used for hay or pasture.

Most of the acreage is cleared. Trees of most species are suitable for planting.

### *Capability unit IIIe-1*

There is only one soil in this unit, Milton loam, 2 to 6 percent slopes. This is a moderately deep, well-drained, light-colored soil on the lake plain where the depth to bedrock ranges from 20 to 42 inches. Fragments of igneous rock and various amounts of limestone are on the surface and throughout the soil material. This soil may be droughty during long dry periods. It is medium in organic-matter content, medium in moisture-supplying capacity, and moderately permeable. The capacity to store and release plant nutrients is medium.

This soil is suited to the principal crops grown in the county. Winter wheat is well suited, but crops that require large amounts of water late in the growing season may be damaged during long dry periods.

Maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Tillage across the slope helps to lessen the erosion hazard. In some places contour cultivation is needed to control erosion. Lime and fertilizer should be applied in amounts indicated by soil tests.

There may be a temporary perched water table in this soil during wet periods, but drainage generally is not needed.

This soil is well suited to permanent pasture. Legumes and grass grow well, but a reduction in yields can be expected during long dry periods.

Most of the acreage has been cleared. Trees of most species are well suited, but the establishment of trees may be difficult during dry periods.

### *Capability unit IIIe-2*

This unit consists of moderately deep, moderately well drained, gently sloping soils on side slopes adjacent to streams on the lake plain. The organic-matter content is low, the capacity to store and release plant nutrients is high, the moisture-supplying capacity is high, and permeability is slow. The soils in this unit are—

- St. Clair loam, 2 to 6 percent slopes.
- St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded.

These soils are susceptible to erosion, and in places part of the original surface layer has been removed by erosion. The subsoil is high in content of clay and is slowly permeable. Consequently, if the surface soil is eroded, yields are significantly reduced.

Most of the crops commonly grown in the county are suitable. The cropping system can be as intensive as the following: a row crop, a cover crop, a row crop, small grain, and a meadow crop. Meadow crops should be grown more frequently in eroded areas to help maintain good tilth and to control further erosion. The maintenance of good tilth is difficult on St. Clair silty clay loam.

Contour tillage and terracing help to control erosion. Tillage should be kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

There may be a temporary perched water table in these soils during long wet periods, but drainage generally is not needed.

These soils are well suited to legumes and grass, which can be grown for either hay or pasture. Grazing of pastures when the soil is wet and soft destroys soil structure and generally reduces productivity.

Trees of most species grow well, but most of the acreage has been cleared.

### *Capability unit IIIe-3*

This unit consists of well-drained, light-colored soils on sloping to moderately steep ridges and dunes on the lake plain. These soils are droughty during long dry periods, and they are subject to both wind and water erosion. The organic-matter content is low, the capacity to hold and release plant nutrients is low, permeability is rapid, and the moisture-supplying capacity is low. The soils in this unit are—

Spinks fine sand, 6 to 12 percent slopes.
Spinks fine sand, 12 to 18 percent slopes.
Spinks loamy fine sand, 6 to 12 percent slopes.

Spinks fine sand, 12 to 18 percent slopes, occupies only about 53 acres in the county. It is not suited to regular cultivation because of the hazard of severe erosion. However, because of its small total acreage, it has been placed in unit IIIe-3 instead of in a separate unit.

The other soils in this unit are suited to the principal crops in the county. On those that have a slope range of 6 to 12 percent, the cropping system can be as intensive as the following: two row crops, followed by small grain and a meadow crop. On Spinks fine sand, 12 to 18 percent slopes, the cropping system should not be more intensive than a row crop, 1 year of small grain, and 2 years of a meadow crop. The maintenance of good tilth is not difficult on these soils if management is good.

Windbreaks or strips of sod are needed in most areas to control wind erosion. The surface commonly is irregular or uneven. Therefore, countour cultivation generally is not feasible, but tillage across the slope helps to reduce runoff and thereby to control water erosion. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. Fertilization on a crop to crop basis will minimize the loss of plant nutrients through leaching. Drainage is not needed.

Because of their limited capacity to store moisture, these soils are not highly productive of pasture plants. Forage yields are greater if deep-rooted legumes are used in a legume-grass mixture than if shallow-rooted legumes are used. However, a reduction in yields can be expected during dry periods.

A few areas of these soils are wooded. Trees of most species, particularly conifers, are suitable for planting. Windbreak plantings help to reduce wind erosion.

### *Capability unit IIIw-1*

In this unit are deep, very poorly drained, dark-colored soils on level or nearly level flood plains. The organic-matter content is high, the capacity to store and release plant nutrients is medium or high, permeability is moderately slow, and the moisture-supplying capacity is high. Flooding is a hazard. Surface water may concentrate in old stream channels and in scoured areas. The soils in this unit are—

Sloan silt loam.
Sloan silty clay loam.

Row crops can be grown continuously in most areas if management is good. Winter grain should not be grown in areas where winter floods are likely.

The maintenance of good tilth is not difficult if tillage is kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains are needed to remove excess water. Shallow surface drains can be used to remove water that stands in low areas. Small, low areas can be eliminated by land smoothing. Diversion terraces along the base of slopes will intercept runoff from higher areas.

Yields of forage are good, and much of the acreage is used for permanent pasture.

Trees reproduce naturally if protected from grazing and fire. The planting of seedlings is seldom necessary.

Soils of this unit contain some areas that, 3 years or more out of 5, are flooded to such extent that yields are significantly reduced. These areas have the same limitations as soils in capability unit Vw-1.

### *Capability unit IIIw-2*

In this unit are moderately deep, very poorly drained to moderately well drained soils that are underlain by limestone. These soils are on level or nearly level flood plains and uplands. The organic-matter content is medium or high, the capacity to store and release plant nutrients is medium, permeability is moderate or moderately slow, and the moisture-supplying capacity is medium or high. The soils in this unit are—

Alluvial land.
Eel silt loam, over limestone.
Millsdale silty clay loam.
Shoals and Sloan soils, over limestone.

Wetness is the principal limitation of the soils in this unit. Millsdale silty clay loam is a dark-colored soil in low-lying areas on the lake plain. It is underlain by limestone at a depth of 20 to 42 inches. The other soils are on flood plains and are subject to flooding.

These soils are suited to most crops commonly grown in the county. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain and a green-manure catch crop. Winter grain should not be grown in areas where winter floods are likely. The maintenance of good tilth is a problem on the silty clay loam.

Tillage should be kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Drainage is needed on all of the soils, except the Eel soil. Tile drains are difficult to install because of the underlying limestone. Shallow surface drains can be used to remove water that stands in low areas. Small, low areas can be eliminated by land smoothing. Diversion ditches along the base of slopes will intercept runoff from higher areas.

Most of the acreage is cleared. Wetness limits forage yields on the Millsdale soil but is a less important factor on the soils on flood plains.

Trees reproduce naturally on the flood plains if protected from grazing and fire. Water-tolerant species are suitable for planting on the Millsdale soil.

Soils of this unit contain some areas that, 3 years or more out of 5, are flooded to such extent that yields are significantly reduced. These areas have the same limitations as soils in capability unit Vw-1.

### *Capability unit IIIw-3*

This unit consists of moderately deep, somewhat poorly drained, level to gently sloping, light-colored soils that have a clayey subsoil. These soils occur in slightly elevated areas on the lake plain or in areas where the depth to bedrock ranges from 20 to 42 inches. The organic-matter content is low or medium, the capacity to store and release plant nutrients is medium or high, permeability is moderately slow or slow, and the moisture-supplying capacity is high. The soils in this unit are—

- Fulton silty clay loam, 0 to 2 percent slopes.
- Fulton silty clay loam, 2 to 6 percent slopes.
- Nappanee loam, 0 to 2 percent slopes.
- Nappanee loam, 2 to 6 percent slopes.
- Nappanee loam, 2 to 6 percent slopes, moderately eroded.
- Nappanee sandy loam, 0 to 2 percent slopes.
- Nappanee sandy loam, 2 to 6 percent slopes.
- Nappanee silty clay loam, 0 to 2 percent slopes.
- Nappanee silty clay loam, 2 to 6 percent slopes.
- Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded.
- Randolph loam, 0 to 2 percent slopes.
- Randolph loam, 2 to 6 percent slopes.

The Randolph soils are underlain by limestone; the other soils, by glacial or lacustrine material. Erosion is a serious hazard on the gently sloping soils. Inasmuch as the subsoil is high in content of clay and slowly permeable, yields on these soils are significantly reduced if the surface soil is eroded.

Most crops commonly grown in the county are suitable. The nearly level soils are suited to a cropping system as intensive as the following: a row crop, followed by a small grain and a green-manure crop. The gently sloping soils require a less intensive system, such as: a row crop, a cover crop, a row crop, small grain, and a meadow crop.

The maintenance of good tilth is difficult on these soils. Tillage should be kept to the minimum required to provide satisfactory seedbeds, to control weeds, and to minimize crusting. The cultivation of these soils across the slope helps to reduce runoff and thereby to control erosion. Contour tillage or terraces that have a slight gradient are needed in some areas. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains are needed to remove excess water. To provide adequate drainage, the tile needs to be closely spaced and carefully installed. On the Randolph soils, the underlying bedrock may interfere with terracing or with the installation of tile.

Only a few areas of these soils are used for permanent pasture. Grass and legumes are well suited and can be grown for either hay or pasture. However, grazing of pastures when the soil is wet and soft destroys soil structure, makes drainage more difficult, and generally reduces productivity.

Trees of most species are well suited.

### *Capability unit IIIw-4*

In this unit are deep, very poorly drained, dark-colored soils in level or nearly level, broad areas on the lake plain. These soils are underlain by lacustrine material. The organic-matter content is high, the capacity to store and release plant nutrients is high, permeability is moderately slow, and the moisture-supplying capacity is high. The ponding of surface water in depressions is common. The soils in this unit are—

- Toledo silty clay.
- Toledo silty clay loam.

These soils are suited to most of the principal crops of the county, including sugar beets and tomatoes. The cropping system can be as intensive as the following: two row crops, followed by small grain and a green-manure crop.

The maintenance of good tilth generally is a serious problem. Tillage should be kept to the minimum necessary to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

The drains are needed on these soils. Shallow surface drains can be used to remove water that collects during wet periods. Land smoothing will eliminate pockets in which water stands and will permit the more uniform production of crops.

Good yields of forage crops can be expected, but these soils are seldom used for permanent pasture. The grazing of pastures when the soil is wet and soft destroys soil structure, makes drainage more difficult, and generally reduces productivity.

Most of the acreage is cleared. If trees are planted, species that tolerate wetness should be selected.

### *Capability unit IIIw-5*

Muck is the only soil in this unit. It consists of a shallow to moderately deep, very poorly drained, dark-colored, organic soil in level or nearly level, low-lying areas on the lake plain. The organic surface layer is underlain by a thin sandy layer over lacustrine or glacial material. The organic-matter content is very high, the capacity to store and release plant nutrients is high, permeability is moderately slow, and the moisture-supplying capacity is very high. Both wind erosion and fire are serious hazards.

This soil is suited to the principal crops of the county, including specialty crops. Row crops can be grown continuously if wind erosion is controlled, but small grain is not well suited. Wind erosion sometimes damages spring grain. If winter grain or spring grain is grown, lodging is a problem because of the difficulty in controlling nitrogen levels. Arborvitae, or some other suitable shrub, and Tatarian honeysuckle can be planted as windbreaks to help control wind erosion.

Excessive tillage should be avoided because it encourages the oxidation of organic matter. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Tile drains are needed, but adequate outlets generally are not available. To reduce the hazard of both wind erosion and fire, keep the water table at a depth of 24 to 30 inches.

This soil is not used for pasture. Areas that can be drained are used for crops.

Trees generally are not planted. Only those species that can tolerate very wet conditions are suitable for planting.

### *Capability unit IIIs-1*

In this unit are shallow to moderately deep, well-drained, nearly level or gently sloping, light-colored soils that formed in sandy deposits underlain by limestone.

The organic-matter content is low, the capacity to hold and release plant nutrients is low, permeability is rapid, and the moisture-supply capacity is low. Wind erosion is a problem in cultivated fields. The soils in this unit are—

- Dunbridge sandy loam, 0 to 2 percent slopes.
- Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes.
- Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes.

These soils are suited to all of the principal crops of the county, except those that require large amounts of water late in summer. The nearly level areas can be used continuously for row crops but, because of droughtiness, are better suited to small grain.

Tillage should be kept to the minimum necessary to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. Fertilization needs to be on a crop to crop basis. Drainage is not needed.

Some areas of these soils are used for permanent pasture. Forage yields are fair, except during dry periods. Higher yields can be expected if legumes are included in the grass mixture.

Trees of most species are suitable, but the establishment of trees is difficult during dry periods.

### *Capability unit IIIs-2*

In this unit are deep, nearly level or gently sloping, well drained or moderately well drained, light-colored soils that formed mainly in slightly elevated sandy deposits on the lake plain. The organic-matter content is low, the capacity to hold and release plant nutrients is low, permeability is rapid, and the moisture-supplying capacity is low. These soils are droughty during long, dry periods, and they are subject to severe wind erosion. They are—

- Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes.
- Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes.
- Spinks fine sand, 2 to 6 percent slopes.
- Spinks loamy fine sand, 2 to 6 percent slopes.

These soils are suited to the principal crops of the county. The cropping system can be as intensive as the following: a row crop, a cover crop, a row crop, small grain, and a green-manure crop. Windbreaks or strips of sod are needed in most areas to help control wind erosion.

The maintenance of good tilth is not difficult on these soils if management is good. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. Fertilization needs to be on a crop to crop basis to minimize the loss of nutrients through leaching. Drainage is not needed.

These soils are not highly productive of permanent pasture plants, because their capacity to hold moisture is limited. Forage yields are greater if deep-rooted legumes are used in a legume-grass mixture than if shallow-rooted legumes are used. A reduction in yields is to be expected during long dry periods.

A small acreage is wooded. Trees of most species, particularly conifers, are suitable. Windbreak plantings help to control wind erosion.

### *Capability unit IIIs-3*

This unit consists of well-drained, level to gently sloping, light-colored soils on the lake plain. These soils are underlain by limestone at a depth of 10 to 20 inches. The organic-matter content is medium, the capacity to store and release plant nutrients is low, permeability is moderate, and the moisture-supplying capacity is low. Fragments of igneous rock and various amounts of limestone are on the surface and throughout the soil material. The soils in this unit are—

- Ritchey loam, 0 to 2 percent slopes.
- Ritchey loam, 2 to 6 percent slopes.

These soils are droughty. Consequently, they are not suited to crops that require a large amount of water late in summer. They are suited to winter grain. The cropping system can be as intensive as the following: a row crop, followed by winter grain and a green-manure crop.

Maintenance of good tilth is not difficult if tillage is kept to the minimum necessary to provide satisfactory seedbeds, to control weeds, and to minimize crusting. Tilling across the slope reduces runoff and thereby helps to control erosion. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests. Drainage is not needed.

These soils for the most part are cleared. They are well suited to permanent pasture. Forage yields are good if drought-tolerant grasses and legumes are grown. However, yields will be significantly reduced during long dry periods.

Trees that have a shallow root system and that can tolerate drought are suitable for planting.

### *Capability unit IVe-1*

This unit consists of moderately deep, moderately well drained, light-colored soils that occur as long, narrow bands on side slopes adjacent to streams. The organic-matter content is low, the capacity to hold and release plant nutrients is high, permeability is slow, and the moisture-supplying capacity is high. The soils in this unit are—

- St. Clair loam, 6 to 12 percent slopes, moderately eroded.
- St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded.

These soils are subject to erosion. If eroded they are considerably less productive because of the high content of clay in the subsoil.

Most of the principal crops of the county are suitable. The cropping system can be as intensive as the following: a row crop, followed by small grain, and 3 years of a meadow crop. An additional year of a meadow crop may be needed both on long slopes and on strong slopes.

Tillage should be kept to the minimum necessary to provide satisfactory seedbeds, to control weeds, and to minimize crusting. Tilling across the slope reduces runoff and thereby helps to control erosion. In many spots the preparation of seedbeds is difficult because of the heavy surface layer, which tends to clod if tilled. Contour cultivation and terracing are not practical on short, irregular slopes. Lime and fertilizer should be applied in amounts indicated by soil tests. All crop residues should be returned to the soil.

A temporary perched water table may be present during long wet periods, but drainage generally is not needed.

These soils can be used for permanent pasture, but the soils will be damaged if pastures are grazed during wet periods. Legumes and grass can be grown for hay or pasture. Good yields can be expected.

Trees of most species grow well.

### *Capability unit IVw-1*

There is only one soil in this unit, Joliet silty clay loam. This is a very poorly drained, level or nearly level, dark-colored soil in low-lying areas on the lake plain. It is underlain by limestone at a depth of 10 to 20 inches. The organic-matter content is high, the capacity to store and release plant nutrients is medium, permeability is moderate, and the moisture-supplying capacity is medium. Fragments of igneous rock and various amounts of limestone are on the surface and throughout the soil material.

Shallowness to bedrock is the principal limitation of this soil. All of the principal crops of the county can be grown, except those that require large amounts of water late in the growing season. The cropping system can be as intensive as the following: 2 years of a row crop, followed by small grain, and a meadow crop.

The maintenance of good tilth generally is difficult. Tillage should be kept to the minimum necessary to provide satisfactory seedbeds, to control weeds, and to minimize crusting. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Drainage is needed to remove excess water, but tile drains are difficult to install on this shallow soil. Surface drains can be used to remove water that collects in low areas. Small, low areas can be eliminated by land smoothing. Diversion terraces along the base of slopes will intercept water from higher areas.

Most of this soil is cleared. Many areas are used for permanent pasture, but yields of forage are limited because of the lack of water during long dry periods. Forage yields are greater if deep-rooted legumes are used in a legume-grass mixture than if shallow-rooted legumes are used.

Only water-tolerant trees that have a shallow root system are suitable for planting.

### *Capability unit IVw-2*

Warners soils, over clay, are the only soils in this unit. These are dark-colored, very poorly drained, shallow, organic soils that occur in level or nearly level areas on the lake plain. The surface layer is a mixture of mineral and organic material. The organic-matter content is very high, the capacity to store and release plant nutrients is high, permeability is moderately slow, and the moisture-supplying capacity is high.

Marl generally occurs in the solum. It presents a nutritional problem if it is mixed with the surface soil. Truck crops that are not suited to calcareous soils should not be grown. All other crops commonly grown in the county are suitable. Row crops can be grown continuously.

Maintenance of good tilth is not difficult if tillage is kept to the minimum necessary to provide satisfactory seedbeds and to control weeds. All crop residues should be returned to the soil. Lime and fertilizer should be applied in amounts indicated by soil tests.

Drainage is needed to remove excess water, but suitable outlets may not be available. Diversion terraces can be used to intercept surface runoff from higher areas.

Most of the acreage is cleared, but only a few undrained areas are used for permanent pasture. Forage yields are good. The grazing of pastures when the soil is wet and soft destroys soil structure and generally reduces productivity.

If trees are planted, species that tolerate wetness should be selected.

### *Capability unit Vw-1*

This unit consists of soils of the kinds classified as belonging in unit I-1, IIw-1, IIIw-1, or IIIw-2 but that contain some areas that, 3 years or more out of 5, are flooded to such extent that yields are significantly reduced. The hazard of flooding is not indicated on the soil map. Local knowledge will be necessary to determine which areas likely will be flooded. The soils that contain such areas are—

Alluvial land (IIIw-2).
Eel loam (I-1).
Eel silt loam (I-1).
Eel silt loam, over limestone (IIIw-2).
Genesee loam (I-1).
Genesee silt loam (I-1).
Shoals loam (IIw-1).
Shoals silt loam (IIw-1).
Shoals silty clay loam (IIw-1).
Shoals and Sloan soils, over limestone (IIIw-2).
Sloan silt loam (IIIw-1).
Sloan silty clay loam (IIIw-1).

Areas that are likely to be flooded are best suited to silage corn, soybeans, and other short-season crops.

Yields of forage crops are good, and most of the acreage is used for permanent pasture. Legumes and grasses that tolerate flooding are suitable. The grazing of pastures when the soil is wet and soft destroys soil structure and generally reduces productivity.

Trees reproduce naturally if protected from fire and grazing.

### *Capability unit VIe-1*

There is only one soil in this unit, St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded. This is a moderately deep, moderately well drained, light-colored soil on the side slopes of draws and in long, narrow areas adjacent to streams. The organic-matter content is low, the capacity to store and release plant nutrients is high, permeability is slow, and the moisture-supplying capacity is medium.

This soil is susceptible to severe erosion if used for row crops, but it can be used for long-term legume-grass meadow. Reseeding occasionally with winter grain is satisfactory.

Tillage should be kept to the minimum necessary to provide satisfactory seedbeds. Tilling across the slope will reduce runoff and help to control erosion. Lime and fertilizer should be applied in amounts indicated by soil tests. Generally, only wet spots or seepy areas need to be drained.

Many areas of this soil are used for pasture. Fair yields can be expected. Legumes and grass grown together produce more forage than grass grown alone and can be used for hay or pasture. The soil will be damaged if pastures are grazed during wet periods.

Trees of most species grow well.

### *Capability unit VIs-1*

This unit consists of well-drained to very poorly drained soils in level or gently sloping areas on the lake plain. These soils are either stony or very shallow to bedrock. The Romeo soils are underlain by limestone at a depth of 10 inches or less. The organic-matter content ranges from high to low, the capacity to store and release plant nutrients is medium, permeability is moderately rapid, and the moisture-supplying capacity is low or medium. The soils in this unit are—

Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes.
Millsdale stony silty clay loam.
Randolph stony loam, 0 to 2 percent slopes.
Ritchey stony loam, 0 to 2 percent slopes.
Romeo soils, 0 to 2 percent slopes.
Romeo soils, 2 to 6 percent slopes.

These soils cannot be used for cultivated crops. In most places the number and size of the stones on the surface make the use of tillage implements impossible. Even if expensive clearing operations were undertaken, shallowness to bedrock would limit the use of these soils for crops.

Many areas are cleared and are in poor-quality pasture. Improvement of pastures can be undertaken only in the patches between the larger stones. The reseeding of these areas with grass and legumes will greatly increase forage yields. Lime and fertilizer should be applied in amounts indicated by soil tests. Seedbeds can be prepared by disking the old sod. The control of weeds by clipping is difficult.

These soils are not highly productive of wood crops, and many of the wooded areas are used for grazing. Protection from grazing and fire will permit the natural regeneration of the stands. Interplanting can be undertaken on partly stocked sites.

The soils in this unit are especially well suited as habitats for wildlife.

### *Capability unit VIIe-1*

The only soil in this unit is St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded. This is a moderately deep, moderately well drained, light-colored soil on the side slopes of draws and adjacent to streams. The organic-matter content is low, the capacity to store and release plant nutrients is high, permeability is slow, and the moisture-supplying capacity is high.

Erosion is a serious hazard if this soil is cultivated. The operation of equipment is also hazardous on these steep slopes. Consequently, this soil is not suited to cultivated crops.

A few areas are used for permanent pasture. Forage yields can be increased by applying lime and fertilizer in amounts indicated by soil tests. Because of the difficulty of mowing, the control of weeds is a problem.

Many areas of this soil are wooded. Trees grow well and will reproduce naturally if protected from grazing and fire. Hand labor generally has to be used if trees are to be planted.

## Estimated Yields

Table 1 shows, for most soils in the county, the estimated yields of the principal crops in the county under two levels of management. These yields are assumed to be the average that can be expected over a 5-year period if weather conditions are average. They are intended only as a guide to show the relative productivity of the soils and their response to management. The miscellaneous land types, Made land and Borrow pits, Quarries, and Urban land, were excluded from this table.

The yields shown in columns A are those that can be expected under the average level of management commonly used by most farmers in the county at the time of the survey.

The yields shown in columns B are those that can be expected under improved management. Improved management includes timeliness of tillage; applying lime and fertilizer in amounts indicated by soil tests; using improved plant varieties; and following recommended practices to control erosion, to conserve moisture, to maintain the content of organic matter, and to preserve good tilth. If needed, tile and surface drains are used to remove excess water, and chemicals are used to control weeds and insects. Irrigation has not been considered in estimating these yields.

Tomatoes and sugar beets are rated only at a high level of management in table 1 because yields under an average level of management would not bring profitable returns.

The estimates in table 1 are based (1) on information obtained from farmers; (2) on yields obtained on demonstration plots; (3) on observations by the county agent, the soil conservationist of the Soil Conservation Service, and the party chief of the Ohio Division of Lands and Soil; and (4) on results obtained in field trials and experiments at the Ohio Agricultural Experiment Station.

## Management of Land in Farms

Successful farming requires an understanding of soil management and of the proper use of the soils. This section provides basic information for the conservation and improvement of cropland and pasture.

### *General practices*

The economical growing of crops requires soil management that fits the soil (*3, 30*). Thus, an evaluation of the organic-matter content and natural fertility of the soils, of the yield level desired, and of past management is important.

An adequate supply of plant nutrients and organic matter, a good root zone, and the proper balance of air and water are necessary to grow crops efficiently. Management practices needed to improve yields include drainage, control of erosion, rotation of crops, use of suitable crop varieties, and the adequate use of lime and fertilizer (*9, 10, 13, 15, 20*). Nitrogen, phosphate, and potash need to be applied in suitable amounts to maintain fertility [3].

Organic matter affects both soil tilth and the amount of nitrogen in the soil. Generally, the supply of nitrogen is proportionate to the content of organic matter. Consequently, management must provide an adequate supply

[3] FERTILIZER USE IN OHIO. Ohio Extension Service Bulletin. (Revised each year.)

TABLE 1.—*Estimated average acre yields of principal crops*

[Yields in columns A are those obtained under the average management commonly used in the county; yields in columns B are those to be expected under improved management. If no yields are indicated, the crop is not grown under the management specified or the soil is not suited to its production]

| Soil | Corn | | Soybeans | | Wheat | | Oats | | Hay [1] | | Tomatoes | Sugar beets |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B | A | B | B [2] | B [3] |
| | Bu. | Bu. | Bu. | Bu. | Bu. | Bu. | Bu. | Bu. | Tons | Tons | Tons | Tons |
| Alluvial land | | | | | | | | | | | | |
| Belmore loam, 1 to 4 percent slopes | 55 | 85 | 21 | 28 | 30 | 36 | 45 | 65 | 1.7 | 3.5 | | 11.5 |
| Belmore sandy loam, 1 to 4 percent slopes | 50 | 80 | 20 | 25 | 28 | 34 | 45 | 65 | 1.5 | 3.0 | | 11.2 |
| Colwood fine sandy loam | 90 | 120 | 33 | 40 | 40 | 50 | 65 | 85 | 2.5 | 5.0 | 28 | 22.6 |
| Colwood loam | 90 | 120 | 33 | 40 | 40 | 50 | 65 | 85 | 2.5 | 5.0 | 28 | 22.8 |
| Digby loam, 0 to 2 percent slopes | 70 | 105 | 30 | 35 | 35 | 40 | 60 | 75 | 2.0 | 4.0 | 20 | 12.5 |
| Digby sandy loam, 0 to 2 percent slopes | 70 | 105 | 30 | 35 | 35 | 40 | 60 | 75 | 2.0 | 4.0 | 18 | 12.2 |
| Dunbridge sandy loam, 0 to 2 percent slopes | 70 | 90 | 24 | 28 | 28 | 34 | 45 | 65 | 1.5 | 3.0 | | |
| Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes | 60 | 80 | 20 | 25 | 28 | 34 | 45 | 65 | 1.5 | 3.0 | | |
| Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes | 58 | 75 | 18 | 23 | 27 | 33 | 44 | 64 | 1.5 | 3.0 | | |
| Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes | | | | | | | | | | | | |
| Eel loam | 70 | 110 | 28 | 40 | 33 | 42 | 55 | 76 | 2.1 | 4.3 | 21 | 11.9 |
| Eel silt loam | 70 | 110 | 28 | 40 | 33 | 42 | 55 | 76 | 2.1 | 4.3 | 21 | 11.9 |
| Eel silt loam, over limestone | | | | | | | | | | | | |
| Fulton silty clay loam, 0 to 2 percent slopes | 63 | 82 | 25 | 28 | 30 | 36 | 47 | 66 | 1.7 | 3.5 | 16 | 9.5 |
| Fulton silty clay loam, 2 to 6 percent slopes | 61 | 82 | 23 | 28 | 29 | 36 | 46 | 66 | 1.7 | 3.5 | 16 | 9.0 |
| Genesee loam | 75 | 115 | 30 | 40 | 37 | 45 | 58 | 78 | 2.5 | 4.5 | 21 | 12.5 |
| Genesee silt loam | 75 | 115 | 30 | 40 | 37 | 45 | 58 | 78 | 2.5 | 4.5 | 21 | 12.5 |
| Haney loam, 0 to 2 percent slopes | 75 | 100 | 28 | 32 | 35 | 40 | 65 | 75 | 1.9 | 3.8 | 19 | 12.0 |
| Haney loam, 2 to 6 percent slopes | 75 | 100 | 28 | 32 | 35 | 40 | 65 | 75 | 1.9 | 3.8 | 19 | 11.2 |
| Haney sandy loam, 0 to 2 percent slopes | 70 | 95 | 26 | 31 | 35 | 40 | 65 | 75 | 1.9 | 3.8 | 18 | 11.9 |
| Haney sandy loam, 2 to 6 percent slopes | 70 | 95 | 26 | 31 | 35 | 40 | 65 | 75 | 1.9 | 3.8 | 18 | 11.0 |
| Haskins and Digby loams, over clay, 0 to 2 percent slopes | 70 | 100 | 22 | 35 | 35 | 45 | 55 | 80 | 2.0 | 3.8 | 20 | 11.9 |
| Haskins and Digby loams, over clay, 2 to 6 percent slopes | 70 | 98 | 23 | 34 | 35 | 45 | 55 | 80 | 2.0 | 3.8 | 20 | 11.2 |
| Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes | 70 | 100 | 25 | 35 | 35 | 45 | 55 | 80 | 2.0 | 3.8 | 18 | 11.6 |
| Haskins and Digby fine sandy loams, over lay, 2 to 6 percent slopes | 70 | 98 | 24 | 34 | 35 | 45 | 55 | 80 | 2.0 | 3.8 | 18 | 11.0 |
| Hoytville clay | 80 | 115 | 33 | 40 | 37 | 47 | 60 | 80 | 2.5 | 5.0 | 27 | 21.5 |
| Hoytville clay loam | 80 | 117 | 33 | 42 | 37 | 47 | 60 | 80 | 2.5 | 5.0 | 28 | 21.7 |
| Hoytville clay, thin solum variant | 78 | 113 | 32 | 39 | 37 | 47 | 60 | 80 | 2.5 | 5.0 | 26 | 21.5 |
| Joliet silty clay loam | | | | | | | | | 1.5 | 3.0 | | |
| Kibbie fine sandy loam, 0 to 2 percent slopes | 70 | 98 | 30 | 36 | 35 | 42 | 55 | 75 | 2.0 | 4.0 | 19 | 11.5 |
| Kibbie fine sandy loam, 2 to 6 percent slopes | 70 | 96 | 30 | 35 | 35 | 42 | 55 | 75 | 2.0 | 4.0 | 18 | 11.0 |
| Kibbie loamy fine sand, 0 to 2 percent slopes | 70 | 96 | 30 | 35 | 35 | 42 | 55 | 75 | 2.0 | 4.0 | 18 | 11.5 |
| Mermill fine sandy loam | 86 | 118 | 31 | 39 | 39 | 46 | 64 | 84 | 2.4 | 5.0 | 26 | 22.2 |
| Mermill sandy clay loam | 85 | 118 | 32 | 39 | 39 | 46 | 64 | 84 | 2.5 | 5.0 | 26 | 22.4 |
| Millgrove loam | 90 | 115 | 33 | 40 | 40 | 47 | 65 | 85 | 2.5 | 5.0 | 27 | 21.8 |
| Millsdale silty clay loam | 65 | 100 | 28 | 38 | 30 | 45 | 50 | 80 | 3.0 | 4.5 | 14 | 9.2 |
| Millsdale stony silty clay loam | | | | | | | | | | | | |
| Milton loam, 0 to 2 percent slopes | 60 | 87 | 22 | 31 | 28 | 40 | 45 | 74 | 2.5 | 3.8 | | 9.5 |
| Milton loam, 2 to 6 percent slopes | 60 | 85 | 22 | 30 | 28 | 40 | 45 | 74 | 2.5 | 3.8 | | |
| Muck | 70 | 105 | 32 | 40 | | | | | | | | |
| Nappanee loam, 0 to 2 percent slopes | 60 | 80 | 23 | 30 | 30 | 35 | 45 | 65 | 1.7 | 3.5 | 15 | 9.5 |
| Nappanee loam, 2 to 6 percent slopes | 58 | 78 | 22 | 29 | 30 | 35 | 45 | 65 | 1.7 | 3.5 | 15 | |
| Nappanee loam, 2 to 6 percent slopes, moderately eroded | 55 | 75 | 21 | 28 | 30 | 35 | 45 | 65 | 1.7 | 3.5 | 14 | |
| Nappanee sandy loam, 0 to 2 percent slopes | 58 | 78 | 21 | 29 | 28 | 35 | 45 | 65 | 1.5 | 3.0 | 15 | 9.2 |
| Nappanee sandy loam, 2 to 6 percent slopes | 56 | 75 | 20 | 28 | 28 | 35 | 45 | 65 | 1.5 | 3.0 | 14 | |
| Nappanee silty clay loam, 0 to 2 percent slopes | 55 | 73 | 20 | 29 | 28 | 35 | 43 | 65 | 1.7 | 3.2 | 14 | 9.5 |
| Nappanee silty clay loam, 2 to 6 percent slopes | 54 | 72 | 20 | 25 | 28 | 35 | 43 | 65 | 1.5 | 3.2 | 14 | |
| Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded | 52 | 70 | 18 | 25 | 28 | 35 | 43 | 65 | 1.5 | 3.2 | 13 | |
| Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes: | | | | | | | | | | | | |
| Ottokee | 57 | 87 | 23 | 32 | 30 | 40 | 50 | 70 | 1.7 | 3.5 | | 9.5 |
| Spinks | 48 | 77 | 19 | 28 | 27 | 39 | 45 | 70 | 1.8 | 3.3 | | |
| Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes: | | | | | | | | | | | | |
| Ottokee | 55 | 87 | 21 | 32 | 30 | 40 | 50 | 70 | 1.7 | 3.5 | | |
| Spinks | 45 | 75 | 18 | 26 | 26 | 38 | 45 | 70 | 1.8 | 3.3 | | |
| Randolph loam, 0 to 2 percent slopes | 65 | 90 | 24 | 32 | 26 | 35 | 40 | 72 | 2.5 | 4.0 | 12 | 9.6 |
| Randolph loam, 2 to 6 percent slopes | 63 | 85 | 22 | 30 | 25 | 33 | 38 | 70 | 2.5 | 4.0 | 12 | 9.5 |
| Randolph stony loam, 0 to 2 percent slopes | | | | | | | | | | | | |

See footnotes at end of table.

TABLE 1.—*Estimated average acre yields of principal crops*—Continued

| Soil | Corn | | Soybeans | | Wheat | | Oats | | Hay [1] | | Tomatoes | Sugar beets |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B | A | B | B [2] | B [3] |
| | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Tons* | *Tons* |
| Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes | 58 | 85 | 22 | 33 | 26 | 35 | 40 | 70 | 1.7 | 3.5 | ---- | 9.2 |
| Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes | 58 | 85 | 22 | 33 | 26 | 35 | 40 | 70 | 1.7 | 3.5 | ---- | ---- |
| Ritchey loam, 0 to 2 percent slopes | 50 | 65 | 18 | 24 | 25 | 35 | 40 | 70 | 1.5 | 3.0 | ---- | ---- |
| Ritchey loam, 2 to 6 percent slopes | 48 | 62 | 17 | 22 | 24 | 33 | 38 | 68 | 1.5 | 3.0 | ---- | ---- |
| Ritchey stony loam, 0 to 2 percent slopes | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Romeo soils, 0 to 2 percent slopes | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1.5 | 3.0 | ---- | ---- |
| Romeo soils, 2 to 6 percent slopes | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1.5 | 3.0 | ---- | ---- |
| St. Clair loam, 2 to 6 percent slopes | 50 | 78 | 20 | 28 | 24 | 38 | 43 | 74 | 2.0 | 3.5 | ---- | ---- |
| St. Clair loam, 6 to 12 percent slopes, moderately eroded | 48 | 70 | 19 | 26 | 22 | 35 | 43 | 70 | 1.7 | 3.0 | ---- | ---- |
| St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded | 48 | 75 | 19 | 26 | 22 | 35 | 43 | 70 | 1.7 | 3.0 | ---- | ---- |
| St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded | 47 | 73 | 18 | 25 | 22 | 35 | 43 | 70 | 1.7 | 3.0 | ---- | ---- |
| St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded | ---- | ---- | ---- | ---- | 20 | 33 | 40 | 65 | 1.5 | 3.0 | ---- | ---- |
| St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes | 60 | 82 | 23 | 33 | 28 | 35 | 40 | 70 | 1.7 | 3.5 | ---- | 9.0 |
| Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes | 60 | 80 | 23 | 32 | 28 | 35 | 40 | 70 | 1.7 | 3.3 | ---- | ---- |
| Shoals loam | 70 | 105 | 26 | 35 | 35 | 40 | 50 | 72 | 1.8 | 4.0 | 15 | 11.9 |
| Shoals silt loam | 70 | 105 | 26 | 35 | 35 | 40 | 50 | 72 | 1.8 | 4.0 | 15 | 11.9 |
| Shoals silty clay loam | 70 | 100 | 26 | 33 | 35 | 40 | 50 | 72 | 1.8 | 4.0 | 15 | 11.7 |
| Shoals and Sloan soils, over limestone | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Sloan silt loam | 80 | 110 | 35 | 42 | 40 | 45 | 65 | 78 | 3.0 | 4.5 | 26 | 20.8 |
| Sloan silty clay loam | 80 | 105 | 35 | 40 | 40 | 45 | 65 | 78 | 3.0 | 4.5 | 25 | 20.2 |
| Spinks fine sand, 2 to 6 percent slopes | 44 | 73 | 18 | 25 | 25 | 37 | 44 | 70 | 1.8 | 3.3 | ---- | ---- |
| Spinks fine sand, 6 to 12 percent slopes | 42 | 70 | 16 | 23 | 24 | 35 | 43 | 66 | 1.8 | 3.0 | ---- | ---- |
| Spinks fine sand, 12 to 18 percent slopes | 40 | 65 | 14 | 21 | 22 | 32 | 40 | 65 | 1.7 | 2.8 | ---- | ---- |
| Spinks loamy fine sand, 2 to 6 percent slopes | 45 | 75 | 18 | 26 | 26 | 38 | 45 | 70 | 1.8 | 3.3 | ---- | ---- |
| Spinks loamy fine sand, 6 to 12 percent slopes | 42 | 70 | 16 | 23 | 24 | 35 | 45 | 70 | 1.8 | 3.0 | ---- | ---- |
| Tedrow loamy fine sand, 0 to 2 percent slopes | 50 | 82 | 20 | 31 | 23 | 34 | 43 | 70 | 2.0 | 3.5 | ---- | 9.5 |
| Tedrow loamy fine sand, 2 to 6 percent slopes | 50 | 80 | 20 | 30 | 22 | 33 | 43 | 70 | 2.0 | 3.5 | ---- | ---- |
| Toledo silty clay | 75 | 110 | 33 | 38 | 35 | 45 | 60 | 80 | 2.5 | 4.5 | 26 | 20.7 |
| Toledo silty clay loam | 75 | 110 | 33 | 38 | 35 | 45 | 60 | 80 | 2.5 | 4.5 | 26 | 20.8 |
| Warners soils, over clay | 75 | 110 | 32 | 40 | 32 | 42 | 60 | 75 | 2.5 | 4.5 | ---- | ---- |
| Wauseon fine sandy loam | 84 | 105 | 31 | 40 | 35 | 42 | 60 | 78 | 2.5 | 4.5 | 28 | 20.8 |
| Wauseon fine sandy loam, over clay | 88 | 120 | 33 | 42 | 40 | 45 | 64 | 80 | 2.5 | 4.5 | 28 | 21.4 |
| Wauseon loamy fine sand | 85 | 110 | 30 | 40 | 35 | 42 | 60 | 78 | 2.5 | 4.5 | 27 | 21.0 |
| Wauseon loamy fine sand, over clay | 85 | 115 | 32 | 41 | 38 | 44 | 62 | 78 | 2.5 | 4.5 | 27 | 21.8 |

[1] Yields in column A are based on a mixture of red clover and timothy; yields in column B are based on the use of best suited legumes or grasses for the soil and for the rotation.

[2] Only above average management considered profitable, units not rated below yield of 12 tons.

[3] Only above average management considered profitable, units not rated below yield of 9 tons.

of organic matter through the utilization of crop residues, green manure, or barnyard manure. Nitrogen fertilizer is used to supplement the nitrogen that crops obtain from the organic matter. It may also be needed to facilitate decomposition of the organic matter and to maintain the proper balance of nitrogen in the soil when residue-producing crops are plowed under. The use of nitrogen fertilizer increases crop yields and residues.

High-quality cover crops and crops that produce large quantities of residue, grown in a predetermined sequence, will add organic matter to the soil. In addition, cover crops break up the beating action of rain. In spring they help to remove excess moisture from the soil; thus, plowing can be done earlier. In fall they provide traction for the equipment used to harvest corn; consequently, there is less compaction of the soil.

Drainage of cropland improves the air-water relationship in the root zone (*11*, *23*, *26*, *28*, *29*). Tile drains or surface drainageways, or both, can be used to remove excess water, but they should be designed to function properly (fig. 7). Land smoothing to correct irregularities of the surface will supplement the drainage system. Good soil structure and an ample supply of organic matter also benefit soil drainage.

The loss of surface soil through erosion reduces soil productivity. Erosion generally can be controlled by reducing the rate and volume of runoff and by increasing the rate of water absorption by the soil. Growing meadow

*Figure 7.*—**Deepening and widening old open ditch to provide improved outlet for tile drain.**

crops, cover crops, or green-manure crops and the proper use of crop residues help to reduce surface runoff. Contour cultivation, stripcropping, and the use of diversions and terraces are other measures effective in controlling erosion.

The following management is suitable for all cropland—

1. Return to the soil, except in areas recently seeded, all crop residues, corn stover, and straw. Straw and other residues may injure young seedlings of grass and legumes. For information on how to seed mulched areas, contact your soil conservationist or county agricultural extension agent.
2. Spread all available manure on the field. Use more in eroded areas than in uneroded areas.
3. Plan for timely plowing, planting, cultivating, and harvesting.
4. Avoid excessive tillage when preparing seedbeds. Do not operate tractors and other machinery on soil that is too wet.
5. Plant suitable crop varieties at the recommended rate. The latest bulletins of the Ohio Agricultural Extension Service provide information on crop varieties and hybrids.
6. Inoculate legume seed.
7. Apply fertilizer and lime according to need, as determined by soil tests.

For a small fee, soil testing service is available through the Ohio Agricultural Extension Service. Tests determine acidity, organic-matter content, and the availability of phosphorus and potassium in the soil. Tests for the minor elements can also be obtained. The proper sampling of a field is important in obtaining a representative test of the soil. To do this, first obtain instructions and containers from your County Agricultural Extension Service (*12*); then refer to that part of the soil survey map that shows your farm, and use it as a guide for sampling. Do not mix unlike soils.

### *Irrigation*

Nearly every year there are periods when crops would be benefited by irrigation. Operators who want to irrigate cropland or pasture should first find a suitable source of water and then determine their legal right to use it. The Ohio Department of Natural Resources has the authority to regulate the use of water in flowing streams. Water from drilled wells can be used for irrigation if the supply is adequate. Water from a pond can be used if the normal flow or supply to a downstream user is not cut off or diminished.

The water supply in Wood County is not sufficient for widespread use of supplemental irrigation. In most areas wells yield only enough water for domestic use. In some places the water contains such impurities as hydrogen sulfide and calcium carbonate in quantities sufficient to be toxic to plants. Therefore, before water is used for irrigation, both the quality and quantity should be considered. These factors, however, should not rule out the irrigation of small areas of specialty crops (*25*).

For a soil to be suitable for irrigation, the surface layer should be porous, or able to absorb water readily; the surface layer and the subsoil should have good water-holding capacity; and the water and air in the subsoil and underlying material should be able to move freely to prevent waterlogging. A permeable soil allows gravitational water to drain freely. It also warms up early in spring.

*Supplemental irrigation should not be considered until all other limitations of production are corrected.* If surface drainage or internal drainage is less than ideal, this condition must be corrected before supplemental irrigation is attempted. Lime and fertilizer should be applied in amounts indicated by soil tests. Adequate amounts of crop residues should be returned to the soil. A crop rotation that helps to keep the soil in good physical condition is essential.

Irrigation systems should be designed by qualified engineers who will take into consideration, among other things, the crop or crops to be irrigated, the water-intake of the soil, the water supply, and the size of the area to be irrigated. The system should be designed to serve the needs of a specific field. Other factors that need to be carefully evaluated are cost of equipment and economy of operation. The Soil Conservation Service and Agricultural Extension Service will supply additional information on irrigation.

### *Field crops*

In general farming, crops are grown both for sale and for use as feed. Cover crops and green-manure crops should receive the same management as cash crops. Corn, wheat, soybeans, meadow crops, and other crops suited to the county can be grown on most of the soils in the county if management is good. Suggested cropping systems and supporting practices designed to control erosion are described in the section "Management by Capability Units." Cropping systems and supporting practices different from those suggested are suitable if they control erosion as effectively.

### *Special crops*

The growing of special crops for commercial sale is of limited extent in Wood County. Only sugar beets and tomatoes are grown on any large acreage. The management needed for these crops is described in detail. The management described for vegetable crops is more general.

*Sugar beets* [4].—Sugar beets require a soil that has high water-holding capacity, relatively high organic-matter content, and enough lime content to insure a pH of 6.5 or 7.0. Deep, dark-colored, medium-textured soils are best suited. However, the level or nearly level, dark-colored, fine-textured soils in the county meet most of the requirements, and many of these soils are used for this purpose. Generally, both surface and internal drainage are needed. Land smoothing is also needed in many areas to prevent ponding.

Important factors in the high production of sugar beets are date of planting, width of the rows, spacing between plants, and use of manure and fertilizer. Maintenance of soil tilth, proper tillage, and timeliness of tillage are also extremely important.

Maximum yields are obtained by planting as early in spring as soil and weather conditions permit. Sugar beets require a porous, well-aerated seedbed. However, tillage should be kept to the minimum needed to develop a level, finely divided, firm seedbed in the uppermost 2 inches. This amount of tillage is essential for good germination. A disk-type opener, equipped with depth bands, will insure uniform planting depth. Dark-colored, fine-textured soils generally are plowed in fall to reduce the time necessary for preparing seedbeds in spring. Rows should be narrow enough and the plants spaced so that each plant can utilize the maximum of the soil surface.

Sugar beets respond to liberal amounts of readily available plant food. They require relatively large amounts of phosphate and potash and respond to phosphate placed close to the seed. The amount of manure, crop residues, and fertilizer used in previous years governs fertilizer recommendations. A soil test should be made to determine the specific amount of lime and fertilizer needed. A starter application of about 100 pounds of a balanced fertilizer in the row is recommended. If soil tests are not available, applications of 10 pounds each of nitrogen, phosphate, and potash generally are satisfactory. A large application of fertilizer is not a substitute for good tilth and good physical condition of the soil.

Sugar beets are damaged by many insects and diseases, but cultural practices and use of chemicals have been effective in keeping insects and diseases under control in Wood County. Damage by disease or insects generally is more severe if sugar beets are grown continuously or if sugar beets follow sod.

In Wood County, sugar beets commonly are grown in a rotation with corn. A rotation that includes 1 or 2 years of a meadow crop that produces large amounts of residue helps to maintain productivity. In the future, yields of sugar beets undoubtedly will be increased by the development of hybrid plants, wider use of chemicals, and better cultural methods. Field evaluation of these factors cannot be made at this time.

[4] Prepared with the assistance of the staff of the Northern Ohio Sugar Company, Findlay, Ohio.

*Tomatoes* [5].—Soil conditions and fertility levels necessary for the high production of most specialty crops are also important in growing tomatoes (*19*).

Tomatoes for commercial processing are an important crop in Wood County. Rainfall and temperature normally are favorable for high yields. Tomatoes grow best when the weather is warm. Poor set commonly occurs if the temperature falls below 55° F. or rises above 95° for several hours when the flowers are open for pollination.

Tomatoes can be grown on a wide range of soils, but they grow best on medium-textured, well-drained soils that have a deep root zone, high available water capacity, and high organic-matter content. In Wood County tomatoes are grown mostly on the dark-colored, heavy Hoytville and Toledo soils. Yields generally are high. High yields are also common on the dark-colored, loamy or sandy Mermill, Millgrove, Colwood, and Wauseon soils, but the control of diseases and of weeds is more difficult on sandy soils. Soils that are low in organic-matter content and rather acid or that are not adequately drained should not be used for tomatoes.

Tomatoes root deeply and are likely to be injured by an excessive amount of water in the soil. They become progressively more susceptible to injury by water as the plant approaches maturity.

If the soil is flooded for a few hours during warm weather, the roots will be damaged, and possibly the plant will die. Consequently, good drainage both within the soil and on the surface is essential. Land smoothing will eliminate low areas where water might stand.

Most of the tomatoes produced in Wood County are from plants imported from Southern States. Plantings, using 4,000 to 6,000 plants per acre, generally are made after May 1 but before May 20. Plantings after May 1 normally are free from frost kill. Information on expected dates of the last killing frost is in the section "Additional Facts About the County."

Good soil preparation is important in the successful culture of tomatoes. Seedbed preparation may be done either in fall or in spring. Fall plowing is common on the heavier Hoytville and Toledo soils. Erodible soils generally are not plowed until spring.

Frequent shallow cultivations, from 1 to 2 inches in depth, are needed. When the tomatoes become large, cultivations should be more shallow and farther from the plants to avoid damaging the wide-spreading root system.

Tomatoes should be grown only once in a 3- or 4-year rotation. A long cropping sequence reduces damage from soil-borne insects and diseases. Using a sod crop in the rotation improves the physical condition of the soil by adding organic matter. Organic matter retains moisture and holds nutrients in an available form. Where the organic-matter content is high, care should be taken in applying nitrogen fertilizer or manure. Excess nitrogen produces heavy vine growth, and heavy vine growth results in poor fruit set, delayed maturity, and slow ripening.

Tomatoes require high fertility levels. Enough lime should be used to maintain a pH of 6.5 to 6.8. The amount of fertilizer used depends on previous management prac-

[5] This section prepared with the assistance of the field representatives of the Campbell Soup Company, Napoleon, Ohio; the Foster Canning Company, Napoleon, Ohio; the Libby, McNeill, Libby Company, Leipsic, Ohio; and the H. J. Heinz Company, Bowling Green, Ohio.

tices, but large applications are justified only if the grower is willing to follow a thorough protection program to control insects and diseases.

Fertilizer applications should be adjusted according to results of soil tests. Successful growers apply fertilizer in many different ways, but the response to fertilizer depends greatly on the physical condition of the soil and on climatic conditions. Because of the amount used, much of the application is broadcast before plowing or deep drilled before planting. On dark-colored soils, a typical application is 600 to 800 pounds of a 6–24–12 fertilizer or its equivalent. A fertilizer high in phosphate should be used at planting time.

*Vegetables.*—Vegetable crops should be planted and harvested early so that the produce will be ready for the most profitable fresh-market sales. Loamy and sandy soils that have good internal drainage are ideal for most vegetable crops. These soils warm up early in spring, absorb moisture readily, and can be tilled throughout a wide range of moisture content. Loamy and sandy soils that are not adequately drained can be adapted for vegetable production. Tile drains, land smoothing, and surface drainageways are effective in removing excess water. The Soil Conservation Service or County Agricultural Extension Service will furnish specific information concerning drainage for special crops.

Vegetable crops require high fertility levels. Soil tests should be followed in planning fertility programs. For most vegetables, soil reaction should be maintained at pH 6.5 to 6.8. A pH of 5.0 to 5.4 helps to control scab if potatoes are grown.

Soils used for vegetables should be high in organic-matter content. Organic matter improves soil tilth, increases infiltration of rainfall or of irrigation water, increases moisture-holding capacity, and supplies plant nutrients. To increase the content of organic matter, crop residues, cover crops, green-manure crops, or large amounts of manure should be plowed under each year.

The Agricultural Extension Service and the Soil Conservation Service will supply information on suitable crop varieties, production methods, control of disease and of insects, and soil requirements for specific crops.

### *Pasture*

Only about 2 percent of the acreage in the county is used for permanent pasture, but most of the soils are suited to high-quality permanent pasture. Green feed for livestock is provided mainly by rotational grazing or by green chopping of meadowland. Beef cattle are mostly dry-lot fed.

Permanent pastures in the county generally are restricted to soils that are shallow to limestone, soils on flood plains, and sloping soils adjacent to these areas. Some soils that have a higher productive potential are used for pasture, but these generally are small areas close to buildings or areas that serve as access lanes. A few open woodlots are used for pasture, but these are rapidly being cleared for crops.

Yields of pasture crops generally are low on shallow soils, such as the Romeo, Ritchey, and Dunbridge, mainly because of their low moisture-supplying capacity. In spring and early in summer when moisture conditions are favorable, bluegrass grows well. The dark-colored Millsdale and Joliet soils and the light-colored Randolph soils are very poorly drained to somewhat poorly drained and are likely to be damaged by trampling if grazed early in spring when the soils are wet. Bluegrass grows well on these soils and responds to fertilization. The addition of legumes to the grass mixture would have little value because there is not sufficient moisture during the summer for the growth of legumes.

The best potential land for permanent pasture in Wood County is on flood plains. Many of the areas are small and are irregular in shape. The possibility of flooding during the growing season limits use for crops. The Eel, Shoals, and Sloan soils, which occur on flood plains, have good moisture-supplying capacity and, therefore, are well suited to legumes. Birdsfoot trefoil grows well and is reasonably tolerant to flooding during the growing season. Shallow soils on flood plains are less affected by droughtiness than shallow soils on uplands, but they are less productive than the deep soils. The growth of bluegrass in spring can be increased by applications of nitrogen fertilizer.

The sloping soils adjacent to flood plains are suited to a wide range of pasture plants. The addition of alfalfa, birdsfoot trefoil, or other legume to the grass mixture will increase yields and lengthen the pasturing season. If legumes are grown, grazing should be discontinued about September 1 to permit regrowth before freezing weather. A balance of grass with alfalfa or clover is necessary to avoid bloat problems. This can be done by varying the amount of nitrogen used. The Nappanee and St. Clair soils occur on breaks to stream bottoms. These soils have a clayey subsoil and will erode if disturbed. In spring a perched or temporary high water table makes them susceptible to damage by trampling. Consequently, care should be taken to prevent damaging the sod on these soils.

Permanent pastures need the same management used for cropland. Grasses respond to an adequate supply of plant nutrients. Lime and fertilizer, applied in amounts indicated by soil tests, will increase yields. Poor drainage should be corrected. Control of weeds by periodic clipping encourages the growth of desirable plants.

## Management of Woodland [6]

The early settlers of Wood County found the area almost entirely covered by a thick, deciduous swamp forest (*21*). A few openings had a cover of grass, interspersed with groves of oak and hickory. These openings occurred on the better drained sandy soils, which now make up the Wauseon-Ottokee-Spinks association and the Belmore association (see the general soil map at the back of this report). At the present time, only about 4.5 percent of the county is wooded. Most of the wooded areas are between 10 and 15 acres in size. A Conservation Needs Study in Wood County, completed in 1959, indicates that by 1975 only 12,740 acres, or slightly more than 3 percent of the acreage, will remain wooded.

Mismanagement, or high grading, of the woodlands has resulted in the removal of the better trees and in the general decline in the quality of the stands. Pasturing of woodlands further reduced the possibility of regrowth of desirable species. In recent years, Dutch elm disease

[6] ROGER HERRETT and BURNIE MAUER, Ohio Division of Forestry, and H. P. GARRITT, woodland conservationist, Soil Conservation Service, assisted in the preparation of this section.

has eliminated many of the larger elms, which in places made up as much as 50 percent of the stand. These factors, in addition to the high value of the land, have led to the rapid clearing of the soils for crops. The forest acreage in the county is not large, and consequently the trend toward further depletion should be reversed in the interest of long-term benefits to the community.

The present woodlands in the county vary in composition, mainly according to the different soil patterns in the county. Except for the species on flood plains, the following list shows the general composition of the woodlands by soil association.

1. Hoytville association and Toledo association.
   Species: black oak, scarlet oak, white oak, bur oak, white ash, and red maple.
2. Belmore association and Wauseon-Ottokee-Spinks association.
   Species: black oak, scarlet oak, and some white oak.
3. Millsdale-Randolph-Romeo association.
   Species: white oak, black oak, white ash, and hickory.
4. Flood plains.
   Species: sycamore, cottonwood, and, in better drained areas, black walnut.

Generally, the composition of natural stands will vary according to the soils in an individual site. High grading, however, probably accounts for the present dominance of less desirable species, such as hickory and scarlet oak. Favoring better species, such as white oak, bur oak, and white ash, and protecting the site from grazing will help to rectify this condition.

Practical procedures of good timber management are not complicated and are within the capabilities of the average land owner. The investment in time and money is not large. Guidance in land-use planning is provided by the Ohio Division of Forestry and by your local Soil Conservation Service office.

The objective of woodland management is to grow a stand of the most valuable trees adapted to the site, in the shortest possible time. The two principal phases of woodland management are (1) adequate stocking of desirable species, and (2) management of the stand after these species have been established. Most desirable species are intolerant of shade. Consequently, clear-cut openings half an acre in size, or larger, should be made either at the time of logging or when defective or otherwise undesirable trees are removed. Periodic cuttings should be made to improve the composition of the stand, to reduce competition from undesirable species, and to stimulate growth of desirable trees. Efforts should be made to prevent fires. Livestock should be excluded at all times.

*Windbreaks.*—Windbreaks meet a genuine need in the county (fig. 8). The land is flat, and the wind has an unobstructed sweep across it. As more of the few remaining woodlands are cleared, the hazard of wind erosion will increase.

The many benefits of windbreaks more than justify the cost of planting. In addition to beautifying their surroundings, farmstead windbreaks protect both buildings and livestock from cold winds, and they provide a haven for birds and small wildlife. Field windbreaks are used principally to control soil blowing, but they also help to slow drying winds in summer and to trap snow in winter. The result is better moisture conditions during the growing season.

***Figure 8.*—Mature windbreak protects farm buildings.**

Norway spruce, white pine, Scotch pine, Austrian pine, and arborvitae are the species considered most suitable for all of the soils in the county, except the soils in mucky areas and on flood plains. Sycamore, silver maple, and cottonwood are the preferred species for planting on these soils.

If trees are to be grown in heavy soil or in thick sod, site preparation should be undertaken during the summer or fall prior to the time of planting. Clean cultivation or close mowing of these areas for several years after planting is beneficial.

*Tree planting.*—Tree planting in the county is confined mainly to small areas or to scattered large areas at institutions. Generally, plantations of native hardwoods are not successfull, because of exposure and soil conditions in old fields. Therefore, except on flood plains and in mucky areas, most plantations consist of conifers. The most desirable species are white pine, Norway spruce, and Austrian pine.

Where there is heavy sod or a thick growth of clover, beds should be prepared with a two-bottom plow, on the contour if necessary. Similar preparation is advisable on heavy soils to facilitate hand planting or to promote closure after machine planting. Preparing the site in this manner helps to improve tilth, aeration, and drainage. Site preparation should be undertaken during the summer or fall prior to the time of planting.

## Wildlife [7]

Most of Wood County was originally a deciduous swamp forest within a larger area called the Great Black Swamp. Wet soils, such as the Hoytville, occupied most of the area. Fish, game birds, and game animals were abundant. Deer, bear, and cougar were common, and there were some elk and bison in the area.

In a short time, there has been a complete change in the wildlife population in Wood County, mainly as a re-

[7] ROGER MCELROY and ROGER HOTHEM, Ohio Division of Wildlife, and GRANVILLE SMITH, field biologist, Soil Conservation Service, assisted in the preparation of this section.

sult of the change in soil cover from almost complete forest to almost complete tillage. Most of the larger game animals once common have disappeared or are seldom seen, and the pollution of streams by industrial wastes and by silting has reduced the population of game and pan fish.

Fishing and hunting are now important recreational activities in the county. Adequate cover, food, and water must be made available if the county is to support large numbers of game birds and animals. Pheasants and rabbits are now the dominant game species.

The abundance of pheasants in the county is thought to be related to soil fertility, provided cover is available. One of the centers of pheasant concentration in Ohio is located in the Wauseon-Ottokee-Spinks soil association, where the population ranges from 80 to 160 per square mile. This is an area of intense cultivation and high production potential. Fertilization of crops is heavy. Small areas of the Ottokee and Spinks soils that are less intensively cultivated than other soils provide cover close to food supplies. The next highest concentration of pheasants is in the Hoytville soil association. Here the population is from 40 to 80 per square mile. The population in the Toledo soil association is 40 or fewer per square mile.

Rabbits prefer areas that provide cover. To a large extent, the amount of cover provided by the cropping sequence determines the population, if food is adequate. Thus, the rabbit population will be low on fertile, intensively cultivated soils, such as the Hoytville, and high on moderately fertile soils that have good cover, such as the Millsdale and Randolph. A cropping sequence that includes 1 or 2 years of a meadow crop is good. The Toledo soil association has the best combination of food and cover in the county for rabbits. In this association, idle land held for investment purposes provides abundant cover, and small areas of fertile soils are intensively cultivated.

The needs of quail closely resemble those of rabbits. Quail, like rabbits, live their life span within an area of a few hundred yards, while pheasants may move from 1 to 3 miles for food and cover. A number of small areas of cover near a source of food are needed for a high population of quail.

The squirrel population has been declining and will continue to decline as more of the wooded areas on the Hoytville, Toledo, Nappanee, and other poorly drained soils are cleared of trees.

Management of soils for wildlife and good farming practices are compatible. There is a good supply of wildlife food, especially grain, in the county, but cover is lacking in the intensively tilled areas. Water is supplied by the many drainage ditches and by ponds. A good sod border will help to protect the ditches and ponds and also will provide cover for wildlife. Conifer plantings around farm ponds will benefit both man and wildlife. Windbreaks not only protect farm buildings and fields but provide travel lanes and nesting places for wildlife. The planting of conifers in areas not used for other purposes will result in an increase in the quail and rabbit population. The use of flushing bars on mowers will save many birds and animals during the nesting season. Cover in meadows will be greatly increased if stubble is clipped a few inches higher. Birds eat many times their weight in weeds, insects, and seeds. Thus, the saving in crops more than compensates for the space needed to give them refuge. Care should be taken if agricultural chemicals and sprays are used in areas reserved for wildlife habitats.

For additional information on management of the soils for wildlife, contact your local game protector, the county extension agent, or a representative of the Soil Conservation Service.

## Engineering Uses of the Soils [8]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important to the engineer are shear strength, drainage, grain size, plasticity, and permeability to water. Compaction characteristics, shrink-swell characteristics, depth to water table, depth to bedrock, topography, and degree of acidity or alkalinity are perhaps as important. These properties and characteristics are discussed in this section.

With the use of the soil map for identification, the engineering interpretations reported here can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of soil properties for use in the planning of soil and water conservation systems, including systems for surface and internal drainage and for storage and supply of water.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways and airports and in planning detailed investigations of the selected locations.
4. Locate probable sources of sand and gravel for use in construction.
5. Correlate performance of engineering structures with types of soil and thus gain information that will be useful in designing and maintaining engineering structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps, reports, and aerial photographs for the purpose of making maps or reports that can be readily used by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to a particular area.

It should be emphasized that the engineering interpretations reported here may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depth of layers here reported. Even in these

[8] JAMES O. EVANS, soil scientist, division of Lands and Soil, Ohio Department of Natural Resources, assisted in the preparation of this section.

situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some terms used by soil scientists may not be familiar to engineers, and other terms—soil, clay, silt, and sand, for example—have special meaning in soil science. These and other terms used in the report are defined in the Glossary at the back of this report.

### *Engineering classification of the soils*

Many highway engineers classify soils according to the system used by the American Association of State Highway Officials (AASHO) (*1*). In this system, soil materials are classified in seven principal groups. The groups range from A–1, which consists of gravelly soils of high bearing capacity, to A–7, which consists of clayey soils that have low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. The numbers range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol, for example, A–6(8).

Some engineers prefer the Unified soil classification system (*31*). In this system, soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic (one class).

Table 2 shows the AASHO and the Unified classification of specified soils as determined by laboratory tests. Table 3 shows the estimated classification of all soils in the county according to both systems.

### *Soil test data*

To be able to make the best use of soil maps and soil survey reports, the engineer should know the physical properties of the soil materials and the in-place condition of the soil. After testing soil materials and observing their behavior in engineering structures, the engineer can develop general design recommendations for the mapping units delineated on the maps.

To help evaluate the soils for engineering purposes, samples of six soil types were tested according to standard procedures. Table 2 gives the results of the tests.

The engineering classifications in table 2 are based on data obtained by mechanical analysis and by tests that determine liquid limit and plasticity index. The mechanical analysis was made by combined sieve and hydrometer methods. The tests that determine liquid limit and plasticity index measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from semisolid to plastic. As the moisture content is further increased, the material changes from plastic to liquid. The *plastic limit* is the moisture content at which the material changes from semisolid to plastic. The *liquid limit* is the moisture content at which the material changes from plastic to liquid. The *plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is plastic.

Table 2 also gives the results of moisture-density (compaction) tests. In these tests, soil material is compacted into a mold several times, each time at a successively higher moisture content, but with the compactive effort remaining constant. The dry density (unit weight) of the compacted material increases as the moisture content increases, until the optimum moisture content is reached. After that, the dry density decreases as the moisture content increases. The highest dry density obtained in the compaction test is the *maximum dry density*, and the corresponding moisture content is the *optimum moisture*. Moisture-density data are important in earthwork because, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density at approximately optimum moisture content.

### *Engineering descriptions of the soils*

Table 3 gives a brief description of the soils mapped in Wood County. Also, it gives estimates of some soil properties significant in engineering, and the engineering classification of the soil material in the principal horizons. The data in table 3 is based on the results of laboratory tests (see table 2), on experience with the same kinds of soils in other counties, and on information in other parts of this report, especially the sections "Descriptions of the Soils" and "Genesis, Classification, and Morphology of the Soils."

Excluded from table 3 are Alluvial land, Made land and Borrow pits, Quarries, and Urban land, all of which are miscellaneous land types. On-site studies are necessary to determine the engineering properties of these land types because the soil material in these units is variable.

In table 3, depth to the high water table refers to the shallowest depth at which saturated soil material occurs in winter and early in spring because of a perched or other ground-water table. If less than normal precipitation falls during the wet season, saturated soil material may be at a considerably greater depth than that shown in the table. Soil conditions immediately after heavy precipitation are not considered. In all soils, but particularly in those in sloping areas and on uplands, the depth to the water table is greater late in spring, in summer, and in fall than the depth shown in table 3.

Depth to bedrock refers to depth to noncompressible material. In many places the depth is as much as 50 or 80 feet, although it is shown in the table as more than 4, 8, or 10 feet. The depth shown in the table is the minimum depth encountered in scattered field tests.

Permeability, expressed in inches per hour, refers to the movement of water through undisturbed (not compacted) soil material. Permeability of a soil depends largely on the texture and structure of the soil material.

The available water capacity, expressed in inches of water per inch of soil, represents the amount of water that is readily available to plants. This amount of water will wet an air-dry soil to a depth of 1 inch.

The shrink-swell potential is an indication of the change in volume to be expected with a change in moisture content. Soils that have high shrink-swell potential normally are considered undesirable for engineering purposes because increase in volume generally is accompanied by loss in bearing capacity. Also, there is an increase in pressure against walls and floors initially in contact with the soil in a dry state.

TABLE 2.—*Engineering*

[Tests performed by the Ohio Department of Highways according to standard

| Soil name and location | Parent material | Ohio highway report No. | Depth | Horizon | Moisture-density data [1] | |
|---|---|---|---|---|---|---|
| | | | | | Maximum dry density | Optimum moisture |
| | | | *In.* | | *Lb. per cu. ft.* | *Pct.* |
| Fulton silty clay loam: SW¼SE¼ sec. 35, Ross Township. | Lacustrine clay and silt. | [5] | 0 to 7½ | Ap and A2 | [7] | [7] |
| | | 93524 | 7½ to 36 | B1 and B2 | 104 | 21 |
| | | [5] | 36 to 73 | C1 | [7] | [7] |
| | | [5] | 73 to 94 | IIC2 | [7] | [7] |
| Haskins loam: NW¼NW¼ sec. 36, Lake Township. | Mixed lacustrine outwash. | [5] | 0 to 9 | Ap | [7] | [7] |
| | | 93517 | 9 to 41 | B1, B2, and B3. | 122 | 11 |
| | | 93518 | 41 to 75 | IIC | 114 | 16 |
| Hoytville clay loam: NE¼SW¼ sec. 18, T. 3 N., R. 10 E. | Lacustrine till enriched with clay. | 41038 | 0 to 7 | Ap | 114 | 14 |
| | | 41039 | 7 to 38 | B2 | 106 | 17 |
| | | 41040 | 38 to 96 | C1 and C2 | 97 | 21 |
| Kibbie fine sandy loam: SE¼SE¼ sec. 17, Grand Rapids Township. | Lacustrine sand and silt. | 93519 | 0 to 15 | Ap and A2 | 118 | 10 |
| | | 93520 | 15 to 36 | B1, B2, and B3. | 115 | 14 |
| | | 93521 | 36 to 73 | C | 108 | 13 |
| Nappanee silt loam: SW¼SW¼ sec. 3, Portage Township in Hancock County. | Glacial till. | 96677 | 0 to 7 | Ap | 104 | 19 |
| | | 96678 | 7 to 22 | B2 | 106 | 19 |
| | | 96679 | 22 to 94+ | C | 112 | 15 |
| Toledo silty clay: SE¼NE¼ sec. 35, Ross Township. | Lacustrine clay and silt. | [5] | 0 to 10½ | Ap and A1 | [7] | [7] |
| | | [5] | 10½ to 45½ | B1g and B2g | [7] | [7] |
| | | 93522 | 45½ to 82 | C1 | 102 | 21 |
| | | 93523 | 82 to 95 | IIC2 | 107 | 19 |

[1] Based on AASHO Designation: T 99–57, Method A (*1*).
[2] Mechanical analysis according to AASHO Designation: T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis used in this table are not suitable for naming textural classes for soils.

*test data*

procedures of the American Association of State Highway Officials (AASHO) (*1*)]

| Mechanical analysis [2] | | | | | | | Liquid limit | Plasticity index | Classification | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | | | Percentage smaller than 0.005 mm. | | | AASHO | Unified [3] | Ohio Highway Dept.[4] |
| ⅜-in. | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 60 (0.25 mm.) | No. 200 (0.074 mm.) | | | | | | |
| ------- | ------- | 100 | 99 | ([7]) | 95 | 48 | 33 | 11 | A-6(8) | ML-CL | A-6a. |
| ------- | ------- | 100 | 99 | 99 | 98 | 54 | 52 | 28 | A-7-6(18) | CH | A-7-6. |
| ------- | 100 | 98 | 97 | ([7]) | 95 | 53 | 34 | 15 | A-6(10) | CL | A-6a. |
| 100 | 98 | 96 | 93 | ([7]) | 86 | 54 | 28 | 11 | A-6(8) | CL | A-6a. |
| ------- | 100 | 98 | 92 | ([7]) | 60 | 29 | 27 | 4 | A-4(5) | ML-CL | A-4a. |
| ------- | ------- | 100 | 95 | 86 | 65 | 25 | 22 | 7 | A-4(6) | ML-CL | A-4a. |
| 100 | 99 | 96 | 92 | 89 | 82 | 41 | 34 | 13 | A-6(9) | CL | A-6a. |
| ------- | ------- | 100 | 94 | 91 | 81 | 51 | 35 | 12 | A-6(9) | ML-CL | A-6a. |
| ------- | ------- | 100 | 98 | 96 | 87 | 56 | 46 | 27 | A-7-6(16) | CL | A-7-6. |
| 100 | 99 | 98 | 96 | 93 | 84 | 52 | 46 | 16 | A-7-6(11) | ML-CL | A-7-6. |
| ------- | ------- | 100 | 98 | 92 | 38 | 10 | ([6]) | ([6]) | A-4(1) | SM | A-4a. |
| ------- | ------- | 100 | 98 | 96 | 66 | 34 | 26 | 10 | A-4(6) | CL | A-4a. |
| ------- | 100 | 99 | 98 | 95 | 15 | 2 | ([6]) | ([6]) | A-2-4(0) | SM | A-3a. |
| ------- | ------- | 100 | 95 | ([7]) | 81 | 37 | 33 | 8 | A-4(8) | ML-CL | A-4a. |
| 100 | 99 | 97 | 94 | ([7]) | 80 | 50 | 48 | 23 | A-7-6(15) | CL | A-7-6. |
| 100 | 98 | 95 | 90 | ([7]) | 78 | 45 | 33 | 13 | A-6(9) | CL | A-6a. |
| ------- | ------- | 100 | 99 | ([7]) | 97 | 56 | 50 | 19 | A-7-5(14) | ML | A-7-5. |
| ------- | ------- | 100 | 99 | ([7]) | 97 | 57 | 46 | 24 | A-7-6(15) | CL | A-7-6. |
| ------- | 100 | 98 | 96 | ([7]) | 91 | 47 | 38 | 17 | A-6(11) | CL | A-6b. |
| 100 | 99 | 95 | 91 | ([7]) | 89 | 46 | 33 | 14 | A-6(10) | CL | A-6a. |

[3] SCS and the Bureau of Public Roads (BPR) have agreed to consider that all the soils having plasticity indexes within two points from A-line are to be given a borderline classification.

[4] Based on classification of soils, Ohio State Highway Testing Laboratory, February 1, 1955.

[5] Tests on this horizon performed by the Division of Lands and Soil, Ohio Department of Natural Resources, at the Soil Physics Laboratory, Ohio State University, according to standard procedures of AASHO.

[6] Nonplastic.

[7] No data available.

TABLE 3.—*Brief description of the soils, and*

| Map symbol | Soil | Description of soil | Depth to seasonally high water table | Depth to bedrock | Depth from surface |
|---|---|---|---|---|---|
| | | | | | *Inches* |
| BmB<br>BnB | Belmore loam, 1 to 4 percent slopes.<br>Belmore sandy loam, 1 to 4 percent slopes. | Light-colored, well-drained sandy loam or loam over sandy and gravelly material; calcareous clay or clay loam till at a depth of 48 inches or more; few large boulders and some cobblestones; on beach ridges, terraces, and outwash plains. | 4 feet or more. | More than 8 feet. | 0–8<br>8–25<br>25–40<br>40–60+ |
| Cs<br>Co | Colwood fine sandy loam.<br>Colwood loam. | Dark-colored, very poorly drained, lake-laid soils that overlie calcareous fine sand and silt. | Water table is at the surface. | More than 8 feet. | 0–7<br>7–38<br>38–48+ |
| Dm<br>Dn | Digby loam, 0 to 2 percent slopes.<br>Digby sandy loam, 0 to 2 percent slopes. | Light-colored, somewhat poorly drained loam or sandy loam over sandy and gravelly material; calcareous clay or clay loam till at a depth of 48 inches or more; on beach ridges, stream terraces, and outwash plains. | 6 inches or more. | More than 8 feet. | 0–8<br>8–35<br>35–48+ |
| Dr | Dunbridge sandy loam, 0 to 2 percent slopes. | Light-colored, well-drained sandy soil over limestone. | 20 to 42 inches. | 20 to 42 inches. | 0–10<br>10–14<br>14–30 |
| Ds<br>DsB<br>Dx | Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes.<br>Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes.<br>Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes. | Dunbridge: Light-colored, well-drained sandy soils over limestone; some boulders and cobblestones.<br>Spinks: Light-colored, well-drained sandy soils over limestone. | 10 to 42 inches.<br>More than 3½ feet. | 10 to 42 inches.<br>More than 3½ feet. | 0–8<br>8–14<br>14–26<br>0–9<br>9–51 |
| Ea<br>Em | Eel loam.<br>Eel silt loam. | Moderately well drained loam or silt loam on first bottoms; subject to occasional flooding. | 18 inches or more. | More than 4 feet. | 0–8<br>8–20<br>20–48+ |
| Er | Eel silt loam, over limestone. | Moderately well drained silt loam on first bottoms; subject to occasional flooding. | 18 inches or more | 20 to 42 inches. | 0–9<br>9–34 |
| Fu<br>FuB | Fulton silty clay loam, 0 to 2 percent slopes.<br>Fulton silty clay loam, 2 to 6 percent slopes. | Light-colored, somewhat poorly drained soils that developed from calcareous, lacustrine clay or silty clay. | 6 inches or more; water table is at or near the surface during winter and spring. | More than 8 feet. | 0–11<br>11–36<br>36–85+ |
| Gm<br>Gn | Genesee loam.<br>Genesee silt loam. | Well-drained loam or silt loam on first bottoms; subject to occasional flooding. | 2 feet or more. | More than 4 feet. | 0–9<br>9–15<br>15–42+ |
| Hd<br>HdB<br>Hn<br>HnB | Haney loam, 0 to 2 percent slopes.<br>Haney loam, 2 to 6 percent slopes.<br>Haney sandy loam, 0 to 2 percent slopes.<br>Haney sandy loam, 2 to 6 percent slopes. | Light-colored, moderately well drained loam or sandy loam over sandy and gravelly material; calcareous clay or clay loam at a depth of 48 inches or more; on beach ridges, stream terraces, and outwash plains. | More than 30 inches. | More than 8 feet. | 0–7<br>7–34<br>34–48+ |
| Ht<br>HtB | Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes.<br>Haskins and Digby fine sandy loams, over clay, 2 to 6 percent slopes. | Haskins: Light-colored, somewhat poorly drained soils underlain by calcareous clay or clay loam at a depth of 18 to 42 inches; on beach ridges, stream terraces, and outwash plains. | 6 inches or more. | More than 8 feet. | 0–6<br>6–36<br>36–42<br>42–46+ |

See footnotes at end of table.

*their estimated physical and chemical properties*

| Classification | | | Percentage passing sieve— | | | Permeability | Available water capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|---|
| USDA texture | Unified | AASHO | No. 4 (4.7mm.) | No. 10 (2.0mm.) | No. 200 (0.074mm.) | | | | |
| | | | | | | *Inches per hour* | *Inches per inch of soil* | *pH* | |
| Loam | ML | A-4 | 89–99 | 82–92 | 52–62 | 2.5–9.5 | 0.15–0.17 | 6.1–6.5 | Moderate. |
| Sandy clay loam | SC, CL | A-4 | 88–98 | 85–95 | 45–55 | 1.7–2.5 | 0.14–0.18 | 6.1–6.5 | Moderate. |
| Clay loam or sandy clay loam. | CL | A-6, A-4 | 88–98 | 85–95 | 55 85 | 1.7–2.5 | 0.14–0.18 | 6.1–6.5 | Moderate. |
| Loamy sand | SM | A-2 | 60–100 | 75–85 | 25–35 | 4.5–10.0 | 0.02–0.05 | [1] | Low. |
| Fine sandy loam | SM, ML | A-4 | 95–100 | 90–100 | 45–60 | 5.0–10.0 | 0.11–0.14 | 5.8–6.2 | Moderate. |
| Sandy clay loam | CL | A-4 | 95–100 | 90–100 | 55–70 | 1.7–2.5 | 0.10–0.12 | 6.1–6.5 | Moderate. |
| Loam | ML, CL, SM. | A-4 | 85–100 | 80–100 | 30–70 | 0.1–0.8 | 0.14–0.16 | [1] | Moderate. |
| Loam | ML | A-4 | 95–100 | 85–95 | 60–70 | 2.5–5.0 | 0.15–0.19 | 5.8–6.5 | Moderate. |
| Clay loam or loam | CL, ML | A-6, A-4 | 95–100 | 90–100 | 65–75 | 1.0–3.0 | 0.11–0.18 | 5.4–6.5 | Moderate. |
| Loamy sand and gravel | GM, SM | A-1, A-2 | 50–100 | 30–75 | 20–30 | 2.5–5.5 | 0.04–0.08 | [1] | Low. |
| Sandy loam | SM | A-2 | 95–100 | 95–100 | 36–46 | 5.0–10.0 | 0.10–0.12 | 6.1–6.5 | Low. |
| Sandy loam | SM | A-2 | 95–100 | 95–100 | 36–50 | 5.0–10.0 | 0.09–0.10 | 6.1–6.5 | Moderate. |
| Sand | SM | A-2 | 95–100 | 95–100 | 15–25 | 5.0–10.0 | 0.04–0.10 | 6.3–6.8 | Low. |
| Loamy fine sand | SM | A-2 | 95–100 | 90–100 | 23–33 | 2.5–5.5 | 0.14–0.16 | 6.0–6.5 | Low. |
| Loamy fine sand | SM | A-2 | 95–100 | 90–100 | 22–32 | 2.5–5.5 | 0.11–0.15 | 6.0–6.5 | Low. |
| Fine sand | SM | A-2 | 95–100 | 90–100 | 15–25 | 2.5–5.5 | 0.04–0.10 | 6.0–6.7 | Low. |
| Loamy fine sand | SM | A-2 | 90–100 | 85–100 | 20–35 | 2.5–10.0 | 0.11–0.15 | 6.4–6.8 | Low. |
| Loamy fine sand | SM, SP | A-2 | 90–100 | 85–100 | 18–30 | 2.5–10.0 | 0.08–0.12 | 6.4–7.2 | Low. |
| Silt loam | ML | A-4 | 95–100 | 90–100 | 80–90 | 0.8–2.5 | 0.16–0.19 | 6.6–6.8 | Moderate. |
| Clay loam | CL | A-6 | 95–100 | 90–100 | 75–85 | 0.05–0.2 | 0.15–0.18 | 6.8–6.9 | Moderate. |
| Loam | ML, CL | A-4 | 95–100 | 90–100 | 55–65 | 0.2–2.5 | 0.13–0.15 | 6.9–7.1 | Moderate. |
| Silt loam | ML, CL | A-4 | 95–100 | 95–100 | 82–92 | 0.8–2.5 | 0.16–0.19 | 6.8–7.4 | Moderate. |
| Silt loam | ML, CL | A-4 | 95–100 | 95–100 | 78–90 | 0.8–2.5 | 0.14–0.16 | 7.2–7.8 | Moderate. |
| Silty clay loam | CL | A-6, A-7 | 95–100 | 95–100 | 85–100 | 0.2–0.8 | 0.15–0.18 | 5.3–5.7 | Moderate. |
| Silty clay | CH | A-7 | 95–100 | 95–100 | 85–100 | 0.05–0.2 | 0.10–0.14 | 5.7–7.2 | High. |
| Silty clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 95–100 | 85–100 | 0.05–0.2 | 0.04–0.10 | [1] | Moderate to high. |
| Silt loam | ML, CL | A-4 | 95–100 | 95–100 | 83–93 | 0.2–1.2 | 0.17–0.20 | 6.1–6.5 | Moderate. |
| Silt loam | CL | A-6 | 95–100 | 90–100 | 79–89 | 0.2–0.8 | 0.16–0.19 | 6.6–7.3 | Moderate. |
| Loam | ML, CL | A-4 | 95–100 | 90–100 | 70–80 | 0.2–2.5 | 0.14–0.18 | 6.6–7.3 | Moderate. |
| Loam | ML, CL | A-4 | 95–100 | 85–95 | 55–75 | 1.0–10.0 | 0.14–0.18 | 6.3–7.1 | Moderate. |
| Clay loam or loam | CL, ML | A-6, A-4 | 96–100 | 85–98 | 60–70 | 0.2–1.0 | 0.15–0.17 | 6.1–6.8 | Moderate. |
| Loamy sand and gravel. | GM, SM | A-1, A-2 | 50–100 | 40–95 | 15–35 | 0.5–2.0 | 0.01–0.05 | [1] | Low. |
| Loam | ML, CL | A-4 | 95–100 | 85–95 | 62–72 | 1.0–10.0 | 0.14–0.18 | 5.6–6.0 | Moderate. |
| Sandy clay loam | SC, CL | A-4, A-6 | 95–100 | 90–100 | 45–60 | 0.2–1.0 | 0.12–0.16 | 5.7–6.4 | Moderate. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 90–100 | 75–90 | 0.05–0.2 | 0.05–0.10 | 6.8–7.3 | Moderate to high. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 95–100 | 75–90 | 0.05–0.2 | 0.04–0.10 | [1] | Moderate to high. |

TABLE 3.—*Brief description of the soils, and their*

| Map symbol | Soil | Description of soil | Depth to seasonally high water table | Depth to bedrock | Depth from surface |
|---|---|---|---|---|---|
| | | | | | *Inches* |
| Hs<br>HsB | Haskins and Digby loams, over clay, 0 to 2 percent slopes.<br>Haskins and Digby loams, over clay, 2 to 6 percent slopes. | Digby, over clay: Light-colored, somewhat poorly drained loam or fine sandy loam over sandy and gravelly material; calcareous clay or clay loam at a depth of 48 inches. | 6 inches or more. | More than 8 feet. | 0–8<br>8–34<br>34–37<br>37–42+ |
| Hv<br>Hy<br>Hw | Hoytville clay.<br>Hoytville clay loam.<br>Hoytville clay, thin solum variant. | Dark-colored, very poorly drained soils that developed from calcareous clay or clay loam till; few boulders. | Water table is at the surface. | More than 4 feet. | 0–8<br>8–40<br>40–62+ |
| Jo | Joliet silty clay loam. | Dark-colored, very poorly drained soil that developed from calcareous clay or clay loam till 10 to 20 inches thick over limestone; few boulders and cobblestones. | Water table is at the surface. | 10 to 20 inches. | 0–6<br>6–16 |
| Kf<br>KfB<br>Ks | Kibbie fine sandy loam, 0 to 2 percent slopes.<br>Kibbie fine sandy loam, 2 to 6 percent slopes.<br>Kibbie loamy fine sand, 0 to 2 percent slopes. | Light-colored, somewhat poorly drained soils that developed from calcareous, lacustrine fine sand and silt. | 6 inches or more. | More than 8 feet. | 0–16<br>16–33<br>33–57+ |
| Mf<br>Mg | Mermill fine sandy loam.<br>Mermill sandy clay loam. | Dark-colored, very poorly drained soils underlain by calcareous clay or clay loam at a depth of 18 to 48 inches; at the base of beach ridges and in depressions on outwash plains. | Water table is at the surface. | More than 10 feet. | 0–8<br>8–38<br>38–60+ |
| Mb | Millgrove loam. | Dark-colored, very poorly drained loam over sandy and gravelly material; calcareous clay or clay loam at a depth of 48 inches or more. | Water table is at the surface. | More than 10 feet. | 0–8<br>8–21<br>21–43+ |
| Mh<br>Mm | Millsdale silty clay loam.<br>Millsdale stony silty clay loam. | Dark-colored, very poorly drained, moderately fine textured soils underlain by limestone; few boulders and cobblestones. | Water table is at the surface. | 20 to 42 inches. | 0–7<br>7–18<br>18–36 |
| Mn<br>MnB | Milton loam, 0 to 2 percent slopes.<br>Milton loam, 2 to 6 percent slopes. | Light-colored, moderately well drained or well drained soils that developed from calcareous clay or clay loam till over limestone. | 20 to 42 inches. | 20 to 42 inches. | 0–7<br>7–26<br>26–40 |
| Mu | Muck. | Very dark colored, very poorly drained soil that consists of organic material 8 to 36 inches thick over loamy fine sand or sand 1 to 12 inches thick; calcareous clay or silty clay is at a depth of 10 to 48 inches. | Soil may be ponded during winter and spring. | More than 8 feet. | 0–13<br>13–28<br>28–46+ |
| Na<br>NaB<br>NaB2<br>Ns<br>NsB<br>Nt<br>NtB<br>NtB2 | Nappanee loam, 0 to 2 percent slopes.<br>Nappanee loam, 2 to 6 percent slopes.<br>Nappanee loam, 2 to 6 percent slopes, moderately eroded.<br>Nappanee sandy loam, 0 to 2 percent slopes.<br>Nappanee sandy loam, 2 to 6 percent slopes.<br>Nappanee silty clay loam, 0 to 2 percent slopes.<br>Nappanee silty clay loam, 2 to 6 percent slopes.<br>Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded. | Light-colored, somewhat poorly drained soils that developed from calcareous clay or clay loam till. | 6 inches or more. | More than 4 feet | 0–12<br>12–22<br>22–60+ |

See footnotes at end of table.

*estimated physical and chemical properties*—Continued

| Classification | | | Percentage passing sieve— | | | Permeability | Available water capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|---|
| USDA texture | Unified | AASHO | No. 4 (4.7mm.) | No. 10 (2.0mm.) | No. 200 (0.074mm.) | | | | |
| | | | | | | *Inches per hour* | *Inches per inch of soil* | *pH* | |
| Loam | ML, CL | A-4 | 95-100 | 85-95 | 60-70 | 1.0-9.5 | 0.14-0.16 | 5.6-6.5 | Moderate. |
| Clay loam | CL | A-6 | 95-100 | 90-100 | 65-75 | 1.0-3.0 | 0.14-0.18 | 5.1-6.5 | Moderate. |
| Loamy sand and gravel | SM | A-2 | 50-100 | 30-90 | 15-30 | 2.5-5.5 | 0.04-0.08 | 6.6-7.8 | Low. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 95-100 | 75-90 | 0.05-0.2 | 0.05-0.10 | (1) | Moderate to high. |
| Clay | CH | A-7 | 95-100 | 95-100 | 77-87 | 0.2-0.8 | 0.11-0.15 | 6.4-6.8 | High. |
| Clay | CH | A-7 | 95-100 | 95-100 | 83-93 | 0.05-0.2 | 0.11-0.15 | 6.8-7.1 | High. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 95-100 | 75-90 | 0.05-0.2 | 0.05-0.10 | (1) | Moderate to high. |
| Silty clay loam | CL | A-7 | 95-100 | 95-100 | 87-97 | 0.2-0.8 | 0.11-0.15 | 6.5-7.0 | Moderate. |
| Silty clay | CH | A-7 | 95-100 | 95-100 | 90-100 | 0.05-0.2 | 0.07-0.14 | 7.0-7.5 | High. |
| Fine sandy loam | SM | A-4 | 95-100 | 95-100 | 41-51 | 5.5-15.0 | 0.12-0.16 | 6.6-7.0 | Low. |
| Clay loam | CL | A-6 | 95-100 | 95-100 | 73-83 | 2.5-5.5 | 0.12-0.15 | 7.0-7.3 | Moderate. |
| Loamy sand | SM | A-4 | 95-100 | 95-100 | 35-45 | 2.0-15.0 | 0.08-0.11 | (1) | Low. |
| Sandy clay loam | CL | A-6 | 95-100 | 85-95 | 56-66 | 5.0-15.0 | 0.14-0.17 | 6.4-6.7 | Moderate. |
| Clay loam | CL | A-6 | 95-100 | 90-100 | 65-75 | 0.8-5.0 | 0.15-0.18 | 6.7-7.2 | Moderate. |
| Clay loam, clay | CL, CH | A-6, A-7 | 95-100 | 90-100 | 75-90 | 0.05-0.2 | 0.05-0.10 | (1) | Moderate to high. |
| Loam | CL | A-6 | 96-100 | 90-100 | 53-63 | 2.2-10.0 | 0.12-0.16 | 5.9-6.2 | Moderate. |
| Loam | CL | A-6 | 96-100 | 90-100 | 50-60 | 2.2-5.0 | 0.11-0.15 | 6.2-6.6 | Moderate. |
| Loamy sand and gravel | SM | A-2 | 96-100 | 65-75 | 20-30 | 5.0-15.0 | 0.04-0.08 | 6.6-6.8 | Low. |
| Silty clay loam | CL | A-7 | 95-100 | 95-100 | 82-92 | 0.2-0.8 | 0.12-0.15 | 6.4-7.3 | Moderate. |
| Silty clay | CH | A-7 | 95-100 | 95-100 | 85-95 | 0.05-0.2 | 0.11-0.15 | 6.6-7.3 | High. |
| Clay loam | CL | A-7 | 95-100 | 95-100 | 75-85 | 0.05-0.2 | 0.08-0.15 | 7.2-7.7 | High. |
| Loam | CL | A-6 | 95-100 | 90-100 | 61-71 | 0.5-2.5 | 0.12-0.15 | 6.2-6.9 | Moderate. |
| Clay loam | CL | A-7 | 95-100 | 90-100 | 75-85 | 0.5-2.5 | 0.11-0.16 | 6.6-7.3 | Moderate. |
| Clay loam | CL | A-7 | 95-100 | 90-100 | 73-83 | 0.2-2.5 | 0.08-0.14 | 6.6-7.7 | Moderate. |
| Muck | Pt | (2) | (2) | (2) | (2) | 0.8-5.0 | 0.2-0.3 | 5.6-6.5 | Low. |
| Loamy fine sand | SM, ML | A-4 | 95-100 | 95-100 | 45-55 | 0.2-0.8 | 0.1-0.14 | 6.6-7.8 | Moderate. |
| Clay or silty clay | CH | A-7 | 95-100 | 95-100 | 87-97 | 0.05-0.2 | 0.13-0.17 | (1) | High. |
| Loam | CL | A-4 | 95-100 | 95-100 | 72-82 | 0.5-1.5 | 0.13-0.16 | 5.4-5.8 | Moderate. |
| Clay | CH | A-7 | 95-100 | 95-100 | 79-89 | 0.1-0.5 | 0.10-0.18 | 5.7-7.1 | High. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 95-100 | 75-90 | 0.05-0.2 | 0.05-0.10 | (1) | Moderate to high. |

TABLE 3.—*Brief description of the soils, and their*

| Map symbol | Soil | Description of soil | Depth to seasonally high water table | Depth to bedrock | Depth from surface |
|---|---|---|---|---|---|
| | | | | | *Inches* |
| Os | Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes. | Ottokee: Light-colored, moderately well drained deep sandy soils. | 18 inches or more. | More than 10 feet. | 0–11<br>11–47<br>47–60+ |
| OsB | Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes. | Spinks: Light-colored, well-drained, deep sandy soils. | 4 feet or more. | More than 10 feet. | 0–7<br>7–48<br>48–100+ |
| Rb<br>RbB<br>Rd | Randolph loam, 0 to 2 percent slopes.<br>Randolph loam, 2 to 6 percent slopes.<br>Randolph stony loam, 0 to 2 percent slopes. | Light-colored, somewhat poorly drained soils that developed from calcareous clay or clay loam till overlying limestone; few boulders and cobblestones. | 6 inches or more. | 20 to 42 inches. | 0–10<br>10–24<br>24–32 |
| Rf<br>RfB | Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes.<br>Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes. | Rimer: Light-colored, somewhat poorly drained sandy soils; calcareous clay or clay loam at a depth of 18 to 36 inches; unstable when saturated. | 6 inches or more. | More than 10 feet. | 0–9<br>9–28<br>28–33<br>33–42+ |
| | | Tedrow, over clay: Light-colored, somewhat poorly drained sandy soils; clay at a depth of 30 to 48 inches; unstable when saturated. | 6 inches or more. | More than 10 feet. | 0–14<br>14–34<br>34–42+ |
| Rh<br>RhB<br>Rk | Ritchey loam, 0 to 2 percent slopes.<br>Ritchey loam, 2 to 6 percent slopes.<br>Ritchey stony loam, 0 to 2 percent slopes. | Light-colored, well-drained loamy soils over limestone; some boulders and cobblestones. | 10 to 20 inches. | 10 to 20 inches. | 0–8<br>8–16 |
| Rs<br>RsB | Romeo soils, 0 to 2 percent slopes.<br>Romeo soils, 2 to 6 percent slopes. | Well-drained silty and clayey soils over limestone; few boulders and cobblestones. | 0 to 10 inches. | 0 to 10 inches. | 0–10 |
| SaB<br>SaC2<br>SbB2<br>SbC2<br>SbD2<br>SbE2 | St. Clair loam, 2 to 6 percent slopes.<br>St. Clair loam, 6 to 12 percent slopes, moderately eroded.<br>St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded.<br>St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded.<br>St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded.<br>St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded. | Light-colored, moderately well drained soils that developed from calcareous clay loam or clay till; on slopes adjacent to streams; subject to seepage in spots; steeper slopes subject to erosion. | 18 inches or more. | More than 4 feet. | 0–8<br>8–18<br>18–62+ |
| Sf | Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes. | Seward: Light-colored, moderately well drained loamy fine sand; calcareous clay or clay loam at a depth of 18 to 36 inches; subject to seepage in spots. | 18 inches or more. | More than 10 feet. | 0–8<br>8–24<br>24–40<br>40–45 |

See footnote at end of table.

*estimated physical and chemical properties*—Continued

| Classification | | | Percentage passing sieve— | | | Permeability | Available water capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|---|
| USDA texture | Unified | AASHO | No. 4 (4.7mm.) | No. 10 (2.0mm.) | No. 200 (0.074mm.) | | | | |
| | | | | | | *Inches per hour* | *Inches per inch of soil* | *pH* | |
| Loamy fine sand | SM | A-2 | 95–100 | 98–100 | 23–33 | 5.0–12.0 | 0.07–0.10 | 6.2–6.6 | Low. |
| Loamy fine sand | SM, SP | A-2 | 95–100 | 98–100 | 19–29 | 5.0–12.0 | 0.04–0.08 | 6.6–6.9 | Low. |
| Loamy fine sand | SM, SP | A-2 | 95–100 | 98–100 | 20–30 | 5.0–12.0 | 0.04–0.08 | (1) | Low. |
| Loamy fine sand | SM | A-2 | 95–100 | 95–100 | 20–35 | 5.0–12.0 | 0.07–0.10 | 6.1–6.8 | Low. |
| Loamy fine sand | SM, SP | A-2 | 95–100 | 90–100 | 15–30 | 5.0–12.0 | 0.04–0.08 | 6.1–6.8 | Low. |
| Fine sand | SP-SM, SM. | A-2, A-3 | 95–100 | 90–100 | 8–25 | 5.0–12.0 | 0.04–0.08 | (1) | Low. |
| Loam | CL | A-4 | 95–100 | 90–100 | 65–75 | 1.0–5.0 | 0.14–0.18 | 5.6–6.4 | Moderate. |
| Silty clay loam | CL | A-7 | 95–100 | 95–100 | 87–97 | 0.2–1.0 | 0.13–0.18 | 6.1–7.0 | Moderate. |
| Clay loam | CL | A-7 | 95–100 | 88–100 | 70–80 | 0.2–1.0 | 0.12–0.16 | 7.0–8.0 | Moderate. |
| Loamy fine sand | SM | A-2 | 95–100 | 90–100 | 23–33 | 5.0–12.0 | 0.12–0.14 | 6.2–6.4 | Low. |
| Sandy loam | SM | A-2, A-4 | 95–100 | 90–100 | 30–45 | 5.0–12.0 | 0.08–0.12 | 6.3–6.9 | Low. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 90–100 | 75–90 | 0.05–0.2 | 0.07–0.12 | 6.3–6.9 | Moderate to high. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 90–100 | 75–90 | 0.05–0.2 | 0.05–0.10 | (1) | Moderate to high. |
| Loamy fine sand | SM | A-2 | 95–100 | 90–100 | 15–35 | 5.0–12.0 | 0.12–0.14 | 6.1–6.5 | Low. |
| Fine sand | SM, SP-SM | A-2, A-3 | 95–100 | 90–100 | 8–18 | 5.0–12.0 | 0.08–0.12 | 6.1–6.5 | Low. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 90–100 | 75–90 | 0.05–0.2 | 0.05–0.10 | (1) | Moderate to high. |
| Loam | CL | A-4 | 90–100 | 85–100 | 68–78 | 1.0–5.0 | 0.14–0.16 | 6.6–7.3 | Moderate. |
| Loam or clay loam | CL | A-4, A-6 | 90–100 | 85–100 | 64–74 | 1.0–2.5 | 0.12–0.14 | 6.6–7.3 | Moderate. |
| Silt loam | CL | A-6 | 90–100 | 80–100 | 75–85 | 0.5–7.0 | 0.12–0.15 | 6.3–7.3 | Moderate. |
| Silty clay loam | CL | A-7 | 95–100 | 95–100 | 90–100 | 0.8–2.5 | 0.16–0.19 | 6.1–6.5 | Moderate. |
| Clay | CH | A-7 | 95–100 | 95–100 | 85–95 | 0.2–0.8 | 0.14–0.16 | 6.1–6.5 | High. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 95–100 | 75–90 | 0.05–0.2 | 0.05–0.10 | (1) | Moderate to high. |
| Loamy fine sand | SM | A-2, A-4 | 95–100 | 95–100 | 23–40 | 1.0–5.5 | 0.12–0.14 | 6.1–6.5 | Low. |
| Loamy fine sand | SM | A-2 | 95–100 | 95–100 | 17–27 | 1.0–5.5 | 0.08–0.12 | 5.6–6.0 | Low. |
| Fine sandy loam | SM | A-4 | 95–100 | 95–100 | 40–50 | 0.2–2.5 | 0.12–0.16 | 6.1–6.5 | Moderate. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95–100 | 90–100 | 75–90 | 0.05–0.2 | 0.05–0.10 | 6.5–7.2 | Moderate to high. |

TABLE 3.—*Brief description of the soils, and their*

| Map symbol | Soil | Description of soil | Depth to seasonally high water table | Depth to bedrock | Depth from surface |
|---|---|---|---|---|---|
| | | | | | *Inches* |
| SfB | Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes. | | | | 45–60+ |
| | | Ottokee, over clay: Light-colored, moderately well drained loamy fine sand; calcareous clay or clay loam at a depth of 36 to 48 inches. | 18 inches or more. | More than 10 feet. | 0–9<br>9–46<br>46–60+ |
| Sg<br>Sh<br>Sk | Shoals loam.<br>Shoals silt loam.<br>Shoals silty clay loam. | Light-colored, somewhat poorly drained soils on first bottoms; subject to frequent flooding. | 6 inches or more. | More than 4 feet. | 0–8<br>8–28<br>28–46+ |
| Sm | Shoals and Sloan soils, over limestone. | Shoals: Light-colored, somewhat poorly drained soils on first bottoms; subject to frequent flooding. | 6 inches or more. | 20 to 42 inches. | 0–9<br>9–31 |
| | | Sloan: Dark-colored, very poorly drained soils on first bottoms; subject to frequent flooding. | Water table is at the surface. | 20 to 42 inches. | 0–10<br>10–24 |
| Sn<br>So | Sloan silt loam.<br>Sloan silty clay loam. | Dark-colored, very poorly drained soils on first bottoms; subject to frequent flooding. | Water table is at the surface. | More than 4 feet. | 0–10<br>10–26<br>26–40+ |
| SpB<br>SpC<br>SpD<br>SsB<br>SsC | Spinks fine sand, 2 to 6 percent slopes.<br>Spinks fine sand, 6 to 12 percent slopes.<br>Spinks fine sand, 12 to 18 percent slopes.<br>Spinks loamy fine sand, 2 to 6 percent slopes.<br>Spinks loamy fine sand, 6 to 12 percent slopes. | Light-colored, well-drained, deep fine sand or loamy fine sand. | 4 feet or more. | More than 10 feet. | 0–7<br>7–38<br>38–100+ |
| Td<br>TdB | Tedrow loamy fine sand, 0 to 2 percent slopes.<br>Tedrow loamy fine sand, 2 to 6 percent slopes. | Light-colored, somewhat poorly drained loamy fine sand; unstable when saturated. | 6 inches or more. | More than 10 feet. | 0–8<br>8–79<br>79–90+ |
| To<br>Tt | Toledo silty clay.<br>Toledo silty clay loam. | Dark-colored, very poorly drained soils that developed from calcareous lacustrine clay. | Water table is at the surface. | More than 10 feet. | 0–10<br>10–45<br>45–95+ |
| Wc | Warners soils, over clay. | Very dark colored, very poorly drained soils over calcareous clay or silty clay; developed from organic and mineral material 5 to 10 inches thick over a 2- to 6-inch layer of calcareous marl. | Soil may be ponded during winter and spring. | More than 10 feet. | 0–8<br>8–12<br>12–34+ |
| Wf<br>Wn | Wauseon fine sandy loam.<br>Wauseon loamy fine sand. | Dark-colored, very poorly drained, sandy soils; calcareous clay or clay loam at a depth of 48 inches or more. | Water table is at the surface. | More than 10 feet. | 0–8<br>8–34<br>34–59<br>59–70+ |
| Wm<br>Ws | Wauseon fine sandy loam, over clay.<br>Wauseon loamy fine sand, over clay. | Dark-colored, very poorly drained, sandy soils; calcareous clay or clay loam at a depth of 18 to 48 inches. | Water table is at the surface. | More than 10 feet. | 0–11<br>11–30<br>30–50+ |

[1] Calcareous. [2] Organic material. [3] Marl.

*estimated physical and chemical properties*—Continued

| Classification | | | Percentage passing sieve— | | | Permeability | Available water capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|---|
| USDA texture | Unified | AASHO | No. 4 (4.7mm.) | No. 10 (2.0mm.) | No. 200 (0.074mm.) | | | | |
| | | | | | | *Inches per hour* | *Inches per inch of soil* | *pH* | |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 90-100 | 75-90 | 0. 05-0. 2 | 0. 05-0. 10 | (1) | Moderate to high. |
| | | | | | | | | | |
| Loamy fine sand | SM | A-2 | 95-100 | 95-100 | 23-33 | 1. 0-5. 5 | 0. 12-0. 15 | 5. 6-6. 1 | Low. |
| Loamy fine sand | SM, SP | A-2 | 95-100 | 95-100 | 17-27 | 1. 0-5. 5 | 0. 08-0. 14 | 5. 5-6. 0 | Low. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 90-100 | 75-90 | 0. 05-0. 2 | 0. 05-0. 10 | (1) | Moderate. to high. |
| | | | | | | | | | |
| Silt loam | ML | A-4 | 95-100 | 95-100 | 75-95 | 0. 15-2. 5 | 0. 18-0. 22 | 6. 5-7. 2 | Moderate. |
| Clay loam | CL | A-6 | 95-100 | 90-100 | 70-85 | 0. 2-1. 0 | 0. 14-0. 18 | 6. 5-7. 8 | Moderate. |
| Loam | ML | A-4 | 95-100 | 85-100 | 55-70 | 1. 0-2. 5 | 0. 14-0. 18 | 6. 5-7. 8 | Moderate. |
| | | | | | | | | | |
| Silt loam | ML, CL | A-4 | 95-100 | 90-100 | 75-85 | 0. 2-2. 5 | 0. 18-0. 22 | 6. 9-7. 3 | Moderate. |
| Silt loam | ML, CL | A-4 | 95-100 | 90-100 | 80-90 | 0. 2-2. 5 | 0. 16-0. 19 | 7. 2-7. 8 | Moderate. |
| | | | | | | | | | |
| Silty clay loam | CL | A-6 | 95-100 | 90-100 | 80-90 | 0. 20-3. 0 | 0. 18-0. 21 | 6. 1-7. 8 | Moderate. |
| Silty clay loam | CL | A-6 | 95-100 | 95-100 | 80-95 | 0. 04-1. 0 | 0. 16-0. 20 | 6. 1-7. 3 | Moderate. |
| | | | | | | | | | |
| Silty clay loam | CL | A-6 | 95-100 | 90-100 | 80-95 | 0. 20-3. 0 | 0. 18-0. 21 | 7. 3-7. 6 | Moderate. |
| Clay loam | CL | A-6 | 95-100 | 90-100 | 75-85 | 0. 5-2. 5 | 0. 11-0. 16 | 7. 1-7. 6 | Moderate. |
| Loam | ML | A-4 | 95-100 | 85-95 | 55-70 | 1. 0-2. 5 | 0. 14-0. 18 | 7. 1-7. 6 | Moderate. |
| | | | | | | | | | |
| Fine sand | SM | A-2 | 95-100 | 90-100 | 15-35 | 2. 5-10. 0 | 0. 08-0. 10 | 6. 1-6. 5 | Low. |
| Fine sand | SP-SM, SM. | A-2, A-3 | 95-100 | 95-100 | 5-30 | 2. 5-10. 0 | 0. 04-0. 06 | 6. 5-7. 2 | Low. |
| Fine sand | SP, SM | A-2, A-3 | 95-100 | 95-100 | 0-25 | 2. 5-10. 0 | 0. 04-0. 06 | (1) | Low. |
| | | | | | | | | | |
| Loamy fine sand | SM | A-2 | 95-100 | 90-100 | 20-35 | 2. 5-10. 0 | 0. 11-0. 14 | 6. 5-7. 0 | Low. |
| Loamy fine sand | SM, SP | A-2 | 95-100 | 90-100 | 20-30 | 2. 5-10. 0 | 0. 10-0. 12 | 6. 0-6. 5 | Low. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 95-100 | 80-90 | 0. 08-0. 5 | 0. 07-0. 17 | (1) | Moderate to high. |
| | | | | | | | | | |
| Silty clay | CH | A-7 | 95-100 | 95-100 | 85-100 | 0. 50-2. 0 | 0. 15-0. 18 | 6. 1-6. 6 | High. |
| Silty clay | CH | A-7 | 95-100 | 95-100 | 85-100 | 0. 10-1. 0 | 0. 08-0. 12 | 6. 6-7. 5 | High. |
| Silty clay or clay | CH | A-7 | 95-100 | 95-100 | 85-100 | 0. 05-0. 2 | 0. 04-0. 1 | (1) | High. |
| | | | | | | | | | |
| Mucky loam | OL | (2) | (2) | (2) | (2) | 0. 50-3. 0 | 0. 20-0. 25 | 6. 6-7. 3 | Low. |
| Marl | (3) | (3) | (3) | (3) | (3) | (3) | (3) | (1) | Moderate. |
| Silty clay or clay | CH | A-7 | 95-100 | 95-100 | 90-100 | 0. 10-0. 50 | 0. 08-0. 12 | (1) | High. |
| | | | | | | | | | |
| Loamy fine sand | SM | A-2 | 95-100 | 95-100 | 20-35 | 2. 5-10. 0 | 0. 14-0. 20 | 6. 5-6. 9 | Low. |
| Loamy fine sand | SM | A-2 | 95-100 | 95-100 | 15-25 | 2. 5-10. 0 | 0. 08-0. 14 | 6. 5-7. 2 | Low. |
| Fine sand | SM | A-2 | 95-100 | 95-100 | 10-25 | 2. 5-10. 0 | 0. 04-0. 12 | 6. 8-7. 4 | Low. |
| Clay or clay loam | CH, CL | A-7, A-6 | 95-100 | 90-100 | 75-90 | 0. 05-0. 2 | 0. 05-0. 10 | (1) | Moderate to high. |
| | | | | | | | | | |
| Loamy fine sand | SM | A-2 | 95-100 | 90-100 | 22-32 | 2. 5-10. 0 | 0. 12-0. 18 | 6. 4-6. 9 | Low. |
| Loamy fine sand | SM | A-2 | 95-100 | 90-100 | 15-25 | 2. 5-10. 0 | 0. 08-0. 14 | 6. 6-7. 2 | Low. |
| Clay loam or clay | CL, CH | A-6, A-7 | 95-100 | 90-100 | 75-90 | 0. 05-0. 2 | 0. 05-0. 10 | (1) | Moderate to high. |

### *Engineering interpretations*

Table 4 lists all the soil series in the county and includes Alluvial land and Muck. It gives suitability ratings for specific purposes, names soil features that affect certain engineering practices, and shows the degree of limitation of the soils for use as a sewage disposal field.

The data in table 4 are based on test data given in table 2, on mechanical analysis of the soils, and on field experience. Following are explanations of items in table 4.

*Suitability as source of topsoil.* The thickness, stoniness, texture, and inherent fertility of the surface layer determine the suitability of the soil for use as topdressing.

*Suitability as source of sand and gravel.* The amount, quality, and accessibility of granular (coarse-grained)

TABLE 4.—*Engineering*

| Soil series and map symbols | Suitability as source of— | | | | Soil features affecting | |
|---|---|---|---|---|---|---|
| | Topsoil [1] | Sand | Gravel | Road fill | Highway location | Dikes or levees |
| Alluvial land (Al) | Good; subject to frequent floodings. | Not suitable | Not suitable | Poor to fair; poor stability; seasonally wet. | Seasonal high water table; subject to flooding; highly susceptible to frost action. | Fair to poor stability; medium shrink-swell potential. |
| Belmore (BmB, BnB) | Fair | Good; mixture of medium-textured and coarse-textured sand at depth of 3 to 8 feet. | Good | Good; good compaction and stability. | Good drainage; source of subgrade below a depth of 2 to 3½ feet; material above 2 to 3½ feet is susceptible to frost action. | Good stability; material below a depth of 2 to 3½ feet has moderately rapid permeability when compacted. |
| Colwood (Co, Cs) | Good | Poor because of seasonal high water table; sand is mixed with silt. | Not suitable | Poor; poor stability; generally wet; highly erodible in places. | Seasonal high water table; highly susceptible to frost action. | Poor stability; generally wet; highly erodible in places; medium shrink-swell potential. |
| Digby (Dm, Dn) | Fair | Fair because of seasonal high water table. | Fair in the lower part of profile; seasonal high water table. | Good; good compaction and stability; seasonal high water table. | Seasonal high water table; highly susceptible to frost action in uppermost 3 feet; good source of subgrade at a depth below 3 feet. | Good stability; material below a depth of 3 feet has moderate permeability when compacted. |
| Dunbridge [2] (Dr, Ds, DsB, Dx) | Fair | Fair; fine sand over bedrock. | Not suitable | Good; good stability; unprotected slopes are highly erodible. | Limestone at a depth of 1 foot to 3½ feet. | Rapid permeability when compacted; susceptible to piping; shallow to limestone. |
| Eel (Ea, Em) | Good; subject to occasional flooding. | Not suitable | Not suitable | Poor; poor compaction and poor stability. | Seasonal high water table; subject to flooding; susceptible to frost action. | Poor stability and poor compaction. |

See footnotes at end of table.

materials are the most important considerations. A rating of *good* does not necessarily mean that commercial operations would be profitable in all areas of that particular soil. In some areas the layers of sand or gravel may be only a few feet thick, and in other areas the sand or gravel may be impractical to remove for other reasons.

*Suitability as source of road fill.* Plasticity, erodibility, content of water, and compaction characteristics determine suitability. Well-graded, coarse-grained materials or mixtures of clay and coarse-grained materials are most desirable for road fill. Highly plastic clayey soils, poorly graded silty soils, and organic soils are difficult to compact and are low in stability and, therefore, are least desirable.

*interpretations*

| Soil features affecting—Continued | | | | | | | Degree of limitation for sewage disposal fields and major limiting features |
|---|---|---|---|---|---|---|---|
| Farm ponds | | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | | |
| Reservoir area | Embankment | | | | | | |
| Medium rate of seepage; subject to flooding. | Poor stability; moderate permeability when compacted. | Moderate permeability; fair or poor natural drainage. | High infiltration and high water-holding capacity; moderate permeability. | Not needed, because of level relief. | Slightly erodible. | | Very severe. Seasonal high water table; subject to flooding. |
| Excessive rate of seepage. | Good stability; material below a depth of 2 to 3½ feet has moderately rapid permeability when compacted. | Good natural drainage. | High infiltration and medium water-holding capacity. | Slopes generally short; soil properties favorable. | Moderately erodible; medium water-holding capacity. | | Slight. Moderately rapid permeability; good drainage. |
| Medium to high rate of seepage because of sandy seams. | Poor stability and strength; slow permeability when compacted; high erodibility in places. | Moderate permeability; seasonal high water table; subsurface drainage is satisfactory if adequate outlets are provided. | Medium infiltration and medium water-holding capacity. | Not needed, because of nearly level relief. | Disturbed soil is highly erodible. | | Very severe. Concave relief; seasonal high water table. |
| Excessive rate of seepage. | Good stability; material below a depth of 3 feet has moderate permeability when compacted. | Seasonal high water table; moderate permeability. | Medium infiltration and medium water-holding capacity. | Generally not needed, because of nearly level relief. | Moderately erodible. | | Severe. Seasonal high water table; moderate permeability. |
| Excessive rate of seepage; limestone at a depth of 1 foot to 3½ feet. | Rapid permeability when compacted; susceptible to piping; limestone at a depth of 1 foot to 3½ feet. | Not needed; good natural drainage. | High infiltration and low water-holding capacity; limestone at a depth of 1 foot to 3½ feet. | Slopes generally short and irregular; soil properties suitable. | Highly erodible, but little runoff; low water-holding capacity. | | Severe. Good drainage; rapid permeability; limestone at a depth of 1 foot to 3½ feet. |
| Medium rate of seepage; subject to flooding. | Poor stability; moderate permeability when compacted. | Moderate permeability; fair natural drainage. | High infiltration; moderate permeability; moderately good drainage; medium water-holding capacity. | Terraces not needed; diversions may be needed adjacent to higher areas. | Slightly erodible; soil properties favorable. | | Very severe. Seasonal high water table; moderate permeability; subject to flooding. |

TABLE 4.—*Engineering*

| Soil series and map symbols | Suitability as source of— | | | | Soil features affecting | |
|---|---|---|---|---|---|---|
| | Topsoil [1] | Sand | Gravel | Road fill | Highway location | Dikes or levees |
| Eel, over limestone (Er) | Good | Not suitable | Not suitable | Poor; rock at a depth of 1½ to 3½ feet. | Rock at a depth of 1½ to 3½ feet; high water table. | Poor stability and poor compaction; shallow to limestone. |
| Fulton (Fu, FuB) | Good | Not suitable | Not suitable | Fair; fair stability; seasonal high water table. | Susceptible to frost action; seasonal high water table. | Fair stability; fair compaction; moderate shrink-swell potential. |
| Genesee (Gm, Gn) | Good | Not suitable | Not suitable | Fair; fair stability and strength. | Good drainage; seasonal high water table; subject to flooding; susceptible to frost action. | Fair stability and compaction; moderate shrink-swell potential. |
| Haney (Hd, HdB, Hn, HnB) | Fair | Fair | Fair in the lower part of profile. | Good; good stability and compaction. | Fair drainage; highly susceptible to frost action to a depth of about 3 feet; source of subgrade at a depth below 3 feet. | Good stability; material below a depth of 3 feet has moderately rapid permeability when compacted. |
| Haskins and Digby, over clay. (Hs, HsB, Ht, HtB) | Fair | Poor | Not suitable | Good in uppermost 1½ to 4 feet; plastic clay at a depth below 1½ to 4 feet; seasonal high water table. | Seasonal high water table; highly susceptible to frost action; plastic clay at a depth below 1½ to 4 feet. | Material in uppermost 1½ to 4 feet has good stability and moderate shrink-swell potential; material below that has fair stability and high shrink-swell potential. |
| Hoytville (Hv, Hw, Hy) | Good | Not suitable | Not suitable | Poor; plastic clay; poor stability; high compressibility, poor workability. | Seasonal high water table; plastic soil material; moderately susceptible to frost action. | Very slow permeability; fair stability; high shrink-swell potential; cracks when dry. |
| Joliet (Jo) | Good | Not suitable | Not suitable | Poor; generally wet; poor stability; limestone at a depth of 10 to 20 inches. | Seasonal high water table; susceptible to frost action; limestone at a depth of 10 to 20 inches. | Poor stability; medium shrink-swell potential; limestone at a depth of 10 to 20 inches. |
| Kibbie (Kf, KfB, Ks) | Fair | Fair because of seasonal high water table; sand is very fine. | Not suitable | Poor; poor stability; seasonal high water table; high erodibility in places. | Seasonal high water table; highly susceptible to frost action. | Poor stability; high erodibility in places; medium shrink-swell potential. |

See footnotes at end of table.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | | Degree of limitation for sewage disposal fields and major limiting features |
|---|---|---|---|---|---|---|
| Farm ponds | | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | |
| Reservoir area | Embankment | | | | | |
| Medium rate of seepage; subject to flooding; shallow to limestone. | Poor stability; moderate permeability when compacted; limestone at a depth of 1½ to 3½ feet. | Seasonal high water table; fair natural drainage; limestone at a depth of 1½ to 3½ feet. | High infiltration; medium water-holding capacity; moderate permeability; limestone at a depth of 1½ to 3½ feet. | Not needed, because of relief; shallow to limestone. | Slightly erodible; limestone at a depth of 1½ to 3½ feet. | Very severe. Seasonal high water table; shallow to limestone. |
| Slow rate of seepage. | Fair stability; very slow permeability when compacted. | Somewhat poor natural drainage; slow permeability; artificial drainage is satisfactory. | Moderately slow infiltration; slow permeability; medium water-holding capacity. | Nearly level to gently sloping relief; slow permeability. | Slightly erodible. | Severe. Seasonal high water table; slow permeability. |
| Medium rate of seepage; subject to flooding. | Fair stability; moderate permeability when compacted. | Generally not needed; moderate permeability; good natural drainage. | High infiltration; moderate permeability; medium water-holding capacity. | Terraces not needed; diversions may be needed to remove runoff from adjacent higher areas. | Slightly erodible. | Very severe. Moderate permeability; seasonal high water table; subject to occasional flooding. |
| Excessive rate of seepage. | Good stability; material below a depth of 3 feet has moderately rapid permeability when compacted. | Moderately good natural drainage; moderately rapid permeability. | High infiltration; medium water-holding capacity. | Slopes generally short; soil properties favorable. | Moderately erodible; medium water-holding capacity. | Slight. Moderately rapid permeability; fairly good drainage. |
| Medium rate of seepage to a depth of 1½ to 4 feet, and very slow below that. | Good stability; slow permeability when compacted; substratum has high shrink-swell potential. | Seasonal high water table; slow permeability below a depth of 1½ to 4 feet. | Medium to high infiltration; medium water-holding capacity; slow permeability below a depth of 1½ to 4 feet. | Generally not needed, because of relief; soil properties favorable. | Moderately erodible. | Severe. Seasonal high water table; slow permeability below a depth of 1½ to 4 feet. |
| Very slow rate of seepage. | Fair stability in low fills; high shrink-swell potential; cracks when dry; very slow permeability when compacted. | Seasonal high water table; slow permeability. | Moderate infiltration; medium water-holding capacity; slow permeability. | Not needed, because of relief. | Very slightly erodible. | Very severe. Seasonal high water table; slow permeability. |
| Medium to high rate of seepage; limestone at a depth of 10 to 20 inches. | Poor stability; slow permeability when compacted; shallow to limestone. | Seasonal high water table; moderate permeability; generally receives runoff from nearby areas. | Moderate permeability; low water-holding capacity; medium infiltration shallow to limestone. | Not needed, because of nearly level relief. | Slightly erodible. | Very severe. Seasonal high water table; moderate permeability; level or nearly level relief; limestone at a depth of 10 to 20 inches. |
| Medium to high rate of seepage because of sandy seams. | Poor stability and strength, slow permeability when compacted; high erodibility in places. | Seasonal high water table; moderate permeability. | Medium infiltration; medium water-holding capacity. | Generally not needed, because of relief; soil properties favorable. | Undisturbed soil is moderately erodible; disturbed soil is highly erodible. | Severe. Seasonal high water table; moderate permeability. |

TABLE 4.—*Engineering*

| Soil series and map symbols | Suitability as source of— | | | | Soil features affecting | |
|---|---|---|---|---|---|---|
| | Topsoil [1] | Sand | Gravel | Road fill | Highway location | Dikes or levees |
| Mermill (Mf, Mg) | Good | Poor | Not suitable | Poor; fair stability and strength; plastic clay at a depth below 2 to 4 feet. | Seasonal high water table; highly susceptible to frost action; plastic clay at a depth below 2 to 4 feet. | Fair stability; very slow permeability when compacted; material below a depth of 2 to 4 feet has high shrink-swell potential and cracks when dry. |
| Millgrove (Mb) | Good in the uppermost 1 foot to 2 feet. | Fair in the lower part of profile; seasonal high water table. | Fair in the lower part of profile; seasonal high water table. | Fair; fair stability and compaction to a depth of 2 to 4 feet; good stability below that. | Seasonal high water table; uppermost 2 to 4 feet is highly susceptible to frost action; fair source of subgrade below a depth of 2 to 4 feet. | Fair stability to a depth of 2 to 4 feet, and good below that; medium shrink-swell potential; material below a depth of 2 to 4 feet has moderate permeability when compacted. |
| Millsdale (Mh, Mm) | Good | Not suitable | Not suitable | Poor; poor stability; limestone at a depth of 1½ to 3½ feet. | High water table; susceptible to frost action; limestone at a depth of 1½ to 3½ feet. | Poor stability; medium shrink-swell potential; limestone at a depth of 1½ to 3½ feet. |
| Milton (Mn, MnB) | Fair | Not suitable | Not suitable | Fair; good drainage; limestone at a depth of 1½ to 3½ feet. | Good drainage; limestone at a depth of 1½ to 3½ feet. | Limestone at a depth of 1½ to 3½ feet. |
| Muck (Mu) | Fair in the upper most 10 to 48 inches. | Not suitable | Not suitable | Poor; high water table; unstable organic soil material. | High water table; unstable; very low bearing strength; plastic clay at a depth below 10 to 48 inches. | Organic material is unstable and generally wet; material below a depth of 10 to 48 inches is fairly stable. |
| Nappanee (Na, NaB NaB2, Ns, NsB, Nt, NtB, NtB2) | Fair | Not suitable | Not suitable | Fair to poor; plastic soil material; slopes are unstable if not adequately drained; high compressibility. | Seasonal high water table; plastic soil material; susceptible to frost action. | Very slow permeability; fair stability; high shrink-swell potential; cracks when dry. |
| Ottokee and Spinks (Os, OsB) | Fair | Fair; mostly poorly graded fine sand. | Not suitable | Fair; good stability; fair bearing strength; unprotected slopes are highly erodible. | Few adverse features; possibly a seasonal high water table. | Rapid permeability when compacted; susceptible to piping. |

See footnotes at end of table.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | | | Degree of limitation for sewage disposal fields and major limiting features |
|---|---|---|---|---|---|---|---|
| Farm ponds | | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | | |
| Reservoir area | Embankment | | | | | | |
| Medium rate of seepage to a depth of 2 to 4 feet. | Fair stability; very slow permeability when compacted; material below a depth of 2 to 4 feet has high shrink-swell potential and cracks when dry. | Seasonal high water table; slow permeability below a depth of 2 to 4 feet. | Medium infiltration; medium water-holding capacity. | Not needed, because of relief. | Moderately erodible. | | Very severe. Seasonal high water table; slow permeability below a depth of 2 to 4 feet. |
| Excessive rate of seepage. | Good stability; material below a depth of 2 to 4 feet has moderate permeability when compacted. | Seasonal high water table; moderate permeability. | Medium infiltration; medium water-holding capacity. | Not needed, because of relief. | Moderately erodible. | | Very severe. Seasonal high water table; moderate permeability. |
| Medium to high rate of seepage; limestone at a depth of 1½ to 3½ feet. | Poor stability; slow permeability when compacted. | High water table; slow permeability; generally receives runoff from nearby areas. | Slow permeability; medium infiltration; medium water-holding capacity. | Terraces not needed; diversions needed in most areas to remove runoff from nearby higher areas. | Slightly erodible; soil properties favorable. | | Very severe. Seasonal high water table; slow permeability; level or nearly level relief; limestone at a depth of 1½ to 3½ feet. |
| Limestone at a depth of 1½ to 3½ feet. | Fair stability; slow permeability when compacted. | Good natural drainage; moderate permeability. | Medium infiltration; medium water-holding capacity. | Nearly level to strongly sloping relief; soil properties favorable; limestone at a depth of 1½ to 3½ feet. | Slightly or moderately erodible. | | Severe. Moderate permeability; shallow to limestone. |
| Organic material has rapid permeability and a high water table; below the organic material the seepage rate is slow to moderate. | Organic material not stable; substratum has fair stability. | High water table; rapid permeability to a depth of 10 to 48 inches, and slow below that; tile placed in organic material may settle unevenly. | High infiltration; high water-holding capacity. | Terraces not needed; diversions needed in most areas to remove runoff from nearby higher areas. | Highly erodible; favorable for seeding; wet. | | Very severe. High water table; concave relief. |
| Very slow rate of seepage. | Fair stability; moderate erodibility; high shrink-swell potential; cracks when dry; very slow permeability. | Seasonal high water table; very slow permeability. | Moderately slow infiltration; very slow permeability; medium water-holding capacity. | Nearly level to gently rolling relief; moderately erodible. | Slightly erodible. | | Severe. Very slow permeability; seasonal high water table. |
| Excessive rate of seepage. | Rapid permeability when compacted; susceptible to piping. | Good natural drainage. | High infiltration; low water-holding capacity. | Slopes generally short and irregular; soil properties favorable. | Moderately erodible, but little runoff; low water-holding capacity. | | Slight. Good drainage; rapid permeability; effluent may contaminate shallow water supply. |

TABLE 4—*Engineering*

| Soil series and map symbols | Suitability as source of— | | | | Soil features affecting— | |
|---|---|---|---|---|---|---|
| | Topsoil [1] | Sand | Gravel | Road fill | Highway location | Dikes or levees |
| Randolph (Rb, RbB, Rd) | Fair | Not suitable | Not suitable | Fair; fair stability; limestone at a depth of 1½ to 3½ feet. | Seasonal high water table; susceptible to frost action; limestone at a depth of 1½ to 3½ feet. | Fair stability; medium shrink-swell potential; limestone at a depth of 1½ to 3½ feet. |
| Rimer and Tedrow, over clay. (Rf, RfB) | Fair | Fair | Not suitable | Fair to good to a depth of 1½ to 4 feet; plastic clay below that. | Seasonal high water table; plastic clay at a depth below 1½ to 4 feet is moderately susceptible to frost action. | Material to a depth of 1½ to 4 feet has rapid permeability when compacted; material below that has high shrink-swell potential and cracks when dry. |
| Ritchey (Rh, RhB, Rk) | Fair | Not suitable | Not suitable | Poor; poor stability; limestone at a depth of 10 to 20 inches. | Good drainage; limestone at a depth of 10 to 20 inches. | Fair stability; shallow to limestone. |
| Romeo (Rs, RsB) | Fair | Not suitable | Not suitable | Very poor; poor stability; limestone at the surface or at a depth of 10 inches or less. | Shallowness to bedrock; limestone is at the surface or at a depth of 10 inches or less. | Very shallow to limestone. |
| St. Clair (SaB, SaC2, SbB2, SbC2, SbD2, SbE2) | Poor | Not suitable | Not suitable | Poor to fair; fair stability and high compressibility; plastic clay. | Plastic soil material; moderately susceptible to frost action. | Very slow permeability; fair stability; high shrink-swell potential; cracks when dry. |
| Seward and Ottokee, over clay. (Sf, SfB) | Fair | Fair | Not suitable | Fair to good to a depth of 1½ to 4 feet; plastic clay below that. | Plastic clay at a depth below 1½ to 4 feet is moderately susceptible to frost action. | Material to a depth of 1½ to 4 feet has moderately rapid permeability when compacted; material below that has high shrink-swell potential and cracks when dry. |
| Shoals (Sg, Sh, Sk) | Good in the uppermost 2 to 3 feet. | Not suitable | Not suitable | Poor to fair; fair stability and compaction; seasonal high water table. | Seasonal high water table; subject to flooding; highly susceptible to frost action. | Fair stability and compaction; medium shrink-swell potential. |
| Shoals and Sloan, over limestone. (Sm) | Good in the uppermost 1½ to 3 feet. | Not suitable | Not suitable | Poor; fair stability to a depth of 1½ to 3½ feet; rock below that. | High water table; subject to flooding; highly susceptible to frost action; rock at a depth of 1½ to 3½ feet. | Fair stability and compaction; medium shrink-swell potential. |

See footnotes at end of table.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | | Degree of limitation for sewage disposal fields and major limiting features |
|---|---|---|---|---|---|---|
| Farm ponds | | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | |
| Reservoir area | Embarkment | | | | | |
| Limestone at a depth of 1½ to 3½ feet; seepage rate is excessive unless blanketed and compacted. | Fair stability; slow permeability when compacted. | Somewhat poor natural drainage; moderate permeability; limestone at a depth of 1½ to 3½ feet. | Medium infiltration; medium water-holding capacity. | Generally not needed, because of relief; limestone at a depth of 1½ to 3½ feet. | Slightly erodible; soil properties favorable. | Very severe. Seasonal high water table; limestone at a depth of 1½ to 3½ feet; effluent may penetrate rock and contaminate water supply. |
| Rapid permeability to a depth of 1½ to 4 feet, and slow below that. | Material to a depth of 1½ to 4 feet has rapid permeability when compacted; material below that has a high shrink-swell potential and cracks when dry. | Seasonal high water table; slow permeability below a depth of 1½ to 4 feet. | High infiltration; medium water-holding capacity. | Generally not needed, because of relief; soil properties favorable. | Moderately erodible. | Severe. Seasonal high water table; slow permeability below a depth of 1½ to 4 feet. |
| Shallow to limestone. | Fair stability; slow permeability. | Good natural drainage; limestone at a depth of 10 to 20 inches. | Moderate infiltration; shallow to limestone. | Slopes are generally short; limestone at a depth of 10 to 20 inches. | Moderately erodible; shallow to limestone. | Very severe. Limestone at a depth of 10 to 20 inches. |
| Very shallow to limestone. | Fair stability; slow permeability. | Good natural drainage; limestone at the surface or at a depth of 10 inches or less. | Very shallow to limestone; moderate infiltration and moderate runoff. | Limestone at a depth of 0 to 10 inches. | Moderately erodible; very shallow to limestone. | Very severe. Limestone at the surface or at a depth of 10 inches or less. |
| Very slow rate of seepage. | Fair stability; very slow permeability when compacted; high shrink-swell potential; cracks when dry. | Fairly good natural drainage. | Slow infiltration; medium water-holding capcity. | Shallowness to fine-textured subsoil. | Disturbed soil is highly erodible. | Severe. Slow permeability. |
| Rapid permeability to a depth of 1½ to 4 feet, and slow below that. | Material to a depth of 1½ to 4 feet has rapid permeability when compacted; material below that has high shrink-swell potential and cracks when dry. | Fairly good natural drainage. | High infiltration; low water-holding capacity. | Slopes are generally short and irregular; soil properties suitable. | Moderately erodible. | Moderate to severe. Slow permeability below a depth of 1½ to 4 feet. |
| Subject to flooding; slow rate of seepage. | Fair stability; slow permeability when compacted. | Seasonal high water table; moderate permeability; good outlets generally not available. | High infiltration; somewhat poor natural drainage; high water-holding capacity. | Not needed, because of relief. | Slightly erodible; soil properties favorable. | Very severe. Moderate permeability; seasonal high water table; subject to flooding. |
| Subject to flooding; variable seepage rate but generally medium to high because of underlying limestone. | Fair stability; medium shrink-swell potential; rock at a depth of 1½ to 3½ feet. | High water table; rock at a depth of 1½ to 3½ feet; moderate permeability; good outlets generally not available. | High infiltration; medium water-holding capacity; poor natural drainage. | Not needed, because of relief. | Slightly erodible; soil properties favorable; generally wet. | Very severe. Subject to flooding; rock at a depth of 1½ to 3½ feet; high water table. |

TABLE 4—*Engineering*

| Soil series and map symbols | Suitability as source of— | | | | Soil features affecting— | |
|---|---|---|---|---|---|---|
| | Topsoil [1] | Sand | Gravel | Road fill | Highway location | Dikes or levees |
| Sloan (Sn, So) | Good in the uppermost 2 to 3 feet. | Not suitable | Not suitable | Poor; fair stability and compaction; seasonal high water table. | High water table; subject to flooding; highly susceptible to frost action. | Fair stability and compaction; medium shrink-swell potential. |
| Spinks (SpB, SpC, SpD, SsB, SsC) | Fair to poor | Fair; mostly poorly graded fine sand. | Not suitable | Fair; good stability and fair bearing strength; unprotected slopes are highly erodible. | No adverse features | Rapid permeability when compacted; susceptible to piping. |
| Tedrow (Td, TdB) | Poor | Fair; mostly poorly graded fine sand. | Not suitable | Fair; good stability and fair bearing strength. | Seasonal high water table. | Rapid permeability when compacted; susceptible to piping. |
| Toledo (To, Tt) | Fair | Not suitable | Not suitable | Poor; poor stability; generally wet; plastic soil material. | Seasonal high water table; plastic soil material; moderately susceptible to frost action. | Poor stability; seasonal high water table; high shrink-swell potential; cracks when dry. |
| Warners, over clay (Wc) | Good | Not suitable | Not suitable | Poor; poor stability; generally wet; plastic clay at a depth below 1 foot to 2 feet. | High water table; unstable soil material; plastic clay at a depth below 1 foot to 2 feet. | Poor stability; high shrink-swell potential. |
| Wauseon (Wf, Wn) | Good | Fair | Not suitable | Fair; fair stability; seasonal high water table. | Seasonal high water table; highly susceptible to frost action. | Fair stability; moderately rapid permeability when compacted. |
| Wauseon, over clay (Wm, Ws) | Good | Fair | Not suitable | Poor; seasonal high water table; fair stability; plastic clay at a depth below 1½ to 4 feet. | Seasonal high water table; plastic clay at a depth below 1½ to 4 feet; highly susceptible to frost action. | Fair stability; moderately rapid permeability when compacted; material below a depth of 1½ to 4 feet has high shrink-swell potential and cracks when dry. |

[1] Applies to the plow layer unless otherwise noted.

*Highway location.* The factors that adversely affect the location of highways are high water table, seepage, unstable slopes, susceptibility of the soil to flooding, susceptibility to frost action, plastic soil material, and presence of muck, peat, or rock.

*Dikes or levees.* Stability and permeability of the materials when compacted, shrink-swell potential, susceptibility to piping, and susceptibility to frost action are all to be considered in making interpretations for these uses.

*Farm ponds, reservoir area.* The rate of seepage and the depth to bedrock are of prime consideration.

*Farm ponds, embankment.* The factors to be considered are the same as those for dikes and levees.

*Agricultural drainage.* The suitability of a soil as a site for an agricultural drainage system is affected by its natural drainage, its permeability, and its depth to a seasonal high water table.

*Irrigation.* The soils most desirable for irrigation are those that are nearly level and that have high water-holding capacity, a deep root zone, a moderate rate of infiltration, and a high level of fertility. Additional information about irrigation is in the section "Use and Management of the Soils," under "Irrigation."

*Terraces and diversions.* The soil properties that most affect construction of terraces and diversion ditches are slope, erodibility, and depth to bedrock.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | | Degree of limitation for sewage disposal fields and major limiting features |
|---|---|---|---|---|---|---|
| Farm ponds | | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | |
| Reservoir area | Embarkment | | | | | |
| Subject to flooding; slow rate of seepage. | Fair stability; slow permeability when compacted. | High water table; slow to moderate permeability; good outlets generally not available. | High infiltration; poor natural drainage; medium water-holding capacity. | Not needed, because of relief. | Slightly erodible; soil properties favorable. | Very severe. High water table; slow to moderate permeability; subject to flooding. |
| Excessive rate of seepage. | Rapid permeability when compacted; susceptible to piping. | Not needed; good natural drainage. | High infiltration; low water-holding capacity. | Slopes are generally short and irregular; soil properties are favorable. | Highly erodible, but little runoff; low water-holding capacity. | Slight. Good drainage; rapid permeability; effluent may contaminate shallow water supply. |
| Excessive rate of seepage. | Rapid permeability when compacted; susceptible to piping. | Seasonal high water table; rapid permeability. | High infiltration; low water-holding capacity. | Generally not needed, because of relief; soil properties favorable. | Moderately erodible. | Severe. Seasonal high water table; rapid permeability. |
| Very slow rate of seepage. | Poor stability; high shrink-swell potential; cracks when dry; slow permeability. | Slow permeability; seasonal high water table. | Medium infiltration; medium water-holding capacity; slow permeability. | Not needed, because of relief. | Slightly erodible; wet in many places. | Very severe. Seasonal high water table; slow permeability. |
| Very slow rate of seepage. | Poor stability; high shrink-swell potential; cracks when dry; slow permeability. | High water table; slow permeability in the substratum. | Medium infiltration; poor drainage. | Not needed, because of nearly level relief. | Moderately erodible; high water table. | Very severe. High water table; slow permeability in substratum. |
| Excessive rate of seepage. | Fair stability; moderate permeability when compacted. | Seasonal high water table; moderately rapid permeability. | High infiltration; medium to low water-holding capacity. | Not needed, because of relief. | Highly erodible. | Very severe. Seasonal high water table; moderately rapid permeability. |
| High rate of seepage to a depth of 1½ to 4 feet. | Poor stability; moderately rapid permeability when compacted; material below a depth of 1½ to 4 feet has high shrink-swell potential and cracks when dry. | Seasonal high water table; slow permeability below a depth of 1½ to 4 feet. | High infiltration; medium water-holding capacity. | Not needed because of nearly level relief. | Highly erodible. | Very severe. Seasonal high water table; slow permeability below a depth of 1½ to 4 feet. |

[2] For the undifferentiated soil groups, Ds, DsB, and Dx, see also the interpretations for the Spinks series.

*Waterways.* Erodibility, natural drainage, depth to bedrock, and water-holding capacity determine suitability for this use.

*Sewage disposal fields.* Natural drainage, depth to bedrock, permeability, and susceptibility to flooding are considered in determining the degree of limitation of the soils for this use.

Suitability of the soils for winter grading is not given in table 4, but it can be inferred from the particle-size distribution data given in table 3. In winter, suspending earthwork to avoid using frozen materials is not always economically feasible. Earthwork can be done on gravelly or sandy soils that do not contain more than a small amount of silt and clay, provided the soils are compacted and frozen material is excluded.

## Soils and Rural-Urban Developments

The soils of Wood County have been placed in 12 groups on the basis of characteristics that affect their use for urban or residential development. They are grouped roughly from those best suited to those least suited. Only soil features are recognized. These features include slope, natural drainage, depth to bedrock, stoniness, permeability, kind of underlying material, and susceptibility to flooding or frost heaving. Many other factors that influence use, such as distance to established centers, transportation facilities, and other economic factors, were not considered. The miscellaneous land types, Made land and Borrow pits, Quarries, and Urban land, have not been placed in a building site.

Most of the soils in the county have some limitations that restrict their use as building sites. Nearly all require some drainage. For example, surface drainage may be needed because of the flat landscape; internal drainage, because of a high water table or a temporary, or perched, water table. Generally, the grouping is based on the ease of overcoming such limitations. Limitations that may restrict the use of a site for an individual house are also likely to restrict its use for an industrial plant but may not rule out its use, because factors other than soil must be considered.

A general statement concerning the agricultural productivity of the soils is included in each building site group because the productivity of a soil for agricultural crops generally corresponds with its productivity for lawns and ornamental plants. In addition, in the event that alternate sites equally well suited to buildings are available, the site best suited to agriculture should be maintained in farms. An agricultural yield table in the section "Estimated Yields" provides a useful guide to determine relative productivity.

This grouping is not intended to imply that soils in any one group cannot be put to a particular use. Instead, it is intended to show that there may be hazards or limitations that make such use impractical or too expensive to overcome (*2*). It does not supplant detailed, on-site investigations of areas for which development is planned.

Additional information about the soils in the county can be obtained in the sections "Descriptions of the Soils" and "Genesis, Classification, and Morphology of the Soils" and from the maps in the back of this report. Tables 3 and 4 in the section "Engineering Uses of the Soils" give some of the hazards and limitations for specific uses.

### *Group 1 for building sites*

This group consists of well drained and moderately well drained, permeable soils that have slopes of 0 to 6 percent. The soils are—

Belmore loam, 1 to 4 percent slopes.
Belmore sandy loam, 1 to 4 percent slopes.
Haney loam, 0 to 2 percent slopes.
Haney loam, 2 to 6 percent slopes.
Haney sandy loam, 0 to 2 percent slopes.
Haney sandy loam, 2 to 6 percent slopes.

These soils have few natural limitations. Because they have mild slopes and are easy to grade, they are desirable sites for stores, factories, schools, and hospitals. They are also suitable for septic-tank filter fields. Topsoil may be needed for satisfactory lawns if the subsoil is exposed. The Haney soils may have a perched water table for short periods after heavy rains.

These soils are easily cultivated, and except for the Belmore soils, which are droughty, they are among the best agricultural soils in the county.

### *Group 2 for building sites*

In this group are deep, well drained and moderately well drained, permeable sandy soils that have slopes of 0 to 18 percent. The soils are—

Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes.
Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes.
Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes.
Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes.
Spinks fine sand, 2 to 6 percent slopes.
Spinks fine sand, 6 to 12 percent slopes.
Spinks fine sand, 12 to 18 percent slopes.
Spinks loamy fine sand, 2 to 6 percent slopes.
Spinks loamy fine sand, 6 to 12 percent slopes.

These soils have some natural limitations, but they are easy to grade and are suitable for light buildings. Small areas of the steeper Spinks soils are easily leveled. A perched or temporary water table may be present in the Ottokee and Seward soils for short periods after heavy rains. A slowly permeable, clayey layer that has moderate or high shrink-swell potential occurs at a depth of 1½ to 3½ feet in the Seward and Ottokee soils, over clay. In areas of the Spinks and Ottokee soils, there is some danger that effluent from septic tanks will contaminate the water of shallow wells. Topsoil may be needed for satisfactory lawns.

The soils in this group are slightly droughty and are only moderately productive of crops.

### *Group 3 for building sites*

This group consists of deep, somewhat poorly drained, medium-textured soils that have slopes of 0 to 6 percent. The soils are—

Digby loam, 0 to 2 percent slopes.
Digby sandy loam, 0 to 2 percent slopes.
Haskins and Digby loams, over clay, 0 to 2 percent slopes.
Haskins and Digby loams, over clay, 2 to 6 percent slopes.
Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes.
Haskins and Digby fine sandy loams, over clay, 2 to 6 percent slopes.
Kibbie fine sandy loam, 0 to 2 percent slopes.
Kibbie fine sandy loam, 2 to 6 percent slopes.
Kibbie loamy fine sand, 0 to 2 percent slopes.

These soils have a perched or temporary water table near the surface during wet periods and, consequently, are not suitable for septic-tank filter fields. They are readily permeable and easy to grade but are subject to frost heaving. The Haskins and Digby soils, over clay, are underlain at a depth of 1½ to 3½ feet by a slowly permeable clayey layer that has moderate or high shrink-swell potential. The Kibbie soils have low bearing strength. If the soils of this unit are used for building sites, complete subsurface drainage is needed. Otherwise, basements are likely to be wet.

These soils are highly productive of crops.

### *Group 4 for building sites*

This group consists of deep, somewhat poorly drained sandy soils that have slopes of 0 to 6 percent. The soils are—

Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes.
Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes.
Tedrow loamy fine sand, 0 to 2 percent slopes.
Tedrow loamy fine sand, 2 to 6 percent slopes.

These soils are readily permeable and are easy to grade, but they have a perched or temporary water table near the surface during wet periods. The Rimer and Tedrow soils, over clay, are underlain at a depth of 1½ to 3½ feet by a slowly permeable layer that has moderate or high shrink-swell potential, and they are subject to frost heaving. If septic tanks are installed in the Tedrow soils, there is danger that effluent from the tanks will contaminate the water of shallow wells. If the soils of this group are used for building sites, complete subsurface drainage is needed. Otherwise, basements are likely to be wet. Topsoil is needed for satisfactory lawns.

The soils in this group are slightly droughty if drained and are only moderately productive of crops.

### *Group 5 for building sites*

In this group are deep, somewhat poorly drained soils that have a clayey subsoil. The slope ranges from 0 to 6 percent. The soils are—

- Fulton silty clay loam, 0 to 2 percent slopes.
- Fulton silty clay loam, 2 to 6 percent slopes.
- Nappanee loam, 0 to 2 percent slopes.
- Nappanee loam, 2 to 6 percent slopes.
- Nappanee loam, 2 to 6 percent slopes, moderately eroded.
- Nappanee sandy loam, 0 to 2 percent slopes.
- Nappanee sandy loam, 2 to 6 percent slopes.
- Nappanee silty clay loam, 0 to 2 percent slopes.
- Nappanee silty clay loam, 2 to 6 percent slopes.
- Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded.

These soils have a temporary or perched water table near the surface during wet periods. They are slowly permeable, erodible if disturbed, and subject to frost heaving. They have low bearing strength but will support light buildings. If used for building sites, however, they need complete subsurface drainage. They absorb effluent from septic tanks slowly and consequently are poorly suited as filter fields. Lawns are difficult to establish in areas where the subsoil has been exposed. Therefore, before construction work is started, the topsoil should be removed for later use in these areas. When wet, these soils become sticky and are difficult to grade. Grading should be done when the soils are dry.

The soils in this group are moderately productive of crops.

### *Group 6 for building sites*

This group consists of deep, moderately well drained soils that have a high content of clay in the subsoil. The slope ranges from 2 to 25 percent. The soils are—

- St. Clair loam, 2 to 6 percent slopes.
- St. Clair loam, 6 to 12 percent slopes, moderately eroded.
- St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded.
- St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded.
- St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded.
- St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded.

These soils occur as rather small areas, close to or on slopes along drainageways. They are slowly permeable, erodible if disturbed, and subject to frost heaving. They have low bearing strength but will support residential buildings. They absorb effluent from septic tanks very slowly and consequently are poorly suited as filter fields. Steep slopes should not be used as filter fields. Lawns are difficult to establish in areas where the subsoil has been exposed. Therefore, before construction work is started, the topsoil should be removed for later use in these areas. When wet, these soils become sticky and are difficult to grade. Grading should be done when the soils are dry.

The soils in this group are only moderately productive.

### *Group 7 for building sites*

This group consists of deep, nearly level, very poorly drained, dark-colored sandy soils. The soils are—

- Wauseon fine sandy loam.
- Wauseon fine sandy loam, over clay.
- Wauseon loamy fine sand.
- Wauseon loamy fine sand, over clay.

These soils have a temporary water table at the surface during wet periods, and they are subject to frost heaving. The upper horizons are easy to grade, but there is a slowly permeable, clayey layer with moderate or high shrink-swell potential at a depth of 1½ to 3½ feet in the Wauseon soils, over clay, and at a depth of 4 feet or more in the other Wauseon soils.

The soils in this group have good bearing strength for light buildings but need both surface and subsurface drainage if used for building sites. They have severe limitations for use as septic-tank filter fields because of the high water table. If the water table can be permanently lowered, septic tanks will function well. However, there is some danger that the effluent will contaminate the water of shallow wells in the Wauseon soils that are deep over clay.

These soils are permeable and are highly productive.

### *Group 8 for building sites*

The soils in this group are deep, very poorly drained, dark colored, medium textured, and nearly level. They are—

- Colwood loam.
- Colwood fine sandy loam.
- Mermill fine sandy loam.
- Mermill sandy clay loam.
- Millgrove loam.

These soils have a temporary water table at the surface during wet periods, and they are subject to frost heaving. The Mermill soils are underlain at a depth of 18 to 48 inches by a slowly permeable clayey layer that has moderate or high shrink-swell potential. The bearing strength of the Mermill and Millgrove soils is fair to good for light buildings, but the bearing strength of the Colwood soils is low. These soils need surface and subsurface drainage if used for building sites. They have severe limitations for use as septic-tank filter fields because of the high water table. If the water table can be permanently lowered, septic tanks will function well in all of these soils except the Mermill soils. There is some danger that shallow wells will be contaminated if septic tanks are installed in the Colwood soils.

These soils are moderately permeable and are highly productive of crops.

### *Group 9 for building sites*

This group consists of deep, very poorly drained, nearly level, dark-colored clayey soils. The soils are—

- Hoytville clay.
- Hoytville clay, thin solum variant.
- Hoytville clay loam.
- Toledo silty clay.
- Toledo silty clay loam.

These soils have a temporary water table at the surface during wet periods. They have low bearing strength for foundations and have high shrink-swell potential. They are subject to frost heaving. Both surface and subsurface drainage are needed if they are used for building sites. Septic-tank filter fields will not function well, even if the water table is permanently lowered. Grading should be done when the soils are dry.

If adequately drained and otherwise well managed, the soils in this group are highly productive of crops.

### *Group 10 for building sites*

This group consists of shallow, well-drained loamy soils that are underlain by limestone. The slope ranges from 0 to 6 percent. The soils are—

- Dunbridge sandy loam, 0 to 2 percent slopes.
- Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes.
- Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes.
- Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes.
- Milton loam, 0 to 2 percent slopes.
- Milton loam, 2 to 6 percent slopes.
- Ritchey loam, 0 to 2 percent slopes.
- Ritchey loam, 2 to 6 percent slopes.
- Ritchey stony loam, 0 to 2 percent slopes.
- Romeo soils, 0 to 2 percent slopes.
- Romeo soils, 2 to 6 percent slopes.

These soils are underlain by bedrock at a depth of 42 inches or less, and in places there are outcrops of bedrock. Because of the shallowness to bedrock, they are suited to heavy construction but are not suitable for housing developments that require individual septic-tank filter fields. Lines for septic tanks are difficult to lay, and there is danger that the effluent percolating into bedrock will contaminate ground water. Topsoil is needed for satisfactory lawns. In places stones and fragments of limestone will interfere with grading.

The soils in this group are readily permeable and are droughty during dry periods. They are only moderately productive of crops.

### *Group 11 for building sites*

This group consists of shallow, somewhat poorly drained to very poorly drained soils that are underlain by limestone. The slope ranges from 0 to 6 percent. The soils are—

- Joliet silty clay loam.
- Millsdale silty clay loam.
- Millsdale stony silty clay loam.
- Randolph loam, 0 to 2 percent slopes.
- Randolph loam, 2 to 6 percent slopes.
- Randolph stony loam, 0 to 2 percent slopes.

These soils are underlain by bedrock at a depth of 10 to 42 inches. Because of shallowness to bedrock, they are not suitable for housing developments that require individual septic-tank filter fields. Lines for septic tanks are difficult to install, and there is danger that the effluent percolating into bedrock will contaminate ground water. These soils have an intermittent high water table and are subject to frost heaving. They are difficult to drain but, if used as building sites, need both surface and subsurface drainage. In places stones and fragments of limestone will interfere with grading.

Most of the soils of this group are poorly suited to crops.

### *Group 12 for building sites*

The soils in this unit are on flood plains that are subject to overflow and in depressed areas on the uplands, where surface water accumulates. They are—

- Alluvial land.
- Eel loam.
- Eel silt loam.
- Eel silt loam, over limestone.
- Genesee loam.
- Genesee silt loam.
- Muck.
- Shoals loam.
- Shoals silt loam.
- Shoals silty clay loam.
- Shoals and Sloan soils, over limestone.
- Sloan silt loam.
- Sloan silty clay loam.
- Warners soils, over clay.

Muck and the Warners soils, over clay, are in depressed areas on the uplands. They are not suitable for building sites, because they have poor bearing strength, are difficult to drain, and are subject to frost heaving. The other soils in this group are on flood plains that are subject to normal overflow, though frequency of flooding varies. These soils have value as parks and recreation areas. Some are used for agriculture. The better drained soils on flood plains are suitable for building sites, but the cost of protecting them from flooding is great. Permanent structures that might be damaged by flooding should not be built in recreation areas.

## Use of the Soils for Recreation[9]

This section is designed to aid officials and others interested in the development of parks or recreational areas. It discusses the limitations of the soils as sites for cottages and utility buildings and the desirability of the soils for campsites, picnic areas, intensive play areas, extensive play areas, and wildlife habitats or hunting preserves (*4*). As used here, intensive play areas are areas used for baseball, football, golf, horseshoe, badminton, and other such organized games. Extensive play areas are those used for cross-country hiking, bridle paths, nature study, conservation education, and other nonintensive purposes that allow for the random movement of people. The species of trees best suited to the soils of the county are shown by soil associations in the section "Management of Woodland." This information may be useful in planning recreation developments.

Wetness, permeability, hazard of flooding or ponding, depth to bedrock, stoniness, productivity, and slope affect the usefulness of the soils for recreation. The soils of Wood County have been placed in seven recreational groups on this basis. These groupings take into account only the properties of the soils. Not considered are transportation lines, distance to population centers, and other economic and cultural factors. The presence of trees or other vegetation may also affect the desirability of the soil for a particular site. The information given in this section is not a substitute for detailed investigation at the proposed site.

Additional information that may be helpful to those interested in areas for recreational development can be found

[9] Prepared by D. E. McCormack, State soil scientist, Soil Conservation Service, in consultation with other officials of the Soil Conservation Service.

in the sections "Soils and Rural-Urban Developments," "Engineering Uses of the Soils," and "Wildlife." The maps at the back of this report will also be helpful.

### *Recreation group 1*

In this group are well-drained, medium-textured to coarse-textured soils. These soils have good trafficability, both when bare and when sodded. Most of them can be used as campsites, picnic areas, and intensive and extensive play areas. The soils in this group are—

- Belmore loam, 1 to 4 percent slopes.
- Belmore sandy loam, 1 to 4 percent slopes.
- Dunbridge sandy loam, 0 to 2 percent slopes.
- Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes.
- Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes.
- Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes.
- Haney loam, 0 to 2 percent slopes.
- Haney loam, 2 to 6 percent slopes.
- Haney sandy loam, 0 to 2 percent slopes.
- Haney sandy loam, 2 to 6 percent slopes.
- Milton loam, 0 to 2 percent slopes.
- Milton loam, 2 to 6 percent slopes.
- Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes.
- Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes.
- Ritchey loam, 0 to 2 percent slopes.
- Ritchey loam, 2 to 6 percent slopes.
- Ritchey stony loam, 0 to 2 percent slopes.
- Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes.
- Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes.
- Spinks fine sand, 2 to 6 percent slopes.
- Spinks fine sand, 6 to 12 percent slopes.
- Spinks fine sand, 12 to 18 percent slopes.
- Spinks loamy fine sand, 2 to 6 percent slopes.
- Spinks loamy fine sand, 6 to 12 percent slopes.

The Spinks soils that have slopes of 6 to 18 percent have severe limitations for use as intensive play areas.

Unless the stones are removed, Ritchey stony loam and Dunbridge and Spinks stony loamy fine sands, over limestone, can be used only as extensive play areas.

The Dunbridge soils and the Ritchey soils are underlain by limestone at a depth of 1 or 2 feet. Thus, they have moderately severe limitations for use as sites for cottages or utility buildings in the various recreational areas. Excavations for foundations and basements would be expensive, and the installation of septic-tank systems would be impractical.

The Milton soils are underlain by limestone at a depth of 2 to 4 feet. They have the same limitations for use as the Dunbridge and Ritchey soils, but to a lesser extent. Septic tanks generally function fairly well in the Milton soils, but where creviced limestone is at a depth of less than 4 feet, there is some danger that effluent from septic tanks will move as far as 200 to 300 feet through the rock and contaminate the water supply, particularly the water in shallow wells.

The other soils in this group have few or no limitations that restrict their use as sites for buildings or for septic-tank systems.

All of the soils are well drained and consequently are not suitable habitats for wetland wildlife. Furthermore, they are rapidly permeable below a depth of 2 to 4 feet and generally are not suitable as sites for ponds. They have moderate limitations as habitats for pheasants, rabbits, and other upland wildlife. They are somewhat droughty and are not highly productive of plants that provide wildlife food and cover.

### *Recreation group 2*

The soils in this group are somewhat poorly drained and are medium textured to coarse textured. They have some limitations for campsites, picnic areas, and intensive play areas but few limitations for extensive play areas. The soils in this group are—

- Digby loam, 0 to 2 percent slopes.
- Digby sandy loam, 0 to 2 percent slopes.
- Kibbie fine sandy loam, 0 to 2 percent slopes.
- Kibbie fine sandy loam, 2 to 6 percent slopes.
- Kibbie loamy fine sand, 0 to 2 percent slopes.
- Tedrow loamy fine sand, 0 to 2 percent slopes.
- Tedrow loamy fine sand, 2 to 6 percent slopes.

These soils can be used for campsites in summer and in fall. During this period they dry out quickly after rains and have good trafficability. In spring the water table is likely to be high, and the soils are too wet to be used for camping.

The soils in this group can be used for picnic areas and intensive play areas, except for short periods in spring, when they are likely to be too wet. They have few limitations for year-round extensive play areas.

Septic-tank systems generally function adequately in these soils, except late in winter, in spring, and early in summer when the water table normally is at a depth of 1 to 3 feet. These soils have few limitations for use as sites for cottages or utility buildings, but basements are likely to be wet during wet periods unless special precautions are taken in their construction.

If drained, these soils have only slight limitations as habitats for most upland wildlife, and they are productive of plants that provide their food and cover. Undrained soils generally are too wet to be suitable habitats for upland wildlife. These sandy soils do not provide favorable sites for ponds and generally are not suitable habitats for wetland wildlife.

### *Recreation group 3*

This group consists of somewhat poorly drained, deep soils that are medium textured or moderately coarse textured in the upper part of the profile and fine textured in the lower part. Generally, these soils can be used as picnic areas and intensive play areas, but unless drained, they are too wet to be used to any extent as campsites. The soils in this group are—

- Haskins and Digby loams, over clay, 0 to 2 percent slopes.
- Haskins and Digby loams, over clay, 2 to 6 percent slopes.
- Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes.
- Haskins and Digby fine sandy loams, over clay, 2 to 6 percent slopes.
- Nappanee loam, 0 to 2 percent slopes.
- Nappanee loam, 2 to 6 percent slopes.
- Nappanee loam, 2 to 6 percent slopes, moderately eroded.
- Nappanee sandy loam, 0 to 2 percent slopes.
- Nappanee sandy loam, 2 to 6 percent slopes.
- Randolph loam, 0 to 2 percent slopes.
- Randolph loam, 2 to 6 percent slopes.
- Randolph stony loam, 0 to 2 percent slopes.
- Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes.
- Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes.

These soils have moderate limitations for campsites. Unless adequately drained, they have a high water table in spring and early in summer. Even if drained, they are slow to dry out after rains.

Although these soils are slow to dry out after rains, they have good trafficability, except when they are very wet. Thus, they have only slight limitations for use as picnic areas and intensive play areas. If used for these purposes, however, the stones should be removed from Randolph stony loam.

The slowly permeable subsoil and the high water table prevent the satisfactory functioning of septic-tank systems for year-round residences. If not overloaded, septic tanks function well during July, August, September, and October on all of the soils in this group except the Nappanee, which are too impervious to be suitable.

The water table is high during wet periods. Consequently, these soils have moderate limitations for use as sites for cottages and utility buildings. The Randolph soils are underlain by limestone at a depth of 2 to 4 feet. Because of this, they have good bearing strength for structures but are difficult to excavate for foundations and basements. In the other soils in this group, the bearing strength is less than optimum.

If drained, these soils have only slight limitations as habitats for most species of upland game and are productive of plants that provide their food and cover. Undrained areas generally are too wet for upland wildlife. These soils have severe limitations as habitats for wetland wildlife but, except for the Randolph soils, provide good sites for ponds.

### *Recreation group 4*

In this group are poorly drained or somewhat poorly drained soils that are moderately to very slowly permeable. The slope ranges from 0 to 6 percent but is mostly from 0 to 2 percent. These soils generally are too wet to be used for campsites, picnic areas, or intensive play areas. The soils in this group are—

- Colwood loam.
- Colwood fine sandy loam.
- Fulton silty clay loam, 0 to 2 percent slopes.
- Fulton silty clay loam, 2 to 6 percent slopes.
- Hoytville clay.
- Hoytville clay, thin solum variant.
- Hoytville clay loam.
- Joliet silty clay loam.
- Millgrove loam.
- Mermill fine sandy loam.
- Mermill sandy clay loam.
- Millsdale silty clay loam.
- Millsdale stony silty clay loam.
- Nappanee silty clay loam, 0 to 2 percent slopes.
- Nappanee silty clay loam, 2 to 6 percent slopes.
- Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded.
- Romeo soils, 0 to 2 percent slopes.
- Romeo soils, 2 to 6 percent slopes.
- Toledo silty clay.
- Toledo silty clay loam.
- Wauseon fine sandy loam.
- Wauseon fine sandy loam, over clay.
- Wauseon loamy fine sand.
- Wauseon loamy fine sand, over clay.

These soils have severe limitations for use as campsites, picnic areas, and intensive play areas. The water table is high, and in many areas ponding is likely after rains. Tile drains and drainage ditches will alleviate some wetness, but even if drained, the soils are slow to dry out after rains.

The clayey soils in this group become sticky when wet. Thus, these soils have moderate to severe limitations, even for extensive play areas. They can be used for this purpose during July, August, September, and October, provided they are not used shortly after rains.

The high water table prevents septic-tank systems from functioning well. All of the soils except the Colwood, Joliet, Romeo, Wauseon, and Millgrove soils are too slowly permeable to allow the proper functioning of septic tanks, even if the water table were permanently lowered by drainage.

The soils in this group have severe limitations as sites for cottages and utility buildings, primarily because of wetness. In the Colwood soils, the bearing strength is low. In most of the other soils, it is less than optimum. Bedrock occurs at a depth of less than 1 foot in the Romeo soils, at a depth of 1 to 2 feet in the Joliet soils, and at 4 feet or less in the Millsdale soils.

Drained areas have only slight limitations as habitats for upland wildlife. During the nesting season, undrained areas or low spots in drained areas have severe limitations as habitats for upland game birds.

Undrained areas generally are marshy and have few limitations as habitats for wetland wildlife. The Fulton, Hoytville, Nappanee, Toledo, and Mermill soils provide good sites for ponds.

### *Recreation group 5*

In this group are deep, moderately well drained, slowly permeable soils that have a fine-textured, clayey subsoil. The soils in this group are—

- St. Clair loam, 2 to 6 percent slopes.
- St. Clair loam, 6 to 12 percent slopes, moderately eroded.
- St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded.
- St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded.
- St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded.
- St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded.

The soils in this group that have a slope of less than 12 percent have moderate limitations that restrict their use for campsites. They tend to be a little slow to dry out after rains, and all of the soils except the St. Clair loams are sticky when wet. If the slope is more than 6 percent, some leveling is necessary for good campsites. The soils that have a slope of 12 percent or more generally have severe limitations for campsites.

The St. Clair loams have good trafficability, except when they are very wet. Thus, these soils have only slight limitations for use as picnic areas. Their limitation for intensive play areas varies according to slope. It is slight for soils that have a slope of less than 6 percent and severe for soils that have a slope of 6 percent or more. Their limitation for extensive play areas is slight.

When wet or moist, the St. Clair silty clay loams are sticky and consequently have poor trafficability. For this reason, they have moderate limitations for picnic areas, intensive play areas, and extensive play areas. However, their ratings because of slope are similar to those of the St. Clair loams. The soils that have a slope of more than 18 percent have severe limitations for picnic areas, but they have only slight limitations for use as extensive play areas.

Erosion is a hazard on all of the soils in this group, and efforts should be made to control it.

These soils have good natural drainage. They have few limitations as habitats for upland wildlife, and they are productive of plants that provide their food and cover. They have severe limitations as habitats for wetland wildlife but provide good sites for ponds.

### *Recreation group 6*

The soils in this group occur on flood plains and in depressions and are subject to flooding and ponding. The soils are—

| | |
|---|---|
| Alluvial land. | Shoals loam. |
| Eel loam. | Shoals silt loam. |
| Eel silt loam. | Shoals silty clay loam. |
| Eel silt loam, over limestone. | Shoals and Sloan soils, over limestone. |
| Genesee loam. | Sloan silt loam. |
| Genesee silt loam. | Sloan silty clay loam. |
| Muck. | Warners soils, over clay. |

The flooding and ponding of these soils severely limits their use for campsites, picnic areas, intensive play areas, and extensive play areas and as sites for cottages or utility buildings. The flooding hazard is greatest late in winter and in spring. Most improvements are likely to be damaged by flooding. Septic-tank systems will not function properly.

The Genesee and Eel soils have good natural drainage and tend to dry out quickly after rains and after floods. They have good trafficability even when moist. They can be used as picnic areas and to some extent as intensive play areas if they are cleaned after floods and if the period of use is limited to summer and fall.

The Genesee and Eel soils can also be used to some extent as nature-study areas, trails for cross-country hiking, bridle paths, and other extensive play areas. The other soils in this group occupy lower positions than the Genesee and Eel soils and are flooded more frequently. Consequently, they have very severe limitations for such use because they generally are wet and soft during much of the year.

During dry periods the soils in this group furnish considerable food and cover for wildlife, but during much of the year, wetness and the hazard of flooding limit their use as habitats for upland wildlife. Numerous marshy areas and streams that flow the year round favor the use of these soils for wetland wildlife.

### *Recreation group 7*

This group consists of three miscellaneous land types. The limitations of these areas for recreational use must be determined by investigations of the individual sites. The miscellaneous land types in this group are—

- Made land and Borrow pits.
- Quarries.
- Urban land.

Some areas of Made land and Borrow pits have good potential for recreational use. For example, areas in which water has collected may provide suitable habitats for wetland wildlife.

Except for some soils on bottom lands, Urban land generally is not available for recreational use. The bottom lands have the same potential for recreational use as the soils in group 6.

# *Descriptions of the Soils*

In this section the soil series of Wood County are described in alphabetical order. Following the general description of each series, there is a brief description of a typical soil profile, followed by a discussion of each mapping unit, or soil, in the series. In parentheses, following the name of each mapping unit, is the symbol that identifies the mapping unit on the detailed soil map in the back of the report.

In the section "Genesis, Classification, and Morphology of the Soils," there is a more technical description of a representative profile for each soil series in the county. Information on the use and management of the soils is given in the section "Use and Management of the Soils." Terms used to describe the soils are defined in the Glossary.

Near the back of the report is a list showing the soils mapped in the county and the capability unit of each. Table 5 shows the approximate acreage and proportionate extent of the soils in the county.

## Alluvial Land

**Alluvial land** (Al).—This miscellaneous land type occurs on level or nearly level islands in the Maumee River and is underlain by limestone. In most places it is under a cover of grass, weeds, brush, and trees. Associated soils are those of the Sloan, Shoals, Eel, and Genesee series.

The hazard of flooding and the difficulty of access with farm machinery limit the use of this land for agriculture. *Capability unit IIIw-2.*

## Belmore Series

The Belmore series is made up of well-drained, nearly level to gently sloping, light-colored soils that developed in thick, water-laid deposits of sandy and gravelly material. These soils occur mainly on beach ridges. They are calcareous at a depth of 24 to 60 inches.

Typical profile of Belmore loam:

- 0 to 8 inches, dark-brown, very friable loam.
- 8 to 19 inches, dark reddish-gray or dark reddish-brown, friable sandy loam to loam.
- 19 to 39 inches, dark reddish-brown, friable sandy clay loam.
- 39 to 49 inches, dark grayish-brown, loose fine gravel; strata of sand and sandy loam; calcareous.

**Belmore loam, 1 to 4 percent slopes** (BmB).—This soil occurs on the crest and on the upper part of the slopes of the Maumee Beach Ridge. Included in the areas mapped are a few small areas of redder, moderately well drained soils at the base of the ridges.

Runoff is slow or very slow, and water moves at a moderately rapid rate through the soil. The organic-matter content is low, and the moisture-supplying capacity is medium or low. Tile drainage generally is not needed, except to remove seepage water from some areas.

This soil is well suited to irrigation and is productive if irrigated. It responds well to lime and fertilizer. It tends to warm up early in spring and consequently is well suited to strawberries and other short-season truck crops.

TABLE 5.—*Approximate acreage and proportionate extent of the soils*

| Soil | Acres | Percent |
|---|---|---|
| Alluvial land | 260 | 0.1 |
| Belmore loam, 1 to 4 percent slopes | 164 | (1) |
| Belmore sandy loam, 1 to 4 percent slopes | 343 | .1 |
| Colwood fine sandy loam | 2,912 | .7 |
| Colwood loam | 1,208 | .3 |
| Digby loam, 0 to 2 percent slopes | 592 | .1 |
| Digby sandy loam, 0 to 2 percent slopes | 511 | .1 |
| Dunbridge sandy loam, 0 to 2 percent slopes | 162 | (1) |
| Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes | 970 | .2 |
| Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes | 497 | .1 |
| Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes | 162 | (1) |
| Eel loam | 263 | .1 |
| Eel silt loam | 2,178 | .6 |
| Eel silt loam, over limestone | 113 | (1) |
| Fulton silty clay loam, 0 to 2 percent slopes | 3,196 | .8 |
| Fulton silty clay loam, 2 to 6 percent slopes | 572 | .1 |
| Genesee loam | 385 | .1 |
| Genesee silt loam | 777 | .2 |
| Haney loam, 0 to 2 percent slopes | 301 | .1 |
| Haney loam, 2 to 6 percent slopes | 200 | .1 |
| Haney sandy loam, 0 to 2 percent slopes | 111 | (1) |
| Haney sandy loam, 2 to 6 percent slopes | 60 | (1) |
| Haskins and Digby loams, over clay, 0 to 2 percent slopes | 3,473 | .9 |
| Haskins and Digby loams, over clay, 2 to 6 percent slopes | 114 | (1) |
| Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes | 1,595 | .4 |
| Haskins and Digby fine sandy loams, over clay, 2 to 6 percent slopes | 179 | .1 |
| Hoytville clay | 200,406 | 50.7 |
| Hoytville clay loam | 34,777 | 8.8 |
| Hoytville clay, thin solum variant | 485 | .1 |
| Joliet silty clay loam | 447 | .1 |
| Kibbie fine sandy loam, 0 to 2 percent slopes | 1,720 | .4 |
| Kibbie fine sandy loam, 2 to 6 percent slopes | 124 | (1) |
| Kibbie loamy fine sand, 0 to 2 percent slopes | 426 | .1 |
| Made land and Borrow pits | 2,479 | .6 |
| Mermill fine sandy loam | 382 | .1 |
| Mermill sandy clay loam | 33,517 | 8.5 |
| Millgrove loam | 634 | .2 |
| Millsdale silty clay loam | 3,540 | .9 |
| Millsdale stony silty clay loam | 142 | (1) |
| Milton loam, 0 to 2 percent slopes | 1,100 | .3 |
| Milton loam, 2 to 6 percent slopes | 150 | (1) |
| Muck | 526 | .1 |
| Nappanee loam, 0 to 2 percent slopes | 12,096 | 3.2 |
| Nappanee loam, 2 to 6 percent slopes | 985 | .3 |
| Nappanee loam, 2 to 6 percent slopes, moderately eroded | 445 | .1 |
| Nappanee sandy loam, 0 to 2 percent slopes | 1,217 | .3 |
| Nappanee sandy loam, 2 to 6 percent slopes | 129 | (1) |
| Nappanee silty clay loam, 0 to 2 percent slopes | 3,220 | .8 |
| Nappanee silty clay loam, 2 to 6 percent slopes | 184 | .1 |
| Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded | 153 | (1) |
| Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes | 1,727 | .4 |
| Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes | 7,483 | 2.0 |
| Quarries | 564 | .1 |
| Randolph loam, 0 to 2 percent slopes | 2,343 | .6 |
| Randolph loam, 2 to 6 percent slopes | 63 | (1) |
| Randolph stony loam, 0 to 2 percent slopes | 325 | .1 |
| Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes | 8,247 | 2.1 |
| Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes | 664 | .2 |
| Ritchey loam, 0 to 2 percent slopes | 470 | .1 |
| Ritchey loam, 2 to 6 percent slopes | 186 | .1 |
| Ritchey stony loam, 0 to 2 percent slopes | 98 | (1) |
| Romeo soils, 0 to 2 percent slopes | 2,465 | .6 |
| Romeo soils, 2 to 6 percent slopes | 581 | .1 |
| St. Clair loam, 2 to 6 percent slopes | 159 | (1) |
| St. Clair loam, 6 to 12 percent slopes, moderately eroded | 405 | .1 |
| St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded | 67 | (1) |
| St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded | 260 | .1 |
| St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded | 232 | .1 |
| St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded | 568 | .1 |
| Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes | 2,914 | .7 |
| Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes | 2,667 | .7 |
| Shoals loam | 268 | .1 |
| Shoals silt loam | 955 | .2 |
| Shoals silty clay loam | 107 | (1) |
| Shoals and Sloan soils, over limestone | 65 | (1) |
| Sloan silt loam | 642 | .2 |
| Sloan silty clay loam | 3,611 | 1.0 |
| Spinks fine sand, 2 to 6 percent slopes | 516 | .1 |
| Spinks fine sand, 6 to 12 percent slopes | 178 | .1 |
| Spinks fine sand, 12 to 18 percent slopes | 53 | (1) |
| Spinks loamy fine sand, 2 to 6 percent slopes | 324 | .1 |
| Spinks loamy fine sand, 6 to 12 percent slopes | 143 | (1) |
| Tedrow loamy fine sand, 0 to 2 percent slopes | 1,465 | .4 |
| Tedrow loamy fine sand, 2 to 6 percent slopes | 252 | .1 |
| Toledo silty clay | 11,638 | 3.0 |
| Toledo silty clay loam | 1,969 | .5 |
| Urban land | 8,961 | .23 |
| Warners soils, over clay | 244 | .1 |
| Wauseon fine sandy loam | 3,245 | .8 |
| Wauseon fine sandy loam, over clay | 5,955 | 1.5 |
| Wauseon loamy fine sand | 1,677 | .4 |
| Wauseon loamy fine sand, over clay | 182 | (1) |
| Total | 395,520 | 100 |

[1] Less than 0.1 of 1 percent.

Corn, soybeans, and other late-maturing crops are likely to be damaged by drought. This soil is a source of gravel. *Capability unit IIs–2.*

**Belmore sandy loam, 1 to 4 percent slopes** (BnB).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer contains a greater proportion of sand. This soil occurs on the crest and on the upper part of the slopes of the Whittlesey Beach Ridge. A few small areas in which the surface layer is loamy fine sand or fine sandy loam are included in the areas mapped.

Runoff is slow or very slow. Water moves at a moderately rapid rate through the soil, and the moisture-supplying capacity is low or medium. Artificial drainage is not needed.

This soil is well suited to irrigation and is productive if irrigated. It responds well to lime and fertilizer but is only moderately productive if management is average.

It tends to warm up early in spring and consequently is well suited to short-season crops. Corn, soybeans, and other late-maturing crops are likely to be damaged by drought because of the low or medium moisture-supplying capacity. This soil is a source of sand and gravel. *Capability unit IIs-2.*

## Colwood Series

The Colwood series consists of dark-colored, very poorly drained soils on level, nearly level, or slightly depressed lake plains, deltas, outwash plains, and terraces. These soils developed in stratified calcareous silt, fine sand, and very fine sand that included lenses of clay.

Typical profile of Colwood fine sandy loam:

0 to 8 inches, very dark gray, friable fine sandy loam.
8 to 20 inches, grayish-brown, friable fine sandy loam to light sandy clay loam, mottled with yellowish brown and light yellowish brown.
20 to 38 inches, mottled light yellowish-brown, light brownish-gray, and grayish-brown, friable sandy loam to loam.
38 to 66 inches, mottled gray, light yellowish-brown, and brownish-yellow, firm stratified silt, fine sand, and very fine sand; thin lenses of clay; calcareous.

**Colwood fine sandy loam** (Cs).—This soil occurs on level, nearly level, or slightly depressed lake plains, deltas, outwash plains, and terraces. Small areas of the closely associated Mermill and Wauseon soils are included in the areas mapped.

This soil has a seasonally high water table. It has slow to ponded surface runoff, moderately rapid internal drainage, and high moisture-supplying capacity. Tile drains, which function well in this sandy soil, are needed to remove excess water.

This soil is high in organic-matter content, and it is neutral or slightly acid. It is used principally for general truck crops or for sugar beets, tomatoes, and other specialty crops. *Capability unit IIw-5.*

**Colwood loam** (Co).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer is less sandy. This soil occurs on level, nearly level, or slightly depressed lake plains, deltas, outwash plains, and terraces. Small areas of the associated Mermill and Wauseon soils are included in the areas mapped.

This soil has a seasonally high water table. Surface runoff is slow to ponded, internal drainage is moderately rapid, and the moisture-supplying capacity is high. Tile drains, which function well in this sandy soil, are needed to remove excess water.

This soil is high in organic-matter content, and it is neutral or slightly acid. It is used principally for general farm crops or for sugar beets, tomatoes, and other specialty crops. *Capability unit IIw-5.*

## Digby Series

The Digby series consists of somewhat poorly drained, nearly level or gently sloping soils on secondary beach ridges, gravel bars, terraces, and outwash plains. These soils developed in sand and fine gravel that contained various amounts of fine-textured material and that extended to a depth of 48 inches or more. They are calcareous at a depth ranging from 28 inches to more than 48 inches.

Typical profile of Digby loam:

0 to 7 inches, dark grayish-brown, friable loam.
7 to 16 inches, dark grayish-brown to dark-brown, firm clay loam mottled with yellowish brown.
16 to 32 inches, yellowish-brown, friable loam mottled with dark brown and brownish yellow.
32 to 58 inches, light brownish-gray and grayish-brown, loose, poorly sorted sand and fine gravel; considerable silt and clay; calcareous.

**Digby loam, 0 to 2 percent slopes** (Dm).—This soil occurs on slightly elevated secondary beach ridges, gravel bars, terraces, or outwash plains. Included in the areas mapped are some small areas of soils that have a very dark gray to very dark grayish-brown, or darker colored, surface layer; some Digby soils that slope as much as 6 percent; and some small tracts of Haskins and Digby loams, over clay.

Surface runoff is slow, the organic-matter content is medium, and the moisture-supplying capacity is medium. There is a seasonally high water table. Tile drains, which function well in this sandy soil, are needed to remove excess water.

This soil is moderately productive. It is easy to work and responds well to fertilizer and lime. General farm crops are grown. This soil is a source of gravel. *Capability unit IIw-3.*

**Digby sandy loam, 0 to 2 percent slopes** (Dn).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer contains a larger proportion of sand. Included in the areas mapped are small areas of soils that have a surface layer of fine sandy loam and that slope as much as 6 percent; some soils that have a very dark gray to very dark grayish-brown surface layer; and small areas of Haskins and Digby fine sandy loams, over clay.

Surface runoff is slow, the organic-matter content is medium, and the moisture-supplying capacity is also medium. There is a seasonally high water table. Tile drains, which function well in this sandy soil, are needed to remove excess water.

This soil is easy to work and responds well to fertilizer and lime. General crops are grown. This soil is a source of gravel. *Capability unit IIw-3.*

## Dunbridge Series

The Dunbridge series consists of well-drained soils on nearly level or gently sloping beach ridges and lake terraces. These soils developed in coarse textured and moderately coarse textured materials that ranged from 18 to 30 inches in depth to limestone. In places Dunbridge soils are mapped as undifferentiated mapping units with Spinks soils.

Typical profile of Dunbridge loamy fine sand:

0 to 8 inches, dark-brown, very friable loamy fine sand.
8 to 14 inches, yellowish-brown, very friable fine sandy loam; a few pebbles and limestone fragments.
14 to 25 inches, dark-brown, firm sandy clay loam; few to common pebbles, cobblestones, and limestone fragments.
25 to 27 inches, very pale brown, soft, partially weathered limestone.
27 inches +, limestone bedrock.

**Dunbridge sandy loam, 0 to 2 percent slopes** (Dr).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer contains less fine sand. This soil occurs on nearly level beach ridges and lake terraces. It is underlain by limestone at a depth of 18 to 30 inches. Included in the areas mapped are small areas in which bedrock occurs at a depth of 30 to 42 inches; some small areas of gently sloping Dunbridge sandy loam; and small areas of the associated Milton, Ritchey, and Romeo soils.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low or medium.

Nearly all of this soil is cleared, but only a few areas are cultivated. Most of the acreage is used for pasture. Crops do not receive sufficient moisture, because the soils are sandy and shallow. *Capability unit IIIs-1.*

**Dunbridge and Spinks loamy fine sands, over limestone, 0 to 2 percent slopes** (Ds).—The soils of this undifferentiated mapping unit occur on nearly level beach ridges and lake terraces. They are underlain by limestone at a depth of 18 to 30 inches. Included in the areas mapped are small areas in which bedrock occurs at a depth of 10 to 18 inches, and some areas in which bedrock occurs at a depth of 30 to 42 inches. Also included are small areas in which the surface layer is sandy loam or loamy sand, and small areas of the associated Milton, Ritchey, Romeo and Spinks soils.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low or medium.

Nearly all of the acreage is cleared, but only a few small areas are used for cultivated crops. Most of the acreage is used for pasture. Cultivated crops do not receive sufficient moisture, because the soils are sandy and shallow. *Capability unit IIIs-1.*

**Dunbridge and Spinks loamy fine sands, over limestone, 2 to 6 percent slopes** (DsB).—The soils of this undifferentiated mapping unit occur on gently sloping beach ridges and lake terraces and are underlain by limestone at a depth of 18 to 30 inches. Included in the areas mapped are small areas in which bedrock occurs at a depth of 10 to 18 inches, and some areas in which bedrock occurs at a depth of 30 to 42 inches. Also included are small areas in which glacial boulders or limestone fragments, larger than 10 inches in diameter, occur on the surface and throughout the soil material; some small areas in which the surface layer is sandy loam or loamy sand; and small areas of the associated Milton, Ritchey, Romeo, and Spinks soils.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low or medium.

Nearly all of the acreage is cleared, but only a few small areas are cultivated. Most of the acreage is used for pasture. Crops do not receive sufficient water, because the soils are sandy and shallow. *Capability unit IIIs-1.*

**Dunbridge and Spinks stony loamy fine sands, over limestone, 0 to 2 percent slopes** (Dx).—The soils of this undifferentiated mapping unit occur on nearly level beach ridges and lake terraces. They are underlain by limestone at a depth of 18 to 30 inches, and there are many glacial boulders or limestone fragments, larger than 10 inches in diameter, on the surface and throughout the soil material. Included in the areas mapped are a few small areas in which bedrock occurs at a depth of 10 to 18 inches, and small areas in which bedrock occurs at a depth of 30 to 42 inches. Also included are some small areas in which the surface layer is sandy loam or loamy sand, and small areas of the associated Milton, Ritchey, Romeo, and Spinks soils.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low or medium. The large stones on this soil interfere with cultivation. Most of the acreage is used for permanent pasture, and a few areas are wooded. *Capability unit VIs-1.*

## Eel Series

The Eel series consists of moderately well drained, medium-textured, alluvial soils on nearly level flood plains along the large streams in the county.

Typical profile of Eel loam:

0 to 8 inches, dark grayish-brown, friable loam.
8 to 20 inches, yellowish-brown, friable clay loam mottled with brown in lower part.
20 to 32 inches, brown and yellowish-brown, friable loam mottled with strong brown.
32 to 48 inches, yellowish-brown and brown, friable loam mottled with grayish brown and strong brown.

**Eel loam** (Ea).—This soil formed in recent alluvium on nearly level flood plains. Included in the areas mapped are a few small areas of gently sloping soils along drainageways, and a few areas in which the surface layer is fine sandy loam.

Surface runoff is slow, and the moisture-supplying capacity is high. Tile drains generally are not necessary, but levees are needed to protect this soil from flooding. The organic-matter content is medium, and plant nutrients and minerals are often deposited by floodwater. Weed control is more of a problem on this soil than on the associated soils of the uplands.

This soil is used mainly for cultivated crops. Corn and soybeans are the principal crops, but hay and small grain are also grown. Yields are favorable if flooding is controlled and other management is good. Some areas are on narrow bottoms that are not readily accessible or on bottoms that are subject to frequent overflow. These areas are in permanent pasture, or they are wooded. *Capability unit I-1.*

**Eel silt loam** (Em).—This soil formed in recent alluvium on nearly level flood plains. Included in the areas mapped are a few small areas in which the surface layer is silty clay loam.

Surface runoff is slow, and the moisture-supplying capacity is high. Levees are needed to protect this soil from overflow. Tile drains are needed only in a few scattered wet spots. The organic-matter content is medium, and plant nutrients and minerals are often deposited by floodwater. Weed control is more of a problem on this soil than on the associated soils of the uplands.

This soil is used mainly for corn and soybeans, but some hay and small grain are grown. Yields are favorable if flooding is controlled and other management is good. Some areas are on narrow bottoms that are not readily accessible. Other areas are on bottoms that are frequently flooded. These areas are used for permanent pasture, or they are wooded. *Capability unit I-1.*

**Eel silt loam, over limestone** (Er).—This soil formed in recent alluvium on nearly level flood plains. It is similar to the soil described as typical of the series, except that it has a more silty surface layer, and it is underlain by limestone at a depth of 20 to 42 inches. Included in the areas mapped are small areas in which the surface layer is loam and small areas of well-drained, dark-colored soils that are also underlain by limestone.

Surface runoff is slow, and the moisture-supplying capacity is medium. Generally, tile drains are needed only in a few scattered wet spots, but levees are needed to protect this soil from flooding. The organic-matter content is medium, and plant nutrients and minerals are deposited periodically by floodwater. Weed control is more of a problem on this soil than on the associated soils of the uplands.

The use of this soil depends largely on the depth to bedrock. In some areas, root growth may be restricted because of shallowness to bedrock. Most of the acreage is used for permanent pasture or meadow. *Capability unit IIIw-2.*

## Fulton Series

The Fulton series consists of light-colored, somewhat poorly drained soils that developed in calcareous, lake-laid clay that contained thin layers or strata of silt and fine sand. These soils occur in level areas on the lake plain, where they are associated with the Toledo soils, or in gently sloping areas, adjacent to stream bottoms.

Typical profile of Fulton silty clay loam:

0 to 7½ inches, grayish-brown to brown, friable silty clay loam.
7½ to 17 inches, brown, firm silty clay mottled with yellowish brown.
17 to 36 inches, gray or grayish-brown, very firm silty clay mottled with yellowish brown.
36 to 49 inches, yellowish-brown, firm silty clay loam mottled with grayish brown; calcareous.

**Fulton silty clay loam, 0 to 2 percent slopes** (Fu).—This soil occurs within the glacial lake plain. Included in the areas mapped are some small areas of the very poorly drained Toledo soils and small areas of the closely associated Nappanee soils. Also included are small areas in which the surface layer is very dark grayish-brown, and a few areas in which it is silt loam.

Surface runoff is slow, and water moves slowly through the clayey subsoil. At times water remains ponded on the surface. The moisture-supplying capacity is medium, and there is a seasonally high water table. Both tile and surface drainage are needed to remove excess water. To be effective, the tile should be closely spaced.

This soil is slow to warm up and to dry out in spring. In drying, it forms a crust that hinders the emergence of seedlings. It is medium in organic-matter content and medium acid to neutral in reaction. It is benefited by applications of green manure and animal manure and responds well to both lime and commercial fertilizer.

Nearly all of this soil is cleared. This acreage is used either for crops or for urban development. *Capability unit IIIw-3.*

**Fulton silty clay loam, 2 to 6 percent slopes** (FuB).—This soil is adjacent to stream bottoms, within the lake plain. Included in the areas mapped are small areas in which the surface layer is silt loam, and a few eroded areas in which the plow layer is a mixture of topsoil and subsoil material.

Surface runoff is slow, and the moisture-supplying capacity is medium. Water moves slowly through the clayey subsoil, and there is a seasonally high water table. Tile can be used to remove excess water, but to be most effective it should be closely spaced.

This soil is slow to warm up and dry out in spring. In drying, it forms a crust that hinders the emergence of seedlings. It is medium in organic-matter content and medium acid to neutral in reaction. It is benefited by applications of both green manure and animal manure, and it responds well to lime and fertilizer.

Nearly all of this soil is cleared. This acreage is used either for cultivated crops or for urban development. All of the crops commonly grown in the county are suitable, but crops that help to control erosion should be included in the rotation. *Capability unit IIIw-3.*

## Genesee Series

The Genesee series is made up of well-drained, medium-textured, alluvial soils on level to nearly level bottoms, along the large streams.

Typical profile of Genesee silt loam:

0 to 11 inches, very dark grayish-brown (uncrushed) and dark grayish-brown (crushed) very friable silt loam; abundant roots.
11 to 24 inches, very dark grayish-brown (uncrushed) and dark grayish-brown (crushed) friable loam; plentiful roots.
24 to 62 inches, very dark grayish-brown (uncrushed) and dark grayish-brown (crushed) very friable loam; few roots.

**Genesee loam** (Gm).—This is a level or nearly level soil on flood plains along the large streams. A few small areas of well-drained, dark-colored soils are included in the areas mapped.

This soil has slow or very slow surface runoff and high moisture-supplying capacity. It generally does not need tile drains. However, it is occasionally flooded. The organic-matter content is medium, and plant nutrients and minerals are often deposited by floodwater. The control of weeds is more of a problem on this soil than on the associated soils of the uplands.

Most of this soil is cultivated. Corn and soybeans are the principal crops, but hay and small grain are also grown. If flooding is controlled and other management is good, favorable yields can be obtained. *Capability unit I-1.*

**Genesee silt loam** (Gn).—This is a level or nearly level soil on flood plains along the large streams. Included in the areas mapped are a few small areas of gently sloping soils along drainageways, and a few small areas of well-drained, darker colored soils.

This soil has slow or very slow surface runoff and high moisture-supplying capacity. It generally does not require tile drains, but it is occasionally flooded. The organic-matter content is medium, and plant nutrients and minerals are often deposited by floodwater. Weed control is more of a problem on this soil than on the associated soils of the uplands.

Most of this soil is cultivated. Corn and soybeans are the principal crops, but hay and small grain are also grown. If flooding is controlled and other management is good, favorable yields can be obtained. *Capability unit I-1.*

## Haney Series

The Haney series consists of moderately well drained soils on nearly level or gently sloping secondary beach ridges, gravel bars, terraces, and outwash plains. These soils developed in sand and fine gravel that contained various amounts of fine-textured material and that extended to a depth of 48 inches or more. They are calcareous at a depth of 27 to 36 inches.

Typical profile of Haney loam:

0 to 7 inches, dark grayish-brown, friable loam.
7 to 25 inches, dark-brown, firm clay loam mottled with strong brown.
25 to 34 inches, dark-brown, friable clay loam mottled with strong brown.
34 inches +, yellowish-brown and grayish-brown, loose, poorly sorted sand and fine gravel; considerable silt and clay; calcareous.

**Haney loam, 0 to 2 percent slopes** (Hd).—This soil occurs on ridges, beach deposits, terraces, and gravel bars. Included in the areas mapped are small areas in which the surface layer is very dark grayish brown or very dark brown.

Surface runoff is medium, the organic-matter content is medium, and the moisture-supplying capacity is medium. Ordinarily, tile drains are needed only in a few scattered wet or seepy spots that have a seasonally high water table.

This soil is moderately productive. It may require additional moisture during long, dry periods, but it is suited to irrigation. It is easy to work and responds well to both fertilizer and lime. It warms up early in spring and consequently is suitable for truck crops and home gardens. It is also a source of gravel. *Capability unit I–2.*

**Haney loam, 2 to 6 percent slopes** (HdB).—This soil occurs on ridges, beach deposits, terraces, and gravel bars.

Surface runoff is medium, the organic-matter content is medium, and the moisture-supplying capacity is medium. Ordinarily, tile drains are needed only in a few scattered wet or seepy spots near the edge of ridges.

This soil is moderately productive. It may require additional moisture during long, dry periods, but it is suited to irrigation. It is easy to work and responds well to fertilizer and lime. It warms up early in spring and consequently is suitable for truck crops and home gardens. It is also a source of gravel. *Capability unit IIe–1.*

**Haney sandy loam, 0 to 2 percent slopes** (Hn).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer contains a greater proportion of sand. This soil occurs on ridges, beach deposits, terraces, and gravel bars. Included in the areas mapped are small areas in which the surface layer is fine sandy loam.

Surface runoff is medium, the organic-matter content is medium, and the moisture-supplying capacity is medium. Ordinarily, tile drains are needed only in a few scattered wet or seepy spots that have a seasonally high water table.

This soil is moderately productive. It may require additional moisture during long, dry periods, but it is suited to irrigation. It is easy to work and responds well to both fertilizer and lime. It warms up early in the spring and consequently is suitable for truck crops and home gardens. It is also a source of gravel. *Capability unit I–2.*

**Haney sandy loam, 2 to 6 percent slopes** (HnB).—This soil occurs on ridges, beach deposits, terraces, and gravel bars.

Surface runoff is medium, the organic-matter content is medium, and the moisture-supplying capacity is medium. Ordinarily, tile drains are needed only in a few scattered wet or seepy spots.

This soil is moderately productive. It may require additional moisture during long, dry periods, but it is suited to irrigation. It is easy to work and responds well to fertilizer and lime. It warms up early in the spring and consequently is suitable for truck crops and home gardens. It is also a source of gravel. *Capability unit IIe–1.*

## Haskins Series

The Haskins series consists of somewhat poorly drained soils on nearly level to gently sloping terraces, outwash areas, lake plains, and secondary beach ridges. These soils developed in 18 to 42 inches of lake or outwash deposits, underlain by fine-textured glacial till or by lacustrine deposits.

The Haskins soils in Wood County are mapped as undifferentiated mapping units with Digby soils that are underlain by clay. The Haskins and Digby soils, over clay, are so similar that mapping them separately would have been difficult. A typical profile of a Digby loam, underlain by sand and gravel, is described under the heading "Digby Series."

Typical profile of Haskins loam:

0 to 9 inches, dark grayish-brown, very friable loam.
9 to 20 inches, light olive-brown, friable to firm sandy clay loam mottled with yellowish brown and strong brown.
20 to 41 inches, grayish-brown to light olive-brown, friable sandy loam to loam mottled with yellowish brown.
41 to 46 inches, grayish-brown, firm silty clay loam mottled with yellowish brown.
46 to 75 inches, grayish-brown very firm silty clay loam to clay loam glacial till; grayish-brown coatings; calcareous.

**Haskins and Digby loams, over clay, 0 to 2 percent slopes** (Hs).—This undifferentiated mapping unit consists of soils that have somewhat similar characteristics. These soils occur on nearly level terraces, outwash areas, lake plains, and secondary beach ridges. Some of the areas mapped consist of all Haskins soil or all Digby soil. Others contain both soils. Included in the areas mapped are a few small areas of soils that have a very dark gray to very dark grayish-brown, or darker colored, surface layer, and a few small areas of the associated Nappanee and Kibbie soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water, but effective drainage is difficult in areas where the depth to the dense till or lake clay is less than 30 inches.

These soils warm up rather slowly in spring and consequently are used mostly for corn, soybeans, small grain, and pasture. *Capability unit IIw–3.*

**Haskins and Digby loams, over clay, 2 to 6 percent slopes** (HsB).—This undifferentiated mapping unit consists of soils that have somewhat similar characteristics. These soils occur on gently sloping terraces, outwash areas, lake plains, and secondary beach ridges. Some of the areas mapped are made up of either the Haskins soil or the Digby soil. Others contain both soils. Included in the areas mapped are small areas in which the surface layer is very dark grayish brown to very dark gray, or darker colored. Also included are a few small areas of a moderately well drained soil, and small areas of the associated Nappanee and Kibbie soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water, but effective drainage is difficult in areas where the depth to the dense till or lake clay is less than 30 inches.

These soils warm up rather slowly in spring and consequently are used mostly for corn, soybeans, small grain, and pasture. *Capability unit IIw-3.*

**Haskins and Digby fine sandy loams, over clay, 0 to 2 percent slopes** (Ht).—This undifferentiated mapping unit consists of soils that have somewhat similar characteristics. These soils occur on nearly level terraces, outwash areas, lake plains, and secondary beach ridges. Some of the areas mapped are made up of either the Haskins soil or the Digby soil. Others contain both soils. Included in the areas mapped are small areas in which the surface layer is sandy loam, and small areas in which the surface layer is very dark gray to dark grayish brown, or darker colored. Also included are small areas of the associated Rimer, Nappanee, and Kibbie soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water, but effective drainage is difficult in areas where the depth to the dense till or lake clay is less than 30 inches.

These soils warm up rather slowly in spring and consequently are used mostly for corn, soybeans, small grain, and pasture. *Capability unit IIw-3.*

**Haskins and Digby fine sandy loams, over clay, 2 to 6 percent slopes** (HtB).—This undifferentiated mapping unit consists of soils that have somewhat similar characteristics. These soils occur on gently sloping terraces, outwash areas, lake plains, and secondary beach ridges. Some of the areas mapped are made up of either the Haskins soil or the Digby soil. Others contain both soils. Included in the areas mapped are small areas in which the surface layer is sandy loam. Also included are small areas of the associated Rimer, Nappanee, and Kibbie soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water, but effective drainage is difficult in areas where the depth to the dense till or lake clay is less than 30 inches.

These soils warm up slowly in the spring and consequently are used mostly for corn, soybeans, small grain, and pasture. *Capability unit IIw-3.*

## Hoytville Series

This series consists of dark-colored, very poorly drained soils that developed in fine-textured, calcareous glacial till. These soils occur in level, broad areas on the lake plain.

Typical profile of a Hoytville soil, in a cultivated field:

0 to 8 inches, very dark gray, firm clay loam.
8 to 24 inches, dark grayish-brown, very firm clay mottled with yellowish brown and brownish yellow.
24 to 40 inches, grayish-brown to dark grayish-brown very firm clay mottled with yellowish brown.
40 inches +, firm clay mottled with grayish brown and yellowish brown; glacial till; calcareous.

**Hoytville clay** (Hv).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer contains more clay and generally less sand and silt. This soil occurs in nearly level to slightly depressed, broad areas on the lake plain. It is widely distributed throughout the county. Included in the areas mapped are small areas of soils that have a surface layer of silty clay loam; some soils that have a brownish-gray surface layer and a grayish-brown subsoil; and small areas of the somewhat poorly drained Nappanee soils.

Surface runoff is very slow or ponded, internal drainage is slow, and the moisture-supplying capacity is medium or high. Both tile and surface drainage are needed to remove excess water.

This soil is high in organic-matter content, and it is neutral or slightly acid. Suitable crops include corn, soybeans, tomatoes, sugar beets, wheat, oats, and meadow or hay crops. *Capability unit IIw-6.*

**Hoytville clay loam** (Hy).—This soil occurs in nearly level to slightly depressed areas on the lake plain. Included in the areas mapped are less than 2 acres of sand knolls and ridges, and a few small areas of soils that have a brownish-gray surface layer and a grayish-brown subsoil.

Surface runoff is very slow or ponded, internal drainage is slow, and the moisture-supplying capacity is medium or high. Both tile and surface drainage are needed to remove excess water.

This soil is high in organic-matter content, and it is neutral or slightly acid. Suitable crops include corn, soybeans, tomatoes, sugar beets, wheat, oats, and meadow or hay crops. *Capability unit IIw-6.*

## Hoytville Soils, Thin Solum Variant

The Hoytville soils, thin solum variant, are dark-colored, very poorly drained soils that developed in fine-textured, calcareous glacial till. They are similar to the typical Hoytville soils, except that the depth to the calcareous material is less. They occur in nearly level to slightly depressed areas on the lake plain, between the typical Hoytville soils and organic soils that are at a slightly lower elevation.

Typical profile of Hoytville clay, thin solum variant:

0 to 7 inches, very dark gray, firm clay.
7 to 13 inches, very dark gray, firm clay mottled with olive brown.
13 to 18 inches, dark-gray, firm clay mottled with light olive brown and light yellowish brown.
18 to 44 inches, gray, firm silty clay loam mottled with light olive brown and yellowish brown; calcareous.

**Hoytville clay, thin solum variant** (Hw).—This soil occurs in nearly level to slightly depressed areas on the lake plain. It commonly occurs in transitional areas, between the typical Hoytville soils, which are at a slightly higher elevation, and associated organic soils, which are at a slightly lower elevation.

Surface runoff is very slow or ponded, internal drainage is slow, and the moisture-supplying capacity is medium or high. Both tile and surface drainage are needed to remove excess water.

This soil is high in organic-matter content, and it generally is neutral in reaction. In places the availability of some minerals may be reduced because of the limy plow layer. Soil tests should be made to determine the need for lime and fertilizer. Suitable crops include corn, soybeans, wheat, oats, and meadow or hay crops. *Capability unit IIw-6.*

## Joliet Series

In the Joliet series are dark-colored, very poorly drained soils that are underlain by limestone at a depth of 10 to 20 inches. These soils occur in nearly level or level areas on the lake plain.

Typical profile of Joliet silty clay loam:

0 to 6 inches, very dark gray, very firm silty clay loam.
6 to 16 inches, grayish-brown and very dark grayish-brown, firm silty clay loam, mottled with yellowish brown.
16 inches +, limestone bedrock, in layers 2 to 4 inches thick; uppermost half inch is highly weathered.

**Joliet silty clay loam** (Jo).—This soil occurs in level or nearly level areas on the lake plain where the depth to limestone bedrock is from 10 to 20 inches. Included in the areas mapped are some stony areas in which there are glacial boulders or limestone fragments, more than 10 inches in diameter, on the surface or in the soil material. Also included are small areas of the associated Millsdale and Romeo soils.

Surface runoff is slow, the moisture-supply capacity is medium, and the organic-matter content is high. There is a seasonally high water table. Tile drains are difficult to install because of shallowness to bedrock and stones on the surface or in the soil material.

Only a few areas of this soil are used for crops. Most of the acreage is used for permanent pasture or is wooded. There are sufficient large rocks in the stony areas to make the growing of intertilled crops impractical. *Capability unit IVw-1.*

## Kibbie Series

The Kibbie series is made up of somewhat poorly drained, nearly level and gently sloping soils on outwash plains and terraces or on delta plains. These soils formed in stratified silt, very fine sand, and fine sand.

Typical profile of Kibbie fine sandy loam:

0 to 14 inches, dark grayish-brown to brown, very friable fine sandy loam.
14 to 25 inches, yellowish-brown, very friable fine sandy loam mottled with pale brown.
25 to 44 inches, brown, slightly firm sandy clay loam mottled with strong brown.
44 inches +, dark yellowish-brown and brown, very friable to loose, stratified fine sand and silt mottled with gray.

**Kibbie fine sandy loam, 0 to 2 percent slopes** (Kf).—This soil occurs on nearly level lake-deposited outwash plains and terraces or on delta plains. Included in the areas mapped are a few small areas in which the surface layer is very dark grayish brown, or darker colored, and a few areas in which the surface layer is loam. Also included are a few small areas of moderately well drained soils.

Surface runoff is slow, and internal drainage and the moisture-supplying capacity are medium. There is a seasonally high water table. Tile drains, which function well in this soil, are needed to remove excess water.

This soil is medium in organic-matter content, and it is slightly acid or neutral in reaction. It responds well to fertilization and is easy to till. If properly drained and otherwise well managed, it is well suited to all crops commonly grown in the county. *Capability unit IIw-3.*

**Kibbie fine sandy loam, 2 to 6 percent slopes** (KfB).—This soil occurs on gently sloping lake-deposited outwash plains and terraces or on delta plains. Included in the areas mapped are small areas in which the surface layer is very dark grayish brown, or darker colored, and small areas in which the surface layer is loamy. Also included are a few small areas of moderately well drained soils.

Surface runoff is slow, and internal drainage and the moisture-supplying capacity are medium. There is a seasonally high water table. Tile drains, which function well in this sandy soil, are needed to remove excess water.

This soil is medium in organic-matter content, and it is slightly acid or neutral in reaction. It responds well to fertilization and is easy to till. If adequately drained and otherwise well managed, it is well suited to all crops commonly grown in the county. *Capability unit IIw-3.*

**Kibbie loamy fine sand, 0 to 2 percent slopes** (Ks).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer is more sandy. This soil occurs on nearly level, lake-deposited outwash plains and terraces or on delta plains. Included in the areas mapped are a few small areas of soils that have a very dark grayish-brown, or darker colored, surface layer. Also included are a few small areas of Kibbie loamy fine sand, 2 to 6 percent slopes.

Surface runoff is slow, and internal drainage and the moisture-supplying capacity are medium. There is a seasonally high water table. Tile drains, which function well in this sandy soil, are needed to remove excess water.

This soil is medium in organic-matter content, and it is slightly acid or neutral in reaction. It responds well to fertilization and is easy to till. If properly drained and otherwise well managed, it is well suited to all crops commonly grown in the county. *Capability unit IIw-3.*

## Made Land and Borrow Pits

**Made land and Borrow pits** (Ma).—This miscellaneous land type consists of areas where the soil material has been leveled, moved, or removed; of areas where earth or trash, or both, have been dumped; and of areas on which oil storage tanks are standing or from which storage tanks have been removed. The soil in many of these areas consists of a mixture of parent material and material from the original surface layer and subsoil. This land varies greatly in agricultural value and consequently was not placed in a capability unit.

## Mermill Series

The Mermill series consists of dark-colored, very poorly drained soils that developed in medium-textured or moderately coarse textured outwash material or beach deposits. These soils are underlain by clay or clay loam horizons at a depth of 18 to 40 inches. Thin lenses of fine sand and silt occur in some profiles.

Typical profile of Mermill sandy clay loam:

0 to 9 inches, very dark gray, firm sandy clay loam.
9 to 32 inches, dark-gray, firm sandy clay loam mottled with grayish brown and yellowish brown.

32 inches +, dark yellowish-brown, firm limy clay loam glacial till mottled with grayish brown.

**Mermill fine sandy loam** (Mf).—This soil occurs on level, nearly level, or slightly depressed lake plains and terraces. A profile of this soil is similar to the one described, except that the surface layer contains less clay. Small areas of the Wauseon soils, over clay, are included in the areas mapped. Also included are a few areas in which the upper part of the underlying clay material is weathered.

Surface runoff is very slow, the organic-matter content is high, and the moisture-supplying capacity is also high. There is a seasonally high water table. Tile drains, which function well in this soil, are needed to remove excess water.

This soil is highly productive if management is good. It is easy to till and is suited to all of the crops commonly grown in the county. Yields of sugar beets, tomatoes, and truck crops are good. *Capability unit IIw–5.*

**Mermill sandy clay loam** (Mg).—This soil occurs on nearly level to slightly depressed lake plains and terraces. Included in the areas mapped are small areas in which the surface layer is loam or clay loam; a few areas in which the upper part of the underlying clay material is weathered; and small areas of the associated Hoytville and Millgrove soils.

Surface runoff is very slow or ponded, the organic-matter content is high, and the moisture-supplying capacity is also high. There is a seasonally high water table. Tile drains, which function well, are needed to remove excess water.

This soil is highly productive if management is good. It is easy to till and is suited to all of the crops commonly grown in the county. Yields of sugar beets, tomatoes, and truck crops are good. *Capability unit IIw–5.*

## Millgrove Series

The Millgrove series consists of dark-colored, very poorly drained soils on level or nearly level outwash plains and terraces. These soils developed in medium-textured or moderately coarse textured outwash and beach deposits that contained various amounts of fine-textured material and that extended to a depth of 40 inches or more. They are calcareous at a depth ranging from 30 to 42 inches or more.

Typical profile of Millgrove loam:

0 to 8 inches, very dark grayish-brown, friable loam.
8 to 13 inches, grayish-brown, friable loam mottled with yellowish brown.
13 to 25 inches, grayish-brown, firm loam to clay loam mottled with light olive brown.
25 to 43 inches, grayish-brown, friable, poorly sorted mixture of fine sand, fine gravel, and silt, mottled with yellowish brown; calcareous.

**Millgrove loam** (Mb).—This soil occurs on level or nearly level secondary beach ridges, outwash plains, and terraces. Included in the areas mapped are small areas of soils that have a surface layer of clay loam, and small areas of the Mermill soils.

Surface runoff is very slow, the organic-matter content is high, and the moisture-supplying capacity is also high. There is a seasonally high water table. Tile drains function well.

This soil is easy to work and responds well to lime and fertilizer. It is well suited to all crops commonly grown in the county including sugar beets, tomatoes, and truck crops. *Capability unit IIw–5.*

## Millsdale Series

The Millsdale series is made up of dark-colored, very poorly drained soils that are underlain by limestone at a depth of 20 to 40 inches. These soils occur in level or nearly level areas throughout the county.

Typical profile of Millsdale silty clay loam:

0 to 7 inches, very dark gray, firm silty clay loam.
7 to 15 inches, dark grayish-brown, very firm clay mottled with dark yellowish brown.
15 to 32 inches, dark grayish-brown to grayish-brown, very firm clay mottled with yellowish brown.
32 inches +, limestone bedrock; upper part in layers 2 to 4 inches thick.

**Millsdale silty clay loam** (Mh).—This soil occurs in level or nearly level areas on the lake plain, where the depth to limestone bedrock is from 20 to 40 inches. Included in the areas mapped are small areas of the associated Joliet, Millgrove, and Hoytville soils.

Surface runoff and internal drainage are slow or very slow, the moisture-supplying capacity is high, and the organic-matter content is also high. There is a seasonally high water table. Tile drains are needed to remove excess water but may be difficult and expensive to install because of the shallowness to bedrock. Some rock may have to be excavated to permit the proper grading and covering for tile lines.

Most of the acreage is used for general farm crops. *Capability unit IIIw–2.*

**Millsdale stony silty clay loam** (Mm).—This soil occurs in level or nearly level areas on the lake plain, where the depth to limestone bedrock is from 20 to 40 inches. It is similar to the typical Millsdale soil, except that there are numerous glacial boulders or fragments of limestone, larger than 10 inches in diameter, on the surface and in the soil material.

Surface runoff and internal drainage are slow or very slow, the moisture-supplying capacity is high, and the organic-matter content is also high. There is a seasonally high water table.

Because of the numerous stones, the growing of intertilled crops is not practical. Most of the acreage is in permanent pasture or woods. *Capability unit VIs–1.*

## Milton Series

The Milton series consists of level to gently sloping, moderately well drained or well drained soils that developed in till or glacial outwash. These soils are underlain by limestone at a depth of 20 to 40 inches.

Typical profile of Milton loam:

0 to 6 inches, dark-brown, friable loam.
6 to 11 inches, brown to yellowish-brown, friable loam.
11 to 26 inches, yellowish-brown, firm clay.
26 inches +, limestone bedrock.

**Milton loam, 0 to 2 percent slopes** (Mn).—This soil is underlain by limestone at a depth of 20 to 40 inches. Included in the areas mapped are small areas in which the surface layer is silt loam; small areas in which glacial boulders or fragments of limestone, larger than 10 inches in diameter, occur on the surface or in the soil material; and small areas of the associated Ritchey, Dunbridge, and Romeo soils.

Surface runoff is medium, the moisture-supplying capacity is medium, and the organic-matter content is medium. Generally, tile drains are needed only in a few scattered wet spots.

Nearly all of this soil is cleared and used for crops. Wheat is well suited. There are enough large rocks in the stony areas to make the raising of intertilled crops impractical. *Capability unit IIs-1.*

**Milton loam, 2 to 6 percent slopes** (MnB).—This soil is underlain by limestone at a depth of 20 to 40 inches. Included in the areas mapped are small areas in which the surface layer is silt loam; small areas in which glacial boulders or fragments of limestone, larger than 10 inches in diameter, occur on the surface or in the soil material; and small areas of the associated Ritchey, Dunbridge, and Romeo soils.

Surface runoff is medium, the moisture-supplying capacity is medium, and the organic-matter content is medium. Generally, tile drains are needed only in a few scattered wet spots.

Nearly all of this soil is cleared and used for crops. Wheat is well suited. There are enough large rocks in the stony areas to make the raising of intertilled crops impractical. *Capability unit IIIe-1.*

## Muck

Muck consists of dark-colored, very poorly drained, organic soils in level to slightly depressed, broad areas on the lake plain. It occurs where natural drainage outlets have been obstructed by limestone or by sand ridges.

Typical profile of Muck:

0 to 13 inches, black, loose organic material.
13 to 14 inches, light-gray, loose loamy sand.
14 to 28 inches, light brownish-gray, friable fine sandy loam, mottled with light olive brown.
28 inches +, brown or grayish-brown, very firm silty clay loam to clay; glacial till; calcareous.

**Muck** (Mu).—These organic soils occur in level to slightly depressed areas on the lake plain. Small areas of the associated Warners, Wauseon, and Hoytville soils are included in the areas mapped. Also included is a small acreage of muck that has been burned. A profile of the burned muck differs from the profile described as typical in that only 4 to 6 inches of the organic topsoil remains.

Surface runoff on these soils is slow to ponded, the moisture-supplying capacity is high, and there is a seasonally high water table. Water stands on the surface during the wetter periods of the year unless artificial drains are installed, and runoff from higher areas overflows some areas. Adequate drainage is not possible in some places, because of the lack of suitable outlets for tile drains. In these areas, lift pumps or open ditches can be used to remove excess water. The water table should be maintained at a depth of about 2 feet to prevent decomposition, to minimize wind erosion, and to allow proper aeration for plants. Frost occurs earlier on this part of the lake plain than in the surrounding areas. Fire is a hazard in dry periods, and measures should be taken to control fire. Weed control is more of a problem on these soils than on associated mineral soils.

A considerable acreage is used for pasture. If adequately drained and otherwise well managed, these organic soils are highly productive of field crops. However, they may be deficient in potassium, trace elements, and, to some extent, phosphorus and lime. Because of their high content of organic matter, consideration should be given to the growing of celery, onions, radishes, and other specialty crops. *Capability unit IIIw-5.*

## Nappanee Series

The Nappanee series is made up of light-colored, somewhat poorly drained soils that developed in fine-textured, glacial till. The till commonly is calcareous at a depth of 24 to 36 inches. These soils occur either on slightly elevated flats or on breaks to stream bottoms, on the lake plain.

Typical profile of Nappanee loam:

0 to 8 inches, brown, friable loam.
8 to 12 inches, yellowish-brown, firm clay mottled with grayish brown.
12 to 28 inches, dark, grayish-brown, very firm clay mottled with dark brown.
28 inches +, very firm fine clay loam till mottled with grayish brown and dark yellowish brown; calcareous.

**Nappanee loam, 0 to 2 percent slopes** (Na).—This soil occurs on the lake plain, at slightly higher elevations than the Hoytville soils. Included in the areas mapped are small areas of Nappanee silt loam; a few small areas of soils that have a very dark grayish-brown, or darker colored, surface layer; and small areas of Haskins soils.

The moisture-supplying capacity of this soil is medium to high, and surface runoff and internal drainage are slow. The dense, compact subsoil and the glacial till restrict the movement of air and water. Both tile and surface drainage are needed to remove excess water, but the tile needs to be closely spaced to be most effective.

This soil is slow to dry out and to warm up in spring. It is medium in organic-matter content and is benefited by applications of green manure and animal manure. Most of the acreage is used to grow corn, soybeans, small grain, and pasture crops. *Capability unit IIIw-3.*

**Nappanee loam, 2 to 6 percent slopes** (NaB).—This soil occurs on slightly elevated knolls or as narrow bands on gently sloping breaks to stream bottoms, on the lake plain. Included in the areas mapped are small areas of the moderately well drained St. Clair soils and small areas of Nappanee silt loam.

The moisture-supplying capacity of this soil is medium or high, surface runoff is moderate, and internal drainage is slow. The dense, compact subsoil and the underlying glacial till restrict the movement of both air and water. Tile drains that are closely spaced are needed to remove excess water.

This soil is medium in organic-matter content. If intensively cropped, it is susceptible to erosion. Crops that supply organic matter and that help to control erosion should be included in the rotation. Most of the acreage is used for corn, soybeans, small grain, and pasture. *Capability unit IIIw-3.*

**Nappanee loam, 2 to 6 percent slopes, moderately eroded** (NaB2).—This soil occurs on slightly elevated knolls or as narrow bands on gently sloping breaks, on the lake plain. Part of the original surface layer has been removed by erosion, and the plow layer is a mixture of surface soil and subsoil material. Included in the areas mapped are small areas of the moderately well drained St. Clair soils and small areas in which the surface layer is sandy loam, fine sandy loam, or silt loam.

This soil has medium surface runoff and slow internal drainage. Because of erosion, the organic-matter content has been reduced, the moisture-supplying capacity has been lowered, and tilth has been affected. Management practices that help to control erosion and to increase the content of organic matter are needed. Tile drains are needed to remove excess water.

This soil is used for corn, soybeans, small grain, and pasture. *Capability unit IIIw-3.*

**Nappanee sandy loam, 0 to 2 percent slopes** (Ns).—This soil is more sandy than the soil described as typical of the series. It is underlain by clay at a depth of 12 inches or less. Small areas of Rimer soils are included in the areas mapped.

Surface runoff is medium, internal drainage is slow, and the moisture-supplying capacity is medium. The dense, compact subsoil and the underlying glacial till restrict the movement of air and water. Both tile and surface drainage are needed to remove excess water.

This soil is low in organic-matter content, and it is benefited by both green manure and animal manure. Crops that help to maintain or increase the organic-matter content should be included in the rotation. Most of the acreage is used for corn, soybeans, small grain, and pasture. *Capability unit IIIw-3.*

**Nappanee sandy loam, 2 to 6 percent slopes** (NsB).—This soil occurs on low knolls and in gently sloping areas that border drainageways and stream bottoms. Included in the areas mapped are small areas of Nappanee fine sandy loam, and a few small areas of soils that slope as much as 12 percent.

Surface runoff is medium, and internal drainage is slow. Tile drains are needed to remove excess water.

This soil is medium in organic-matter content and is benefited by both green manure and animal manure. Most of the acreage is used for corn, soybeans, small grain, and pasture. *Capability unit IIIw-3.*

**Nappanee silty clay loam, 0 to 2 percent slopes** (Nt).—This soil is similar to the soil described as typical of the series, except that the surface layer contains more clay and less sand. It occurs on the lake plain, in level or nearly level areas that are at a slightly higher elevation than the Hoytville soils. Small areas of the Hoytville soils are included in the areas mapped, especially in those areas along narrow drainageways.

Surface runoff and internal drainage are slow. Tile and surface drainage help to remove excess water, but the tile needs to be closely spaced to be most effective.

This soil is medium in organic-matter content and is benefited by both green manure and animal manure. Most of the acreage is used for corn, soybeans, small grain, and pasture. *Capability unit IIIw-3.*

**Nappanee silty clay loam, 2 to 6 percent slopes** (NtB).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer contains more clay and less sand. This soil occurs on gently sloping knolls on the lake plain and as narrow bands on breaks along streams and drainageways. Small areas of the moderately well drained St. Clair soils are included in the areas mapped.

Surface runoff is medium, and internal drainage is slow. Tile drains are needed to remove excess water.

This soil is medium in organic-matter content. If intensively cultivated, it is susceptible to erosion. Crops that supply organic matter and that help to control erosion should be included in the rotation. Most of the acreage is used for corn, soybeans, small grain, and pasture. *Capability unit IIIw-3.*

**Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded** (NtB2).—A profile of this soil is similar to the one described as typical of the series, except that the surface layer is thinner and contains more clay and less sand. This soil occurs on gently sloping knolls and as narrow bands on breaks along drainageways and streams on the lake plain. In most places the plow layer is a mixture of the original surface soil and subsoil material. Rill erosion has been active in a few areas that have been cultivated up and down the slope. In these areas the plow layer consists mostly of subsoil material and consequently is lower in organic-matter content and in moisture-supplying capacity than in the less eroded areas.

This soil has moderate surface runoff and slow internal drainage. It would be benefited by tile drains.

Control of erosion will become more of a problem if this soil is intensively cultivated. Even now the preparation of seedbeds may be somewhat difficult. In areas where the subsoil is exposed, seedlings are slow to emerge and stands are likely to be thin.

Nearly all of this soil is used for cultivated crops. Management practices are needed to increase the organic-matter content and to help control erosion. *Capability unit IIIw-3.*

## Ottokee Series

The Ottokee series consists of moderately well drained, light-colored soils that formed in deep sand. These soils occur on nearly level or gently sloping, slightly elevated ridges or knolls on the lake plain or on terraces and beach ridges.

The Ottokee soils in Wood County are mapped as undifferentiated mapping units either with the Seward soils or with the Spinks soils. Because of their similarity to the Seward and Spinks soils, mapping them separately would have been difficult, and a separation according to series would have little significance in soil management. Typical profiles of the Seward and Spinks soils are described under the heading of their respective series. The Seward and Ottokee soils, over clay, are described under the heading "Seward Series."

Typical profile of Ottokee loamy fine sand:

- 0 to 8 inches, yellowish-brown to brown, loose loamy fine sand.
- 8 to 24 inches, brownish-yellow, loose loamy fine sand to fine sand.
- 24 to 48 inches +, yellowish-brown, loose loamy fine sand to fine sand mottled with pale brown and yellowish brown; discontinuous ⅛- to 1-inch reddish-brown to yellowish-red bands.

**Ottokee and Spinks loamy fine sands, 0 to 2 percent slopes** (Os).—The areas mapped may contain only one of these soils or both soils. These soils occur on sandy ridges or knolls on the lake plain or on terraces and beach ridges. Included in the areas mapped are a few areas in which the surface layer is fine sandy loam, and small areas in which the surface layer is very dark grayish brown, or darker colored.

Surface runoff is slow, and the moisture-supplying capacity is low. Thus, crops that require large quantities of water late in the growing season are not suitable. Wind erosion is a serious hazard. Seedlings are often damaged by blowing sand, and crops frequently have to be replanted.

These soils are favorable sites for farmsteads, subdivisions, and roads. They are also a fairly good source of sand for filling and grading. *Capability unit IIIs-2.*

**Ottokee and Spinks loamy fine sands, 2 to 6 percent slopes** (OsB).—The areas mapped may contain only one of these soils or both soils. These soils are on gently sloping sandy ridges or knolls on the lake plain or on terraces and beach ridges. Included in the areas mapped are small areas in which the surface layer is fine sandy loam, and a few small areas in which the surface layer is very dark grayish brown, or darker colored.

Surface runoff is slow, and the moisture-supplying capacity is low. Thus, crops that require large quantities of water late in the growing season are not suitable. Wind erosion is a serious hazard. Seedlings are often damaged by blowing sand, and crops frequently have to replanted.

These soils are favorable sites for farmsteads, subdivisions, and roads. They are also a fairly good source of sand for filling and grading. *Capability unit IIIs-2.*

## Quarries

**Quarries** (Qu).—This miscellaneous land type consists of open pits from which limestone bedrock has been taken for road and railroad construction or for building and industrial purposes. The soil overlying the bedrock has been removed. These areas have no value for agriculture and have not been placed in a capability unit.

## Randolph Series

In the Randolph series are level to gently sloping, somewhat poorly drained or moderately well drained soils that developed in glacial till or outwash. Limestone bedrock occurs at a depth of 20 to 40 inches.

Typical profile of Randolph loam:

0 to 6 inches, dark grayish-brown, friable loam; abundant roots.
6 to 11 inches, pale-brown to yellowish-brown, friable loam mottled with dark grayish brown.
11 to 24 inches, dark yellowish-brown, firm clay loam mottled with yellowish brown.
24 inches +, hard limestone rock.

**Randolph loam, 0 to 2 percent slopes** (Rb).—This soil occurs in level or nearly level areas, where the depth to limestone bedrock is from 20 to 40 inches. Included in the areas mapped are small areas of the associated Nappanee, Haskins, and Digby soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water but generally are difficult and expensive to install because of shallowness to bedrock. Some rock may have to be excavated to permit the proper grading and covering for tile lines.

This soil is used mainly for general farm crops. It is moderately productive if drainage is adequate and other management is good. *Capability unit IIIw-3.*

**Randolph loam, 2 to 6 percent slopes** (RbB).—This soil occurs in gently sloping areas, where the depth to limestone bedrock is from 20 to 40 inches. Included in the areas mapped are a few small areas in which glacial boulders or fragments of limestone, larger than 10 inches in diameter, occur on the surface or in the soil material. Also included are small areas of the associate Nappanee, Haskins, and Digby soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water but generally are difficult and expensive to install because of the shallowness to bedrock. Some rock may have to be excavated to permit the proper grading and covering for tile lines.

This soil is used mainly for general farm crops. It is moderately productive if drainage is adequate and other management is good. *Capability unit IIIw-3.*

**Randolph stony loam, 0 to 2 percent slopes** (Rd).—This soil occurs in level or nearly level areas, where the depth to limestone bedrock is from 10 to 20 inches. Glacial boulders or fragments of limestone, larger than 10 inches in diameter, occur on the surface or in the soil material. Included in the areas mapped are small areas of the associated Nappanee, Haskins, and Digby soils.

Surface runoff is slow, the moisture-supplying capacity is medium, and the organic-matter content is medium. There is a seasonally high water table. Tile drains are needed to remove excess water but are difficult to install because of the stones and the shallowness to bedrock.

Generally the raising of intertilled crops is not practical on this soil. Most of the acreage is used for permanent pasture or is wooded. *Capability unit VIs-1.*

## Rimer Series

The Rimer series is made up of somewhat poorly drained soils that developed in 18 to 36 inches of sandy deposits that overlie fine-textured glacial till or lacustrine material. These soils occur on nearly level or gently sloping, slightly elevated sand ridges and knolls.

The Rimer soils in Wood County are mapped as undifferentiated mapping units with the Tedrow soils. Because of their similarity to the Tedrow soils that overlie clay, mapping them separately would have been difficult and would have little significance in soil management. A profile of a Tedrow soil is described under the heading "Tedrow Series."

Typical profile of Rimer loamy fine sand:

0 to 14 inches, dark-gray, loose loamy fine sand; abundant roots.
14 to 25 inches, light yellowish-brown to yellowish-brown, friable to loose loamy fine sand to fine sand mottled with dark reddish brown and brownish yellow.
25 to 32 inches, yellowish-brown, firm clay loam mottled with light brownish gray.
32 to 42 inches, yellowish-brown, firm clay loam mottled with olive gray; calcareous.

**Rimer and Tedrow loamy fine sands, over clay, 0 to 2 percent slopes** (Rf).—The areas mapped may contain only one of these soils or both soils. These soils occur on nearly level sand ridges or knolls on the lake plain or on terraces and beach ridges. Included in the areas mapped are a few small areas in which the surface layer is sandy loam; some small areas of Rimer fine sandy loam; and small areas of soils that have a very dark grayish-brown, or darker colored, surface layer.

Surface runoff is slow, and the moisture-supplying capacity is medium. There is a seasonally high water table. Tile drains are needed to remove excess water. Wherever possible, the tile should be placed on the clay floor. Weed control is more of a problem on these soils than on the finer textured soils.

These soils respond well to lime and fertilizer and are suited to all crops commonly grown in the county. If they are properly drained and otherwise well managed, favorable yields can be obtained. *Capability unit IIw-2.*

**Rimer and Tedrow loamy fine sands, over clay, 2 to 6 percent slopes** (RfB).—These soils occur on gently sloping sand ridges or knolls on the lake plain or on terraces and beach ridges. Included in the areas mapped are a few areas in which the surface layer is sandy loam; some small areas of Rimer fine sandy loam; and small areas of soils that have a very dark grayish-brown, or darker colored, surface layer. Surface runoff is slow, and the moisture-supplying capacity is medium. There is a seasonally high water table. Tile drains are needed to remove excess water. Wherever possible, the tile should be placed on the clay floor. Weed control is more of a problem on these soils than on the finer textured soils.

These soils respond well to lime and fertilizer, and they are suited to all crops commonly grown in the county. If they are properly drained and otherwise well managed, favorable yields can be obtained. *Capability unit IIw-2.*

## Ritchey Series

The Ritchey series consists of level to gently sloping, moderately well drained or well drained soils that developed in glacial till or outwash. These soils are underlain by limestone at a depth of 10 to 20 inches.

Typical profile of Ritchey loam:

0 to 8 inches, dark-brown, friable loam; some igneous pebbles; abundant roots.
8 to 17 inches, yellowish-brown to dark-brown, very firm clay to clay loam; a few igneous pebbles; plentiful roots.
17 to 18 inches, yellow, loose loamy fine sand.
18 inches +, unweathered limestone bedrock.

**Ritchey loam, 0 to 2 percent slopes** (Rh).—This soil occurs in level or nearly level areas where the depth to limestone is only 10 to 20 inches. Included in the areas mapped are small areas in which the surface layer is silt loam, and small areas of the associated Milton, Dunbridge, and Romeo soils.

Surface runoff is medium, the moisture-supplying capacity is low, and the organic-matter content is medium. Tile drains generally are needed only in a few scattered wet spots. Crops that require large quantities of water late in the growing season are likely to be damaged if they are grown on this soil. *Capability unit IIIs-3.*

**Ritchey loam, 2 to 6 percent slopes** (RhB).—This soil occurs in gently sloping areas, where the depth to limestone is only 10 to 20 inches. Included in the areas mapped are small areas in which the surface layer is silt loam; some small areas in which glacial boulders or fragments of limestone, larger than 10 inches in diameter, occur on the surface or in the soil material; and small areas of the associated Milton, Dunbridge, and Romeo soils.

Surface runoff is medium, the moisture-supplying capacity is low, and the organic-matter content is medium. Tile drains normally are needed only in a few scattered wet spots. There are enough rocks in the stony areas to make the growing of intertilled crops impractical. Crops that require large quantities of water late in the growing season are likely to be damaged if they are grown on this soil. *Capability unit IIIs-3.*

**Ritchey stony loam, 0 to 2 percent slopes** (Rk).—This soil occurs in level or nearly level areas where the depth to limestone is only 10 to 20 inches. Glacial boulders or fragments of limestone, larger than 10 inches in diameter, occur on the surface or in the soil material. Included in the areas mapped are a few areas in which the surface layer is silt loam, and small areas of the associated Milton, Dunbridge, and Romeo soils.

Surface runoff is medium, the moisture-supplying capacity is low, and the organic-matter content is medium. Tile drains ordinarily are not needed.

The growing of intertilled crops is impractical on this shallow, stony soil. Most of the acreage is used for permanent pasture or for woods. *Capability unit VIs-1.*

## Romeo Series

In the Romeo series are well-drained, nearly level to gently sloping, dark-colored soils that are underlain by limestone at a depth of 10 inches or less (fig. 9).

Typical profile of Romeo loam:

0 to 10 inches, very dark gray, friable loam; numerous pebbles.
10 inches +, limestone bedrock; top part breaks into slabs and fragments.

**Romeo soils, 0 to 2 percent slopes** (Rs).—These soils occur in areas where the depth to limestone is 10 inches or

*Figure 9.*—**Open woodlot on Romeo soils, showing fragments of limestone on the surface.**

less and there are some outcrops of limestone. Included in the areas mapped are small areas in which the surface layer is loam, sandy loam, or silt loam, and small areas of the associated Milton, Ritchey, and Dunbridge soils.

Surface runoff is slow, the moisture-supplying capacity is very low, and the organic-matter content is high.

Nearly all of the acreage is used either for permanent pasture or for woods. Wheat is grown on a small acreage that is adjacent to the deeper Milton soils. Yields are poor. The shallowness to bedrock makes the installation of stable fence posts difficult and expensive. *Capability unit VIs-1.*

**Romeo soils, 2 to 6 percent slopes** (RsB).—These soils occur in gently sloping areas where the depth to limestone bedrock is 10 inches or less and there are some outcrops of limestone. Included in the areas mapped are a few small areas of moderately sloping soils; some small areas in which the surface layer is loam, sandy loam, or silt loam; and small areas of the associated Milton, Ritchey, and Dunbridge soils.

Surface runoff is medium, the moisture-supplying capacity is very low, and the organic-matter content is high.

Nearly all of the acreage is used either for permanent pasture or for woods. The growing of intertilled crops is not practical on this shallow soil. The installation of stable fence posts is difficult and expensive. *Capability unit VIs-1.*

## St. Clair Series

The St. Clair series consists of moderately well drained, light-colored soils that developed in calcareous, fine-textured till. These soils occur on gently sloping to steep areas on the lake plain. The depth to calcareous till averages 24 inches.

Typical profile of a St. Clair loam:

0 to 8 inches, dark-gray to brown, friable to firm loam to clay loam.

8 to 24 inches, brown, firm or very firm clay to clay loam mottled with very pale brown in the lower part.

24 inches +, brown, firm, fine silty clay loam mottled with yellowish brown; till.

**St. Clair loam, 2 to 6 percent slopes** (SaB).—This soil occurs on streambanks and along drainageways. Included in the areas mapped are small areas in which the surface layer is silt loam; a few small areas that are moderately eroded; and some small areas on nearly level ridgetops.

Surface runoff is medium, and internal drainage is medium to slow. Tile drains normally are needed only in wet spots. The organic-matter content is medium.

This soil is susceptible to erosion if it is intensively cropped. It is used for small grain, row crops, and meadow crops. *Capability unit IIIe-2.*

**St. Clair loam, 6 to 12 percent slopes, moderately eroded** (SaC2).—This soil occurs along streams and large drainageways. Part of the original surface layer has been removed by erosion, and the present surface layer is a mixture of surface soil and subsoil material. Included in the areas mapped are a few small areas of the somewhat poorly drained Nappanee loam and a few small areas of a moderately well drained, more silty soil. Also included are a few small areas of soils that have more silt and less sand in the surface layer than the typical soil, and small areas of slightly eroded St. Clair soils.

Surface runoff on this soil is rapid, and the organic-matter content is low or medium. If row crops are grown, conservation practices are needed to control runoff and erosion and to increase the organic-matter content. *Capability unit IVe-1.*

**St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded** (SbB2).—This soil occurs on streambanks or along drainageways. It is similar to the soil described as typical of the series, except that the plow layer contains more clay and less sand. Part of the original surface layer has been removed by erosion, and the present surface layer is a mixture of surface soil and subsoil material. Included in the areas mapped are small areas of St. Clair soils that are only slightly eroded. Also included are small areas of a moderately well drained, more silty soil.

Surface runoff on this soil is medium, and internal drainage is medium or slow. Tile drains are needed only in wet spots. The organic-matter content is medium to low.

If row crops are grown, conservation practices are needed to control runoff and erosion and to increase the organic-matter content. *Capability unit IIIe-2.*

**St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded** (SbC2).—This soil occurs on streambanks and along large drainageways. It is similar to the soil described as typical of the series, except that the plow layer contains more clay and less sand. Included in the areas mapped are a few small areas of the Nappanee and Fulton soils, which are somewhat poorly drained.

Surface runoff on this soil is rapid, and part of the original surface layer has been removed by erosion. The present surface layer is a mixture of surface soil and subsoil material. The organic-matter content is low or medium.

If row crops are grown, conservation practices are needed to control runoff and erosion and to increase the organic-matter content. *Capability unit IVe-1.*

**St. Clair silty clay loam, 12 to 18 percent slopes, moderately eroded** (SbD2).—This soil occurs on moderately steep slopes along streams. It is similar to the soil described as typical of the series, except that the surface layer contains more clay and less sand. Included in the areas mapped are a few small areas of slightly eroded St. Clair soils and a few small areas of St. Clair loam.

Surface runoff on this soil is rapid, and part of the original surface layer has been removed by erosion. The present surface layer is a mixture of surface soil and subsoil material. Rill erosion has occurred where row crops have been grown and where the soil has been cultivated up and down the slope. In many of these areas, the calcareous till is exposed.

This soil is too steep and too susceptible to erosion to be used for row crops. It is used mainly for permanent pasture, meadow, or trees, or it is idle. *Capability unit VIe-1.*

**St. Clair silty clay loam, 18 to 25 percent slopes, moderately eroded** (SbE2).—This soil occurs on steep river banks or escarpments on the lake plain. It is similar to the typical soil, except that the surface layer contains more clay and less sand. Included in the areas mapped are some small areas of St. Clair silt loam and other silt loams that slope as much as 35 percent. Also included are small areas of slightly eroded St. Clair soils that are in permanent pasture or that are wooded.

Surface runoff on this soil is very rapid. Erosion has removed part of the original surface layer, and in a few spots the calcareous till is exposed. Rills and a few shallow gullies occur in areas that have been cultivated.

This soil is used mainly for permanent pasture, meadow, and trees, or it is idle. *Capability unit VIIe-1.*

## Seward Series

In the Seward series are moderately well drained soils that developed in 18 to 36 inches of sandy deposits, over fine-textured glacial till or lacustrine material. These soils are on nearly level or gently sloping, slightly elevated sand ridges and knolls.

The Seward soils in Wood County are mapped as undifferentiated mapping units with the Ottokee soils. The Seward and Ottokee soils that overlie clay are so similar that mapping them separately would have been difficult. A typical profile of Ottokee loamy fine sand is described under the heading "Ottokee Series."

Typical profile of Seward loamy fine sand:

0 to 6 inches, dark yellowish-brown, very friable loamy fine sand; abundant roots.
6 to 30 inches, brown to yellowish-brown, loose loamy fine sand to firm sandy loam; strong-brown mottles in lower part.
30 to 37 inches, yellowish-brown, firm clay loam; many gray mottles.
37 to 50 inches +, dark-brown, firm silty clay loam mottled with gray and brownish yellow; calcareous glacial till.

**Seward and Ottokee loamy fine sands, over clay, 0 to 2 percent slopes** (Sf).—The areas mapped may contain only one of these soils, or both soils. These soils occur on nearly level sand ridges or knolls on the lake plain or on terraces and beach ridges. Their profile characteristics are similar. Consequently, a separation according to soil series would have been difficult and would have little significance in soil management. Included in the areas mapped are a few small areas in which the surface layer is very dark grayish brown, or darker colored, and small areas in which the surface layer is fine sandy loam or sandy loam.

Surface runoff is slow, but normally tile drains are needed only in a few scattered wet spots or in seepy areas at the base of sand ridges. The moisture-supplying capacity is low, and thus crops that require large amounts of water may be damaged during long dry periods. Wind erosion is a hazard on exposed ridges or knolls.

These soils respond well to lime and fertilizer and are benefited by additions of organic matter. They are suited to all crops commonly grown in the county. If management is good, yields are moderate. *Capability unit IIs-2.*

**Seward and Ottokee loamy fine sands, over clay, 2 to 6 percent slopes** (SfB).—The areas mapped may contain only one of these soils or both soils. These soils have similar profile characteristics. They occur on gently sloping sand ridges or knolls on the lake plain or on terraces and beach ridges. Included in the areas mapped are small areas in which the surface layer is very dark grayish brown, or darker colored, and some small areas in which the surface layer is fine sandy loam or sandy loam.

Surface runoff is slow, but normally tile drains are needed only in a few scattered wet spots or in seepy areas at the base of sand ridges. The moisture-supplying capacity is low, and thus crops that require large amounts of water may be damaged during long dry periods. Wind erosion is a hazard.

These soils respond well to lime and fertilizer and to additions of organic matter. They are suited to all crops commonly grown in the county. Yields are moderate if management is good. *Capability unit IIe-1.*

## Shoals Series

The Shoals series consists of level or nearly level, somewhat poorly drained alluvial soils that occur principally along Rocky Ford and Beaver Creeks and along the Portage River. Only a few areas are larger than 15 acres in size.

Typical profile of Shoals loam:

0 to 8 inches, dark-gray, friable loam.
8 to 18 inches, dark grayish-brown, friable loam to clay loam mottled with yellowish brown.
18 to 41 inches, yellowish-brown, friable loam to clay loam mottled with grayish brown and brownish gray.

**Shoals loam** (Sg).—This soil occurs in level or nearly level areas along streams. Included in the areas mapped are a few areas that have been recently flooded. In these areas the surface layer is fine sandy loam.

This soil is frequently flooded, and it has a seasonally high water table. Surface runoff is very slow, and the moisture-supplying capacity is high. Tile drains are needed, but drainage generally is difficult because of the lack of outlets.

If this soil is protected from overflow and adequately drained, it is highly productive. Most of the acreage is now used for permanent pasture or has a cover of brush or trees. *Capability unit IIw-1.*

**Shoals silt loam** (Sh).—This soil occurs in level or nearly level areas along streams. It differs from the typical soil in that the surface layer contains more silt.

This soil is frequently flooded, and it has a seasonally high water table. Surface runoff is very slow, and the moisture-supplying capacity is high. Tile drains are needed to remove excess water, but drainage generally is difficult because of the lack of outlets.

If this soil is protected from overflow and adequately drained, it is highly productive. Most of the acreage is now used for permanent pasture or has a cover of brush or trees. *Capability unit IIw-1.*

**Shoals silty clay loam** (Sk).—This soil occurs in level or nearly level areas along streams. It differs from the typical soil in that the surface layer contains more clay and less sand. Because of the finer textured surface layer, it is more difficult to till than the typical soil.

This soil is frequently flooded and it has a seasonally high water table. Surface runoff is very slow, and the moisture-supplying capacity is high. Tile drains are needed to remove excess water, but drainage generally is difficult because of the lack of outlets.

If this soil is protected from overflow and adequately drained, it is highly productive. Most of the acreage is now used for permanent pasture or has a cover of brush or trees. *Capability unit IIw-1.*

**Shoals and Sloan soils, over limestone** (Sm).—This undifferentiated mapping unit occurs in level or nearly level areas along creeks or rivers that are flowing over limestone bedrock. These soils differ from the typical soil in that they are darker colored, have more clay and less sand in

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the surface layer, and are underlain by bedrock at a depth of 20 to 42 inches. Included in the areas mapped are small areas of soils that are more silty, and small areas of gently sloping Shoals silt loam, over limestone. Also included are a few areas of very poorly drained Sloan silty clay loam, over limestone.

Surface runoff is very slow, and the moisture-supplying capacity is medium. These soils are frequently flooded, and they have a seasonally high water table. Tile drains are needed but are difficult to install because of shallowness to bedrock. The rock also interferes with the dredging and cleaning of the creeks and rivers. Most of the acreage is used for permanent pasture or has a cover of brush or trees. *Capability unit IIIw-2.*

## Sloan Series

The Sloan series is made up of dark-colored, very poorly drained alluvial soils in nearly level to slightly depressed areas along nearly all of the streams in the county.

Typical profile of Sloan silty clay loam:

0 to 10 inches, very dark gray, friable silty clay loam.
10 to 40 inches, dark-gray to gray, friable clay loam to loam mottled with strong brown.

**Sloan silt loam** (Sn).—This soil occurs on nearly level recent flood plains, particularly near the origin of streams, where there is a slight natural gradient. Included in the areas mapped are a few areas in which the surface layer is loam.

This soil is frequently flooded, and water stands on the surface after the flood has receded. Surface runoff is very slow or ponded, and the moisture-supplying capacity is high. There is a seasonally high water table. Tile drains are needed to remove excess water.

If this soil is protected from overflow and adequately drained, it is highly productive. Much of the acreage is now used for permanent pasture or has a cover of brush or trees. *Capability unit IIIw-1.*

**Sloan silty clay loam** (So).—This soil occurs on nearly level, recent flood plains, generally along small streams and creeks or in the narrow backwater channels of large streams. Many of these areas are dissected by drainageways or sloughs. Included in the areas mapped are a few areas in which the surface layer is clay loam and the subsoil is light clay or silty clay.

This soil is frequently flooded, and water stands on the surface after the flood has receded. Surface runoff is very slow or ponded, the moisture-supplying capacity is high, and the organic-matter content is high. There is a seasonally high water table. Tile drains are needed to remove excess water.

If this soil is protected from overflow and adequately drained, it is highly productive. Much of the acreage is now used for permanent pasture or has a cover of brush or trees. *Capability unit IIIw-1.*

## Spinks Series

The Spinks series consists of sandy, light-colored, well-drained soils on gently sloping to moderately steep ridges or dunes on the lake plain or on terraces and beach ridges. These soils developed in deep, neutral to calcareous sand, in which there are thin bands that are slightly higher in content of clay than the rest of the soil material.

Typical profile of Spinks fine sand:

0 to 4 inches, dark grayish-brown, loose fine sand.
4 to 10 inches, dark yellowish-brown to yellowish-brown, loose fine sand.
10 to 72 inches, yellow to yellowish-brown, loose fine sand; many, discontinuous, ¼- to ½-inch, strong-brown bands in which there are clay coatings on the sand grains.
72 to 78 inches +, light yellowish-brown, loose sand.

**Spinks fine sand, 2 to 6 percent slopes** (SpB).—This light-colored, well-drained soil occurs on gently sloping sand ridges or dunes. Included in the areas mapped are small areas of a very sandy soil that resembles the typical soil, except that the surface layer is coarser textured and the subsoil lacks the intermittent bands.

Surface runoff is very slow, and the moisture-supplying capacity is low. Corn and other crops that require large quantities of water late in the growing season are not suitable. Blowing sand often damages or kills seedlings, and crops frequently have to be replanted. This soil is an excellent source of sand for filling and grading purposes, and it provides favorable sites for farmsteads, subdivisions, and roads. *Capability unit IIIs-2.*

**Spinks fine sand, 6 to 12 percent slopes** (SpC).—This light-colored, well-drained soil occurs on sloping sand ridges or dunes. Included in the areas mapped are small areas of a very sandy soil that resembles the typical soil, except that the surface layer is coarser textured and the subsoil lacks the intermittent bands.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low. Corn and other crops that require large quantities of water late in the growing season are not suitable. The hazard of wind erosion is severe on this soil, and tillage is difficult. The blowing sand often damages or kills seedlings, and crops frequently have to be replanted. This soil is an excellent source of sand for filling and grading, and it provides favorable sites for farmsteads, subdivisions, and roads. *Capability unit IIIe-3.*

**Spinks fine sand, 12 to 18 percent slopes** (SpD).—This light-colored, well-drained soil occurs on moderately steep sand ridges or dunes. Included in the areas mapped are small areas of a very sandy soil that resembles the typical soil, except that the surface layer is coarser textured and the subsoil lacks the intermittent bands.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low. Corn and other crops that require large quantities of water late in the growing season are not suitable. The hazard of wind erosion is severe on this soil, and tillage is difficult. The blowing sand often damages or kills seedlings, and crops frequently have to be replanted. This soil is an excellent source of sand for filling and grading purposes, and it provides favorable sites for farmsteads, subdivisions, and roads. *Capability unit IIIe-3.*

**Spinks loamy fine sand, 2 to 6 percent slopes** (SsB).—This light-colored, well-drained soil occurs on gently sloping sand ridges or dunes. It is similar to the typical soil, except that there is less sand and more silt and clay in the surface layer. Included in the areas mapped are small areas of a very sandy soil that resembles the typical soil, except that the subsoil lacks the intermittent bands. A few of these included soils have slopes of 0 to 2 percent.

Surface runoff is very slow, and the moisture-supplying capacity is low. Corn and other crops that require large quantities of water late in the growing season are not suitable. Wind erosion is a hazard on this soil, and crops frequently have to be replanted because the blowing sand damages or kills seedlings. This soil is an excellent source of sand for filling and grading purposes, and it provides favorable sites for farmsteads, subdivisions, and roads. *Capability unit IIIs-2.*

**Spinks loamy fine sand, 6 to 12 percent slopes** (SsC).—This light-colored, well-drained soil occurs on sloping sand ridges or dunes. It is similar to the typical soil, except that there is less sand and more silt and clay in the surface layer. Included in the areas mapped are small areas of moderately well drained Ottokee loamy fine sand, and small areas of a very sandy soil that resembles the typical soil, except that the subsoil lacks the intermittent bands.

Surface runoff is slow, the moisture-supplying capacity is low, and the organic-matter content is low. Corn and other crops that require large quantities of water late in the growing season are not suitable. Wind erosion is a severe hazard, and consequently tillage is difficult. Crops frequently have to be replanted because the blowing sand damages or kills seedlings. This soil is an excellent source of sand for filling and grading purposes, and it provides favorable sites for farmsteads, subdivisions, and roads. *Capability unit IIIe-3.*

## Tedrow Series

In the Tedrow series are somewhat poorly drained, nearly level to gently sloping soils that developed in water-deposited sandy material. These soils occur in a complex pattern on slightly elevated sand ridges and knolls.

Typical profile of Tedrow loamy fine sand:

0 to 8 inches, dark grayish-brown to dark-brown, loose loamy fine sand.
8 to 47 inches, yellow to yellowish-brown, loose loamy fine sand to fine sand with mottles of dark reddish brown and dark red.
47 to 59 inches +, dark-gray, loose fine sand; calcareous.

**Tedrow loamy fine sand, 0 to 2 percent slopes** (Td).—This somewhat poorly drained soil occurs on slightly elevated sand ridges and knolls. Included in the areas mapped are a few small areas of soils that are similar to the typical soil, except that the surface layer is very dark grayish brown, or darker colored; some small areas in which the surface layer is fine sandy loam; a few areas in which the surface layer is very dark grayish-brown, or darker colored fine sandy loam; and small areas of Rimer soils, which are more shallow to clay.

Surface runoff is slow, the moisture-supplying capacity is medium, and there is a seasonally high water table. Tile drains, which function well, are needed to remove excess water. The laterals can be widely spaced, but precautions should be taken to prevent the tile from settling and to prevent sand from seeping into tile lines. Weed control is more of a problem on this soil than on the finer textured soils.

This soil responds well to fertilizer, and it is suited to all crops commonly grown in the county. If properly drained and otherwise well managed, it is moderately to highly productive. *Capability unit IIw-2.*

**Tedrow loamy fine sand, 2 to 6 percent slopes** (TdB).—This somewhat poorly drained soil occurs on slightly elevated sand ridges and knolls. Included in the areas mapped are a few areas that are similar to the typical soil, except that the surface layer is very dark grayish brown, or darker colored; a few areas in which the surface layer is fine sandy loam; a few areas in which the surface layer is very dark grayish-brown or darker colored fine sandy loam; and small areas of the shallower Rimer soil.

Surface runoff is slow, the moisture-supplying capacity is medium, and there is a seasonally high water table. Tile drains, which function well, are needed to remove excess water. The laterals can be widely spaced, but precautions should be taken to prevent the tile from settling and to prevent sand from seeping into tile lines. Weed control is more of a problem on this soil than on the finer textured soils.

This soil responds well to fertilizer, and it is suited to all crops commonly grown in the county. If properly drained and otherwise well managed, it is moderately to highly productive. *Capability unit IIw-2.*

## Toledo Series

The Toledo series consists of very poorly drained soils in nearly level to depressed areas on the lake plain. These soils developed in fine-textured, lake-deposited, calcareous material.

Typical profile of Toledo silty clay:

0 to 9 inches, dark-gray to very dark gray, very firm silty clay.
9 to 14 inches, gray, very firm silty clay mottled with strong brown.
14 to 16 inches, gray, very firm silty clay mottled with yellowish brown, olive yellow, and strong brown.
46 to 57 inches, light brownish-gray to gray, firm clay mottled with light olive brown and strong brown; some lenses or pockets of silt.

**Toledo silty clay** (To).—This soil occurs in nearly level to slightly depressed, broad areas on the lake plain in the north-central and northeastern parts of the county. The boundaries separating it from the Hoytville soils are not well defined, and small areas of the Hoytville soils are included in the areas mapped. Also included are some small areas, 2.5 acres or less in size, of the somewhat poorly drained Fulton soils.

This soil has very slow or ponded surface runoff, high moisture-supplying capacity, and high organic-matter content. Both tile and surface drainage are needed to remove excess water. Management should include practices that help to maintain favorable tilth and to preserve soil structure.

Most of the acreage is cultivated. Corn is the principal crop, but soybeans, tomatoes, sugar beets, wheat, oats, and meadow or hay crops are also well suited. *Capability unit IIIw-4.*

**Toledo sily clay loam** (Tt).—This soil occurs in nearly level to slightly depressed, broad areas on the lake plain, in the north-central and northeastern parts of the county. The boundaries separating it from the Hoytville soils are not well defined, and small areas of the Hoytville soils are included in the areas mapped. Also included are some small areas, 2.5 acres or less in size, of the somewhat poorly drained Fulton soils.

Surface runoff is very slow or ponded, the moisture-supplying capacity is high, and the organic-matter content is high. Both tile and surface drainage are needed to remove excess water. Management should include practices to maintain favorable tilth and to preserve soil structure.

Most of the acreage is cultivated. Corn is the principal crop, but soybeans, tomatoes, sugar beets, wheat, oats, and meadow or hay crops are also well suited. *Capability unit IIIw-4.*

## Urban Land

**Urban land** (Ur).—This miscellaneous land type consists of land that has been altered or obscured by railroad yards, factories, villages, towns, or cities. It represents areas in which soil boundaries could not be determined and specific soil types could not be identified. Such areas have no significant agricultural value.

## Warners Series

The Warners series consists of dark-colored, very poorly drained, shallow soils that developed in a mixture of organic and mineral material that overlies silty clay or clay glacial till. These soils are in level or slightly depressed, broad areas on the lake plain, where natural drainage outlets have been obstructed by sand and by limestone ridges.

Typical profile of Warners soils, over clay:

0 to 7 inches, black, mixture of friable muck and mineral material.

7 to 11 inches, gray, friable marl mixed with black or very dark colored gray muck; calcareous.

11 inches +, brown or grayish-brown, very firm silty clay or clay glacial till; calcareous.

**Warners soils, over clay** (Wc).—These soils occur in level or slightly depressed, broad areas on the lake plain. The mineral part of the surface layer is sandy loam, loam, or silt loam. Small areas of Muck and of the associated Wauseon and Hoytville soils are included in the areas mapped.

These soils are subject to overflow from surrounding areas. Runoff is slow, and water often stands on the surface. The moisture-supplying capacity is high, and there is a seasonally high water table. The water table occurs at or near the surface for long periods during the growing season unless artificial drainage is installed. The lack of adequate outlets and the presence of compact till near the surface may limit the suitability of these soils for tile drains. Weed control is more of a problem on these soils than on the associated mineral soils.

Most of the acreage is cultivated. If adequately drained and fertilized, these soils can be used for corn, soybeans, and hay. If drainage is not possible, they can be used for pasture. They are not well suited to truck crops, because of the high content of lime near or in the surface layer. *Capability unit IVw-2.*

## Wauseon Series

The Wauseon series is made up of dark-colored, very poorly drained soils that developed in water-deposited sandy material. These soils are in nearly level to depressed areas, generally in a complex pattern with other sandy soils.

Typical profile of Wauseon loamy fine sand:

0 to 8 inches, very dark gray, loose loamy fine sand; very high in organic-matter content.

8 to 34 inches, dark-gray, grayish-brown, and light olive brown, friable loamy fine sand with mottles of olive yellow and brownish yellow.

34 to 43 inches +, light grayish-brown and olive-yellow, loose sandy loam; calcareous.

**Wauseon fine sandy loam** (Wf).—This dark-colored soil occurs in nearly level to depressed areas. It is similar to the soil described as typical of the series, except that the surface layer contains less fine sand and commonly more clay and silt.

The moisture-supplying capacity is high, surface runoff is very slow or ponded, and there is a seasonally high water table. Tile drains, which function well, are needed to remove excess water. Precautions should be taken, however, to prevent the tile from settling and to prevent sand from seeping into tile lines.

This soil is high in organic-matter content, and it is easily worked. The preservation of favorable soil structure is not a problem. Most of the acreage is cultivated. Suitable crops include corn, soybeans, tomatoes, sugar beets, small grain, and meadow crops. *Capability unit IIw-4.*

**Wauseon fine sandy loam, over clay** (Wm).—This dark-colored soil occurs in nearly level to depressed areas. It is similar to the soil described as typical of the series, except that the surface layer contains less fine sand and more silt and clay, and calcareous clay occurs at a depth of 30 to 48 inches. Included in the areas mapped are a few small areas in which the calcareous clay occurs at a depth of 18 to 30 inches.

This soil has very slow to ponded surface runoff, high moisture-supplying capacity, and a seasonally high water table. Tile drains are needed to remove excess water. Wherever possible, the tile should be placed on the clay floor. Precautions should be taken to prevent sand from seeping into tile lines. This soil is high in organic-matter content, and it is easily worked. The preservation of favorable soil structure is not a problem. Most of the acreage is cultivated. Suitable crops include corn, soybeans, tomatoes, sugar beets, small grain, and meadow crops. *Capability unit IIw-4.*

**Wauseon loamy fine sand** (Wn).—A profile of this soil is the one described as typical of the series. This dark-colored soil occurs in nearly level to depressed areas.

The moisture-supplying capacity is high, and surface runoff is very slow or ponded. There is a seasonally high water table. Tile drains, which function well, are needed to remove excess water. Precautions should be taken, however, to prevent sand from seeping into tile lines.

This soil is high in organic-matter content, and it is easily worked. The preservation of favorable soil structure is not difficult. Most of the acreage is cultivated. Suitable crops include corn, soybeans, tomatoes, sugar beets, small grain, and meadow crops. *Capability unit IIw-4.*

**Wauseon loamy fine sand, over clay** (Ws).—This dark-colored soil occurs in nearly level to depressed areas. It is similar to the soil described as typical of the series, except that it is underlain by calcareous clay at a depth of 30 to 48 inches. Included in the areas mapped are a few areas in which the calcareous clay occurs at a depth of 18 to 30 inches.

Surface runoff is very slow or ponded, and the moisture-supplying capacity is high. There is a seasonally high water table. Tile drains are needed to remove excess water. Wherever possible, the tile should be placed on the clay floor. Precautions should be taken to prevent sand from seeping into tile lines.

This soil is high in organic-matter content, and it is easily worked. The preservation of favorable soil structure is not a problem. Most of the acreage is cultivated. Suitable crops include corn, soybeans, tomatoes, sugar beets, small grain, and meadow crops. *Capability unit IIw-4.*

# *Genesis, Classification, and Morphology of the Soils*

In this section the factors of soil formation are discussed, the system of classification is described, and the soil series in the county are placed in great soil groups (*27*). First the great soil group is described, and then each series in the group is discussed briefly. A technical profile description is given for each soil series. These technical descriptions are more detailed than the descriptions given in the section "Descriptions of the Soils." The colors given in the descriptions are for the soil when moist.

A number of the soils for which technical descriptions are given were sampled in the field, and the samples of the individual horizons were analyzed in the laboratory. All of the sampled profiles are indentified by a symbol, using the letters WD plus a profile number. The laboratory data obtained for the analyzed profiles are given in table 6 in the section "Laboratory Data," which follows the technical descriptions.

Soils are continuous over the land surface of the earth, except on steep and rugged mountains, in areas of perpetual ice and snow, in extreme deserts, and on salt flats. They are formed by forces of weathering and of soil development acting upon materials that have been deposited or accumulated by geological activity. Soil formation proceeds as steps or stages, none of which are distinct. It could be said that there are two major stages in the formation of soils—first the accumulation of parent material, and then the differentiation of horizons within the profile (*24*).

The characteristics of a soil of any given place depend upon the interrelationships of (1) the physical and mineralogical composition of the parent material; (2) the climate under which the material has accumulated and existed since accumulation; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material. These five factors are called the soil-forming factors. Because different factors dominate from place to place, many kinds of soils have been formed. These soil-forming factors control the rate and effects of the physical and chemical processes that function within the soil profiles to produce horizon differentiation.

The changes that occur in the soil system are of four basic kinds: additions, removals, transfers, and transformation (*24*). The intensity of the soil-forming processes, now and in the past, has determined the degree of horizon differentiation and present soil characteristics.

Climate and living organisms are the active factors in soil formation. Little is known of the micro-organisms, earthworms, and other plants and animals living in the soil, but they probably have an influence on soil composition and supply of organic matter equal to that of vegetation. The vegetation and the animal and microbial life, influenced by the climate, act upon the parent material and slowly change it to a natural body that has genetically related horizons. Soils differ on a regional basis, largely because of the influence of climate and vegetation.



The effects of climate and vegetation on soil development are modified by the nature of the parent material and by the relief, which, in turn, influences drainage. The parent material and relief influence the kind of soil profile that is formed and, in some places, dominate the soil-forming factors.

Finally, time is required before the parent material can be transformed into soil. It takes long periods for weathering, leaching, translocation of soil particles, formation of soil structure, and other soil-forming processes to make distinct horizons in soil parent material.

## Genesis of the Soils

The differences among the soils in Wood County have resulted chiefly from the influence of parent material and relief. Climate and vegetation have strongly influenced the development of the soils, but as these factors are nearly uniform throughout the county, they have not caused significant differences among the soils. All of the county was covered by ice as the result of the Wisconsin glaciation, and the soils have formed since the glacier retreated. Studies indicate that the interval of time since the retreat of the glacier has been short enough so that differences in time have not had any marked effect that would account for variations in the soils.

### *Parent material*

Glacial till and lacustrine deposits are the main parent materials for soils in Wood County. The Wisconsin ice sheets that covered the county many centuries ago left a mantle of fine-textured till. This mantle ranged in thickness from a few inches, where limestone bedrock occurs on or near the surface, to 80 feet in the northeastern part of the county, where the depth to bedrock is considerably greater (*25*). Radiocarbon dates from northern Ohio and adjacent Indiana indicate that the glacier retreated from the area about 15,000 years ago (*8*). For a period of time the glacier remained stationary near the northern border of Ohio. The ice front acted as a dam, and meltwaters were ponded for extended periods until the present outlet to Lake Erie was reestablished.

Wood County was affected by at least six stages of glacial lakes. Lake Maumee, which had several stages and occurred at the highest elevation, covered the entire county. The glacial lakes Whittlesey, Arkona, Warren, Wayne, and Lundy, listed in decreasing order of elevation, covered parts of the county (*7*). Prominent sandy or gravelly beach ridges were left at the margins of these glacial lakes.

The soils of roughly three-quarters of the county, or the area south of Perrysburg, were derived mainly from fine-textured, calcareous glacial till. The clay content of this till ranges from 38 to 48 percent. The wave action of the glacial lakes that covered this area probably reworked and modified the till to a considerable extent. The Hoytville and Nappanee soils are dominant in this area.

The soils of the remaining quarter of the county, or the area east and north of Perrysburg, were derived mainly from fine-textured, calcareous lacustrine material. These lake-laid materials are principally silty clay, and the clay content averages more than 40 percent. Thin seams or laminations of fine sandy or silty material are common in the lower part of this material. This fine-textured, lacustrine material was deposited on the till from which the Hoytville soils developed. The Toledo and Fulton soils are dominant in this area.

### *Relief and drainage*

Wood County is part of the glacial lake plain of northwestern Ohio (*6*). The land surface consists mainly of a nearly level plain that slopes gradually northward towards the Maumee River and northeastward towards Lake Erie. In places this flat relief is broken by limestone and sand ridges or knolls and by narrow, steep-sided valleys along the Maumee River and several of its tributaries. The sandy and gravelly ridges represent the beaches, dunes, and offshore bars of the various stages of glacial lakes that occurred in Wood County.

The Maumee River, which is the largest stream in the county, occurs in a valley ranging from 40 to 50 feet in depth and from a fourth to a half mile in width. The Portage River, the next largest stream, occurs on a relatively narrow flood plain and flows in a northeasterly direction to Lake Erie.

The highest elevation in the county, 780 feet, is in the southeastern part of the county, just north of Fostoria. The lowest elevation, 600 feet, is in the northeastern part, near the junction of the Lucas and Ottawa County lines.

Most of the soils on the plain are very poorly drained. Well-drained to somewhat poorly drained soils occur on the ridges, knolls, and valley slopes. To improve drainage, an extensive system of open ditches has been constructed in all parts of the county. These ditches serve as outlets for tile drains.

### *Vegetation*

The original vegetation in Wood County was primarily deciduous swamp forest (*21*). The trees common on the somewhat poorly drained to very poorly drained soils were black ash, white ash, American elm, shagbark hickory, basswood, swamp oak, white oak, bur oak, pin oak, sycamore, silver maple, and cottonwood. Scattered throughout the swamp forest were a few openings, covered with grass and interspersed with groves of white oak and black oak. These openings occurred on the better drained sandy and gravelly soils. On the better drained sloping soils, such as those bordering streams, beech, basswood, white oak, red oak, and sugar maple were dominant.

There were also a few fairly extensive, wet boggy areas, mostly in the southwestern part of the county, where water-loving grasses and sedges were dominant.

### *Climate*

Climate is an active factor in soil formation. It influences the rate of plant growth, the amount of water available to plants, the removal of material by leaching, and the temperature of the soils.

Wood County has a temperate, humid, continental climate. The climate is fairly uniform throughout the county and thus does not account for the major differences among the soils. These differences have been determined more by the differences in vegetation, parent material, relief, and drainage and by the age of the soil material. Climatic factors, however, are interrelated with the types of vegetation and, on a regional basis, determine the kinds of soil that develop. More information about the climate is given in the section "Additional Facts About the County."

### *Time*

The length of time required for the formation of horizons in a soil depends on the other soil-forming factors, particularly on relief and parent material. Differences in the development of soils cannot be correlated exactly with age, because the other soil-forming factors affect or modify both the rate of weathering and the other processes of development.

The age of the lake plain north of Lake Warren is estimated to be slightly less than 10,000 years. The age of the lake plain south of Lake Warren is estimated to be between 10,000 and 13,000 years (*7*). Thus, the soils of this county have been developing a relatively short time compared to soils that developed in till from former glaciations or those that developed in unglaciated areas. This accounts in part for the shallowness of leaching and for the less acid reaction of some soils of the county.

## Classification of the Soils

The soils in Wood County are classified in six great soil groups. Some soils have characteristics that are typical of or transitional to another great soil group. These soils are classified as intergrades rather than in the central concept of their great soil group. The following list shows the classification of the soils in Wood County.

Gray-Brown Podzolic soils:
- Central concept—
  - Belmore, Haney, Milton, Ottokee, Ritchey, St. Clair
- Intergrading to Low-Humic Gley soils—
  - Digby, Fulton, Haskins, Kibbie, Nappanee, Randolph
- Intergrading to Regosols—
  - Dunbridge, Rimer, Seward, Spinks

Humic Gley soils:
- Central concept—
  - Colwood, Hoytville, Joliet, Mermill, Millgrove, Millsdale, Sloan, Toledo, Wauseon

Alluvial soils:
- Central concept—
  - Eel, Genesee, Shoals

Bog soils:
- Central concept—
  - Muck, Warners

Lithosols:
  Central concept—
    Romeo

Regosols:
  Intergrading to Low-Humic Gley soils—
    Tedrow

### *Gray-Brown Podzolic soils*

Gray-Brown Podzolic soils developed under deciduous forest in humid, temperate climate. In undisturbed areas they have a thin, dark-colored A1 horizon and an eluviated A2 horizon. The A2 horizon is light colored, generally gray, grayish brown, or pale brown. In cultivated fields, part or all of the A2 horizon may be incorporated into an Ap horizon.

The B horizon contains more clay than the A2 horizon because of eluviation from the A2 horizon. The chroma of the B horizon of well drained and moderately well drained soils is higher than that of the A2 horizon. The chroma of the B horizon of somewhat poorly drained soils is similar to that of the A2 horizon. The most common colors are dark grayish brown, grayish brown, gray, brown, yellowish brown, or strong brown.

Gray-Brown Podzolic soils have a characteristic pattern of reaction and of base saturation. They are more acid in the lower part of the A horizon and in the upper part of the B horizon than they are in the lower part of the B horizon. The reaction generally is slightly acid to strongly acid in the uppermost horizons and medium acid to neutral in the lower part of the solum. There is a similar pattern of base saturation. Saturation values of as low as 50 percent, or slightly lower, may occur in the lower part of the A horizon and in the upper part of the B horizon, whereas the base saturation in the lower part of the B horizon is seldom below 70 percent.

The Belmore, Haney, Milton, Ottokee, Ritchey, and St. Clair soils represent the central concept of the Gray-Brown Podzolic group in Wood County. Of these, the Belmore, Milton, and Ritchey soils are well drained. The other soils are mottled in the lower part of the solum, an indication that they are only moderately well drained.

Gray-Brown Podzolic soils that are intergrading toward the Low-Humic Gley soils are represented in Wood County by the Digby, Fulton, Haskins, Kibbie, Nappanee, and Randolph soils. These soils are somewhat poorly drained, as evidenced by colors of low chroma in their B horizons. These colors are not representative of Gray-Brown Podzolic soils but are not so gray as the color of typical Low-Humic Gley soils.

The Dunbridge, Rimer, Seward, and Spinks soils are classified as Gray-Brown Podzolic soils, but they have some characteristics of Regosols. The Dunbridge and Spinks soils are well drained, the Seward soils are moderately well drained, and the Rimer soils are somewhat poorly drained. The Dunbridge soils developed largely in loamy fine sand and fine sand that is from 18 to 30 inches thick over limestone bedrock. They have a Bt horizon immediately above the bedrock. The Spinks soils developed in deep, neutral to calcareous sand and have narrow bands of Bt material in the solum. The upper part of the solum of the Rimer and Seward soils consists of sandy material that ranges from 18 to 36 inches in thickness. The lower part is a Bt horizon, 3 to 12 inches thick, that developed in fine-textured material. The solum is underlain by calcareous, fine-textured, lacustrine material or glacial till. The soils of this group have minimal development of horizons.

### *Humic Gley soils*

Humic Gley soils have a thick, dark-colored surface layer over a drab, mottled subsoil, which is gleyed. The drab colors and mottled patterns are the result of poor drainage. The amount of organic matter in the surface layer is moderately high or high. The A1 horizon normally is thicker than that of the associated Gray-Brown Podzolic soils.

These soils occur in nearly level or depressed areas that have a seasonally high water table, and they are poorly drained or very poorly drained. The natural vegetation was predominantly swamp forest. Leaching of bases has been restricted in these soils because of the poor drainage. The depth to carbonates, however, is generally greater than that in associated better drained soils. This condition is reflected in the slightly acid to mildly alkaline reaction of the soils. The surface layer is slightly acid to neutral, and the deeper horizons are neutral to mildly alkaline. The percentage of base saturation is high, and it increases with depth. Generally, the cation exchange capacity of Humic Gley soils is higher than that of the associated Gray-Brown Podzolic soils (*22*).

The Hoytville, Joliet, Mermill, Millgrove, Millsdale, and Toledo soils are Humic Gley soils that have a textural B horizon. The Colwood, Sloan, and Wauseon soils lack a textural B horizon.

### *Alluvial soils*

Alluvial soils developed in recently deposited alluvium. Most of these soils receive additional deposits when streams overflow. Little or no modification of the soil material has taken place through the processes of soil formation. These soils normally lack discernible horizons, although some have a weakly developed A1 or Ap horizon caused by a slight accumulation of organic matter. Some Alluvial soils are mottled in the lower part of the solum, which indicates that they are moderately well drained or somewhat poorly drained.

Alluvial soils are of limited extent in Wood County. They occur mainly along the Maumee and Portage Rivers or along the various branches of the Portage River. The Eel, Genesee, and Shoals soils represent this great soil group in the county.

### *Bog soils*

The Bog soils consist of an accumulation of organic material that is 12 inches or more thick over mineral material. These soils developed in a humid or subhumid climate, under swamp or marsh vegetation. They are very poorly drained.

In Wood County the Muck soils are classified as Bog soils. These organic soils were ponded or covered with water during their development. They occur in depressions where natural drainage outlets have been obstructed by limestone or sand ridges. The very poor drainage favors the accumulation of organic material. The varying depth of the organic accumulation, its chemical composition, and its degree of decomposition are related to the nature of the plant remains and to the height of the water table. The Muck soils in Wood County were not correlated in a specific soil series but were designated as a miscellaneous land type.

Warners soils are also classified as Bog soils, although they have some properties of Humic Gley soils.

### *Lithosols*

Lithosols have no clearly expressed morphology. These soils are made up of a partly weathered mass of rock fragments. They are very shallow over bedrock and have weakly developed profiles. They occur mainly in areas where the glacial deposits are very thin and overlie bedrock.

The Romeo soils are the only Lithosols in the county. In uneroded areas they have a dark-colored A1 horizon that is high in content of organic matter. In most profiles the B horizon is lacking. If there is a B horizon, it is very thin. The Romeo soils are shallow and well drained. They are underlain by limestone bedrock.

### *Regosols*

Soils of this great soil group have few and faint genetic horizons. They may have a faint A horizon grading downward to a C horizon. They formed in deep, unconsolidated material or in relatively soft rocky deposits.

In Wood County, the Tedrow soils are classified as Regosols. However, in most places a B horizon has developed to an extent approaching that of Low-Humic Gley soils. The Tedrow soils are somewhat poorly drained, and they have a mottled subsoil and a dark grayish-brown surface layer.

## Morphology of the Soils

This part of the report contains a technical profile description of a representative soil of each soil series in the county. These descriptions are more detailed than those given in the section "Descriptions of the Soils."

The soils were sampled in the field to obtain the data for the profile descriptions. Most of the soils were sampled in several locations to determine their variation. In many instances samples were taken for laboratory analysis (see tables 6 and 7). Several of the samples tested were taken from Hancock County, Ohio, but the soils are essentially the same as those of the same series mapped in Wood County. Unless otherwise stated, colors are for moist soil.

### Belmore Series

The Belmore series consists of nearly level to gently sloping, light-colored, well-drained Gray-Brown Podzolic soils that developed in the thick, sandy and gravelly material of the beach ridges or in associated local outwash material. These soils occur on the crests and upper part of slopes on the beach ridges. The ridges occur as long narrow bands that are elevated 10 to 20 feet above the surrounding area. They denote the outer limits of glacial lakes that existed during and immediately after the Wisconsin stage of glaciation.

The Belmore soils are associated with the moderately well drained Haney soils, the somewhat poorly drained Digby soils, and the very poorly drained Mermill and Millgrove soils. The Belmore soils are redder (hues of 5YR) throughout than the associated soils, but the Haney, Digby, Mermill, and Millgrove soils have more finer textured material mixed with the sand and gravel or have silty strata within the profile. The Belmore soils are on the main beach ridges; the soils in the Haney toposequence are on secondary beach ridges.

Runoff on the Belmore soils is slow to very slow in nearly level areas and moderately rapid in the more sloping areas. The moisture-supplying capacity is medium in the surface layer and medium or low in the subsoil and underlying material.

*Representative profile of Belmore loam*, in the NE¼NE¼ sec. 20, T. 3 N., R. 10 E., Portage Township, Hancock County.

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) coarse loam; weak, medium, granular structure; very friable; abundant roots; neutral; abrupt smooth boundary.

B11—8 to 14 inches, dark reddish-gray (5YR 4/2) loam; weak, medium, granular structure; very friable; common roots; neutral; clear wavy boundary.

B12—14 to 19 inches, dark reddish-brown (5YR 3/3) sandy loam; weak, medium, granular structure; friable; few roots; slightly acid; clear wavy boundary.

B21t—19 to 30 inches, dark reddish-brown (5YR 3/4) sandy clay loam; weak, medium, subangular blocky structure; friable; few roots; neutral; gradual wavy boundary.

B22t—30 to 39 inches, dark reddish-brown (5YR 3/3) sandy clay loam; weak, medium, subangular blocky structure; friable; few roots; neutral.

C1—39 to 49 inches, dark grayish-brown (10YR 4/2) fine gravel; stratified with sand and sandy loam; single grained; loose; roots absent; calcareous.

The A horizon may be dark brown (7.5YR 4/2), dark reddish brown (5YR 3/3), or dark grayish brown (10YR 4/2) and commonly extends to a depth of 7 or 8 inches. The B21t and B22t horizons range from loam or gravelly sandy clay loam to clay loam in texture and in places contain various quantities of strong-brown (7.5YR 5/8) or yellowish-brown (10YR 5/4) coats or mottles, probably as a result of mineral decomposition in the lower part of the B horizon. Tongues of sandy clay loam or clay loam extend irregularly downward from the B22t horizon into the C horizon. The depth to calcareous material ranges from 24 to 60 inches or more. The greatest depth occurs where tongues of the B22t horizon extend into the underlying material. The C horizon varies in texture and in degree of stratification but is dominantly loamy fine gravel, sand, or coarse sandy loam. The color of the C horizon may be pale brown (10YR 6/3), yellowish brown (10YR 5/4), or light brown (7.5YR 6/3).

### Colwood Series

The Colwood series consists of very poorly drained Humic Gley soils that developed in stratified calcareous silt, fine sand, very fine sand, and some clay. These soils are in level, nearly level, or slightly depressed areas on the lake plain and on deltas, outwash plains, and terraces.

The Colwood soils are part of the toposequence that contains the somewhat poorly drained Kibbie soils. They have a coarser textured B horizon and generally contain less skeletal material than the Mermill soils, which formed in medium-textured outwash material underlain by clay or clay loam till or by lacustrine deposits. They are coarser textured than the Millgrove soils, which are underlain by poorly sorted gravelly and sandy material.

Surface runoff on the Colwood soils is slow to ponded, internal drainage is moderately rapid, and the moisture-supplying capacity is high.

*Representative profile of Colwood fine sandy loam*, in the NW¼NW¼ sec. 28, T. 5 N., R. 11 E., Center Township, Wood County.

Ap—0 to 8 inches, very dark gray (10YR 3/1) fine sandy loam; weak, medium, granular structure; friable; neutral to slightly acid; abrupt smooth boundary.

B21g—8 to 14 inches, grayish-brown (2.5Y 5/2) fine sandy loam; common, distinct, yellowish-brown (10YR 5/6–5/8) mottles; moderate, medium, angular blocky structure; friable; neutral; gradual wavy boundary.

B22—14 to 20 inches, mottled light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/6–5/8) fine sandy loam or light sandy clay loam; moderate, medium, angular blocky structure; friable; neutral; gradual wavy boundary.

B23—20 to 31 inches, mottled light yellowish-brown (10YR 6/4) and brownish-yellow (10YR 6/6) sandy loam or loam; moderate, medium, angular blocky structure; neutral; friable; diffuse wavy boundary.

B3—31 to 38 inches, mottled light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), and brownish-yellow (10YR 6/6) loam; weak, fine to medium, angular blocky structure; friable; neutral; gradual wavy boundary.

C1—38 to 66 inches, mottled gray (10YR 5/1), light yellowish-brown (10YR 6/4), and brownish-yellow (10YR 6/6) stratified silt, fine sand, and very fine sand; thin lenses of clay; single grain; firm; calcareous.

IIC2—66 inches +, mottled gray (10YR 5/1) and yellowish-brown (10YR 5/6) clay glacial till; massive; firm; calcareous.

The organic-matter content of the A horizon is high, and the color ranges from very dark brown (10YR 2/2) to very dark gray (10YR 3/1). The reaction of the A horizon and upper part of the B horizon ranges from slightly acid to mildly alkaline. The texture of the B horizon ranges from heavy fine sandy loam to loam, silt loam, light silty clay loam, or light sandy clay loam. The thickness and the sequence of the stratified material vary considerably within an area, but the calcareous clay lenses generally are thinner and less common than the layers of silt and sand.

### Digby Series

The Digby series consists of somewhat poorly drained Gray-Brown Podzolic soils that are intergrading to Low-Humic Gley soils. These soils developed in poorly sorted calcareous sand and gravel that contained various amounts of finer textured material. The sandy and gravelly material is 6 inches to several feet in thickness and occurs at a depth of 30 inches or more. These soils occur mainly in slightly elevated, nearly level to gently sloping areas that are either remnants of the beach ridges of the glacial lake plain or glaciofluvial outwash of the Wisconsin age. These secondary beach ridges occur as narrow bands, parallel to the main beach ridges, and generally are several feet above the level of the lake plain. Some areas occur on stream terraces adjacent to the bottom lands.

The Digby soils are the somewhat poorly drained members of the toposequence that includes the moderately well drained Haney soils and the very poorly drained Millgrove soils. They are associated with the Haskins and Digby soils, over clay, which developed in gravelly and sandy or loamy deposits that are less than 48 inches thick over fine-textured till or lacustrine deposits. They differ from the Kibbie soils, which developed in silt and sand and are underlain by stratified calcareous silt, fine sand, and very fine sand.

Surface runoff on the Digby soils is slow. The moisture-supplying capacity is medium in the surface layer and in the subsoil and low in the underlying material.

*Representative profile of Digby loam*, in the SW¼SW¼ sec. 27, T. 3 N., R. 12 E., Perry Township, Wood County.

Ap—0 to 7 inches, dark grayish-brown (2.5Y 4/2) loam; moderate, medium, granular structure; friable; numerous limestone and igneous pebbles; medium acid; clear smooth boundary.

B2t—7 to 16 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 4/3) clay loam; common, distinct, yellowish-brown (10YR 5/6) mottles; strong, medium, angular blocky structure; firm; some pebbles; slightly acid; gradual wavy boundary.

B3t—16 to 32 inches, yellowish-brown (10YR 5/4) loam mottled with dark brown (10YR 4/3) and brownish yellow (10YR 6/6); moderate, medium, angular blocky structure; friable; numerous small pebbles; neutral; abrupt wavy boundary.

C1—32 to 58 inches, light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2), poorly sorted sand and fine gravel; considerable silt and clay; single grain; loose; calcareous.

The color of the A horizon ranges from dark grayish brown (10YR 4/2) to very dark gray (10YR 3/1). The dominant color of the B horizons ranges from grayish brown (10YR 5/2) to light brownish gray (10YR 6/2), brown (10YR 5/3), or dark brown (10YR 4/3). The texture of the B horizons varies within short horizontal distances but in most places is sandy loam, loam, sandy clay loam, or coarse clay loam. The depth to the sandy and gravelly material and the thickness of the deposits vary. The amount of coarse skeletal material on the surface and throughout the soil also varies considerably. The depth to carbonates ranges from 28 to 48 inches or more. Lacustrine clay or glacial till may occur at a depth of 48 inches or more.

### Dunbridge Series

The Dunbridge series consists of well-drained Gray-Brown Podzolic soils that are intergrading to Regosols. These soils developed in coarse textured and moderately coarse textured material underlain by limestone. This material appears to be mainly water-deposited fine sand and loamy fine sand, intermixed with water-worked till.

The Dunbridge soils occur on nearly level to gently sloping beach ridges and lake terraces. They are part of the toposequence that includes the well-drained Milton, Ritchey, and Romeo soils; the somewhat poorly drained Randolph soils; and very poorly drained Joliet and Millsdale soils. They are associated with the Milton, Ritchey, Romeo, and Spinks soils but differ from the associated soils in the following respects. The Milton soils have a finer textured Bt horizon and generally a thicker solum than the Dunbridge soils, and they developed in moderately fine textured till or outwash; the Ritchey soils have a finer textured Bt horizon and normally a thinner solum than the Dunbridge soils, and they developed in till and residuum of limestone; the Romeo soils are darker colored than the Dunbridge soils, lack a Bt horizon, and are less than 12 inches thick over limestone. The Spinks soils, in contrast to the Romeo, developed in fine sand and loamy fine sand and have a much thicker solum and faint intermittent bands of slight clay accumulation separated by A2 horizons.

*Representative profile of Dunbridge loamy fine sand,* in the SE¼NE¼ sec. 26, T. 6 N., R. 12 E., Troy Township, Wood County.

Ap—0 to 8 inches, dark-brown (10YR 3/3) loamy fine sand; weak, fine, granular structure; very friable; slightly acid; abrupt smooth boundary.

B1—8 to 14 inches, yellowish-brown (10YR 5/4) light fine sandy loam; very weak, fine, subangular blocky structure; very friable; some pebbles and limestone fragments; slightly acid; clear smooth boundary.

B2t—14 to 25 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, fine and medium, subangular blocky structure; firm; thin clay films on ped surfaces and evident bridging between sand grains; few to common pebbles, cobblestones, and limestone fragments; neutral; abrupt wavy to irregular boundary.

IIC—25 to 27 inches, very pale brown (10YR 7/4) soft partly weathered limestone fragments; calcareous.

IIR—27 inches +, limestone bedrock.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) or brown (10YR 4/3) in color, and it ranges from 7 to 9 inches in thickness. In forested areas there is a 1- to 3-inch very dark brown (10YR 2/2) or black (10YR 2/1) A1 horizon and a 3- or 4-inch, pale-brown (10YR 6/3) or light yellowish-brown (10YR 6/4) A2 horizon. The A horizon ranges from loamy fine sand or fine sand to light fine sandy loam. The B1 horizon is yellowish brown (10YR 5/6, 5/8) or dark yellowish brown (10YR 4/4). It ranges from loamy fine sand to light fine sandy loam in texture and from 4 to 10 inches in thickness. The B2t horizon commonly is dark brown (7.5YR 4/4) but may be dark yellowish brown (10YR 4/4) or strong brown (7.5YR 5/6). This horizon is heavy fine sandy loam, loam, sandy loam, or sandy clay loam, and it ranges from 4 to 12 inches in thickness. The IIC horizon is as much as 6 inches thick in some places but is lacking in other places. The depth to bedrock ranges from 18 to 30 inches. The reaction of the solum is neutral or slightly acid. The content of pebbles, cobblestones, and fragments of limestone varies; in some profiles coarse fragments make up as much as 30 percent of the soil material.

### Eel Series

The Eel series consists of moderately well drained Alluvial soils that formed in material derived from highly calcareous Wisconsin glacial till. These soils occur on nearly level flood plains along the large streams in the county.

The Eel soils are the moderately well drained members of the toposequence that includes the well drained Genesee soils, the somewhat poorly drained Shoals soils, and the very poorly drained Sloan soils.

Runoff on the Eel soils is slow to very slow. The moisture-supplying capacity is high.

*Representative profile of Eel loam,* in the NE¼SE¼ sec. 8, Webster Township, Wood County.

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

C1—8 to 14 inches, yellowish-brown (10YR 5/4) clay loam; weak, fine, subangular blocky structure; friable; roots few; neutral; diffuse boundary.

C2—14 to 20 inches, yellowish-brown (10YR 5/4) clay loam; brown (10YR 5/3) coats or mottles; weak, fine, granular structure; friable; roots few; neutral; diffuse boundary.

C3—20 to 26 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; roots few; neutral; diffuse boundary.

C4—26 to 32 inches, brown (10YR 5/3) loam, many distinct yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; roots few; neutral; diffuse boundary.

C5—32 to 38 inches, yellowish brown (10YR 5/8) loam; many distinct grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; friable; roots few; some concretions of iron or manganese; neutral; diffuse boundary.

C6—38 to 48 inches, brown (10YR 5/3) loam; strong-brown (7.5YR 5/8) and yellowish-brown (10YR 5/8) mottles; massive; friable; some concretions of iron or manganese; neutral.

The color of the A horizon ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2), or from dark brown (10YR 3/3) to brown (10YR 5/3). The A horizon extends to a depth of 8 to 12 inches. These soils do not have a definite sequence of A, B, and C horizons. The depth to mottling ranges from 18 to 24 inches. The peds have organic coats to an average depth of 24 inches. Because of these coats, the color of crushed soil generally is one unit higher in chroma than that of uncrushed soil. The C horizons are loam, silt loam, sandy clay loam, or coarse clay loam and are either of one texture or are stratified. The color of the upper part of the C horizon is very dark brown (10YR 2/3), dark brown (10YR 4/3), or yellowish brown (10YR 5/4). The color of the matrix of the lower part of the C horizon ranges from brown (10YR 5/3) to grayish brown (10YR 5/2), and the color of the mottles, from yellowish brown (10YR 5/4) to yellowish red (5YR 4/6). Thin strata of loamy sand or fine gravel occur in some profiles. The reaction of the solum ranges from neutral to calcareous.

### Fulton Series

The Fulton series consists of light-colored, somewhat poorly drained Gray-Brown Podzolic soils that are intergrading to Low-Humic Gley soils. These soils developed in calcareous, lacustrine clay that contained thin layers or strata of silt and fine sand. They occur on the level part of the lake plain or in gently sloping areas adjacent to stream bottoms on the lake plain.

The Fulton soils are part of the toposequence that includes the very poorly drained Toledo soils. They have the same sequence of horizons as the Kibbie and Nappanee soils, but the Kibbie soils developed in calcareous stratified silt, very fine sand, and fine sand and have a medium-textured B horizon, and the Nappanee soils developed in fine-textured, calcareous glacial till and have a greater quantity of gritty material and gravel throughout the profile.

Surface runoff on the Fulton soils is slow. The moisture-supplying capacity is medium.

*Representative profile of Fulton silty clay loam,* in the SW¼SE¼ sec. 35, Ross Township, Wood County.

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

A2—6 to 7½ inches, brown (10YR 5/3) silty clay loam; weak, fine and very fine, subangular blocky structure; friable; medium acid; clear broken boundary.

B11—7½ to 12 inches, brown (10YR 5/3) silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; medium acid; clear boundary.

B12—12 to 17 inches, brown (10YR 5/3) silty clay; common, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, fine, subangular blocky structure; firm; neutral; clear boundary.

B21gt—17 to 25 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; very firm; neutral; clear boundary.

B22gt—25 to 36 inches, gray (10YR 5/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; strong, medium, subangular blocky structure; very firm; mildly alkaline; clear boundary.

C1—36 to 40 inches, yellowish-brown (10YR 5/6) silty clay loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles and pinkish-gray (7.5YR 7/2) coats of lime; moderate, fine, subangular blocky structure; firm; calcareous; clear boundary.

C2—40 to 49 inches, yellowish-brown (10YR 5/6) silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles or lime coats; weak, medium, platy structure; firm; calcareous.

The organic-matter content of the A horizon ranges from 2.8 to 4.6 percent. The A horizon generally is 6 or 7 inches thick and ranges from medium acid to neutral in reaction. The A horizon ranges from dark grayish brown (10YR 4/2) or dark gray (10YR 4/1) to grayish brown (10YR 5/2) or very dark grayish brown (10YR 3/2). The B horizons range from medium acid to mildly alkaline in reaction. In places thin layers or lenses of fine sand, silty clay loam, or loam occur in the lower part of the B horizons and in the C horizon. Ped surfaces in the lower part of the B horizons may have thin coats of very fine sand. The depth to carbonates commonly is 32 to 36 inches but in some areas is more than 42 inches.

## Genesee Series

The Genesee series consists of well-drained Alluvial soils that formed in material derived from highly calcareous Wisconsin glacial till. These soils occur in small areas on level or nearly level bottoms along the Portage and Maumee Rivers and along Beaver Creek.

The Genesee soils are part of the toposequence that includes the moderately well drained Eel soils, the somewhat poorly drained Shoals soils, and the very poorly drained Sloan soils. They are associated with the Eel soils but differ from these soils in that they are not mottled.

Runoff on the Genesee soils is slow or very slow. The moisture-supplying capacity is high.

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

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; abundant roots; mildly alkaline; abrupt, smooth boundary.

C1—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; plentiful roots; mildly alkaline; gradual wavy boundary.

C2—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 may be dark brown (10YR 4/3), brown (10YR 5/3), very dark grayish brown (10YR 3/2), or yellowish brown (10YR 5/8). The C horizons are loam or silt loam. Thin strata of fine sand and silt occur in some profiles. The structure throughout the profile ranges from weak, medium, subangular blocky to weak, medium or fine, granular. The reaction ranges from slightly acid to mildly alkaline.

## Haney Series

The Haney series consists of moderately well drained Gray-Brown Podzolic soils that developed in sand and fine gravel that contained various amounts of fine-textured material. These soils extend to a depth of 48 inches or more. They occur in elevated nearly level to gently sloping areas, on secondary beach ridges, terraces, or outwash plains.

The Haney soils are the moderately well drained members of the toposequence that includes the somewhat poorly drained Digby soils and the very poorly drained Millgrove soils. They are associated with the Belmore soils, but they have a finer textured, more strongly developed B horizon than the Belmore soils, and they are less red. Also, their B horizon contains some mottles, an indication that they are less well drained than the Belmore soils.

In most places, surface runoff on the Haney soils is medium. The moisture-supplying capacity is medium in the surface layer and the subsoil and low in the underlying material.

*Representative profile of Haney loam*, in SW¼SW¼ sec. 27, T. 3 N., R. 12 E., Perry Township, Wood County.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium to coarse, angular blocky structure; friable; numerous small limestone and igneous pebbles; neutral; clear smooth boundary.

B21t—7 to 13 inches, dark-brown (7.5YR 4/2) clay loam; few, distinct, strong-brown (7.5YR 5/6) mottles; strong, medium, subangular blocky structure that tends to break to prismatic; firm; few small pebbles; neutral; diffuse boundary.

B22t—13 to 25 inches, dark-brown (7.5YR 4/4) clay loam to coarse silty clay loam; few, distinct, strong-brown (7.5YR 5/8) mottles; strong, fine to medium, subangular blocky structure that tends to break to prismatic; firm; few small pebbles; neutral; diffuse boundary.

B3t—25 to 34 inches, dark-brown (7.5YR 4/2) clay loam; few, distinct, strong-brown (7.5YR 5/8) mottles; weak, coarse, subangular blocky structure; friable; many small pebbles; neutral; diffuse wavy boundary.

C—34 inches +, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) poorly sorted sand and fine gravel; considerable silt and clay; single grain; loose; calcareous.

The A horizon ranges from brown (10YR 5/3), dark grayish brown (10YR 4/2) or very dark brown (10YR 2/2) to dark yellowish brown (10YR 4/4) in color and from 7 to 10 inches in thickness. The color of the matrix of the B horizons ranges from dark brown (7.5YR 4/4) or brown (7.5YR 5/4) to dark yellowish brown (10YR 5/6). The dominant texture of the B horizons is sandy clay loam, clay loam, or silty clay loam. A few thin horizons of heavy loam occur in some profiles. The depth to the calcareous, poorly sorted, sandy and gravelly C horizon ranges from 27 to 36 inches. Most of the sand and gravel particles consist of material weathered from limestone, but some were derived from igneous rock, sandstone, and black shale (Ohio shale). In places fine-textured glacial till or lacustrine material occurs below a depth of 48 inches.

### HASKINS SERIES

The Haskins series consists of somewhat poorly drained Gray-Brown Podzolic soils that are intergrading to Low-Humic Gley soils. These soils developed in 18 to 42 inches of lake or outwash deposits, underlain by clay, silty clay loam, or clay loam till or by fine-textured lacustrine deposits. They have textural B horizons, the upper part of which developed in the medium-textured material, and the lower part, in the fine-textured underlying material. They occur on nearly level to gently sloping terraces, outwash areas, lake plains, and secondary beach ridges.

The Haskins soils are part of the toposequence that includes the very poorly drained Mermill soils. They differ from the Nappanee soils in having a coarser textured, sandier B2 horizon. They are finer textured and more strongly developed than the Rimer soils. Their texture and sequence of horizons are similar to those of the Digby soils, but the Digby soils have thicker textural B horizons and are not so fine textured in the lower part of the B horizon. The Haskins soils differ from the Kibbie soils, which formed in stratified silt and fine sand and are not so fine textured in the lower part of the B horizon.

Surface runoff on the Haskins soils is slow. The moisture-supplying capacity is medium.

*Representative profile of Haskins loam,* in the NW¼ NW¼ sec. 36, T. 7 N., R. 12 E., Lake Township, Wood County.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; very friable; some igneous pebbles on surface and in horizon; neutral; abrupt smooth boundary.

B1—9 to 14 inches, light olive-brown (2.5Y 5/4) light sandy clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; neutral; clear boundary.

B21t—14 to 20 inches, light olive-brown (2.5Y 5/4) sandy clay loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable to firm; neutral; clear boundary.

B31—20 to 24 inches, light olive-brown (2.5Y 5/4) sandy loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; weak, medium, granular structure; friable; mildly alkaline; clear boundary.

B32—24 to 30 inches, grayish-brown (10YR 5/2) loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable, mildly alkaline; gradual boundary.

B33—30 to 41 inches, grayish-brown (10YR 5/2) loam; few, fine, distinct, yellowish-brown (10YR 5/8) mottles; weak, fine, granular structure; loose; mildly alkaline; clear boundary.

IIB22t—41 to 46 inches, grayish-brown (10YR 5/2) clay loam; many, medium, faint, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; firm; few igneous pebbles; mildly alkaline; abrupt boundary.

IIC1—46 to 61 inches, grayish-brown (10YR 5/2) silty clay loam glacial till; coated with grayish brown (10YR 5/2); massive, very firm; calcareous.

IIC2—61 to 75 inches, brown (10YR 5/3) clay loam glacial till; massive; very firm; calcareous.

The organic-matter content of the A horizon ranges from 2 to 4 percent. The color of the A horizon ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2), or from dark brown (10YR 4/3) to brown (10YR 5/3). A thin, light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), or pale-brown (10YR 6/3) A2 horizon occurs in some profiles. The color of the matrix of the B horizons ranges from gray (10YR 5/1), grayish brown (10YR 5/2), dark grayish brown (2.5Y 4/2), dark brown (10YR 4/3), or brown (10YR 5/3) to light olive brown (2.5Y 5/4). The mottles in the B horizons range from yellowish brown (10YR 5/6) or strong brown (7.5YR 5/8) to dark brown (7.5YR 4/4). The B horizons are sandy loam, loam, sandy clay loam, or clay loam. In places there are pockets and layers of sandy loam in the B horizons, and in some places a layer of sandy or fine gravelly material, generally less than 6 inches thick, occurs immediately above the finer textured IIB horizon. There are lenses of silt in the lower part of some profiles. Some variations occur in the degree of structural development. The depth to the calcareous IIC horizon ranges from 18 to 42 inches but commonly is between 24 and 42 inches. The depth to the calcareous IIC horizon is slightly greater on the till plain than on the lake plain.

### HOYTVILLE SERIES

The Hoytville series is made up of Humic Gley soils that developed in fine-textured, calcareous glacial till, in level to slightly depressed areas on the lake plain.

The Hoytville soils are the very poorly drained members of the toposequence that includes the somewhat poorly drained Nappanee soils and the moderately well drained St. Clair soils. They are geographically associated with the Mermill and Toledo soils. The Hoytville soils have a finer textured, more compact, more strongly developed subsoil than the Mermill soils, and they are underlain by glacial till and have some coarse skeletal material throughout the profile. The Toledo soils developed in calcareous, stratified clay and silt, and their solum is smooth and nearly free of coarse skeletal material.

Surface runoff on the Hoytville soils is very slow. Internal drainage is slow, and the moisture-supplying capacity is medium or high in the surface layer and subsoil.

*Representative profile of Hoytville clay loam,* in the NW¼NW¼ sec. 24, Bloom Township, Wood County.

Ap—0 to 8 inches, very dark gray (10YR 3/1) clay loam; moderate, fine to medium, granular structure; firm; neutral; abrupt smooth boundary.

B21gt—8 to 24 inches, dark grayish-brown (10YR 4/2) clay; common, distinct, yellowish-brown (10YR 5/6) and brownish-yellow (10YR 6/6) mottles; weak, prismatic structure that breaks to strong, medium, angular blocky structure; very firm; neutral; diffuse boundary.

B22gt—24 to 40 inches, grayish-brown (2.5Y 5/2) to dark grayish-brown (2.5Y 4/2) clay; common, distinct, yellowish-brown (10YR 5/6–5/8) mottles; moderate, coarse, prismatic structure that breaks to moderate, medium and coarse, angular blocky structure; very firm; mildly alkaline; clear boundary.

C—40 inches +, mottled yellowish-brown (10YR 5/6) and grayish-brown (2.5Y 5/2) clay till; upper part has weak, angular, blocky structure that grades to massive with depth; firm; calcareous.

The organic-matter content of the A horizon ranges from 4.2 to 6.5 percent but commonly is more than 5 percent. 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 and from 7 to 9 inches in thickness. The reaction of the A horizon is slightly acid or neutral. The color of the matrix of the subsoil ranges from gray (10YR 5/1) to dark grayish brown (2.5Y 4/2), and the mottles are brown, yellowish brown, brownish yellow, and brown (10YR 5/3, 5/6, 6/6, and 7.5YR 5/4).

The B and C horizons generally are various shades of olive (hues of 2.5Y and 5Y). The B horizons range from slightly acid to mildly alkaline in reaction. The texture of the B horizons generally is clay, but in some areas borders on clay loam or silty clay loam. The depth to the C horizon ranges from 36 to 44 inches. The C horizon is from 37 to about 45 percent clay. Ordinarily, cracks form in this soil during dry weather because of shrinkage. These cracks are as much as 1 inch across and extend into the subsoil. They disappear when the soil becomes moist and swells. A thin solum variant is recognized where the depth to calcareous material is 24 inches or less.

*Representative profile of Hoytville clay, thin solum variant*, in the SE¼NW¼ sec. 16, Troy Township, Wood County.

Ap—0 to 7 inches, very dark gray (10YR 3/1) clay; weak, coarse, angular blocky structure; friable when moist, slightly hard when dry; neutral; abrupt smooth boundary.

B2g—7 to 13 inches, very dark gray (10YR 3/1) clay; common, distinct, light olive-brown (2.5Y 5/4) mottles; strong, medium, angular blocky structure; firm when moist, hard when dry; neutral; clear smooth boundary.

C1—13 to 18 inches, dark-gray (10YR 4/1) clay; many, distinct, light olive-brown (2.5Y 5/6) and light yellowish-brown (2.5Y 6/4) mottles; strong, medium to coarse, angular blocky structure; firm when moist, very hard when dry; few snail shells, 5 to 8 millimeters in size; mildly alkaline; gradual wavy boundary.

C2—18 to 44 inches, gray (10YR 6/1) silty clay loam; light olive-brown (2.5Y 5/6) and yellowish-brown (10YR 5/6) mottles; massive to weak, angular blocky structure; firm when moist, extremely hard when dry; many snail shells, few pieces of shale, and some igneous and limestone pebbles; calcareous.

A profile of the thin solum variant of the Hoytville soil is similar to that of the normal Hoytville soils, except that the depth to carbonates is less. The carbonates may occur on the surface or extend to an accumulation at a depth of 24 inches, but carbonates commonly occur between 10 and 20 inches. The depth of leaching and possibly the degree or horizonation are less than in the typical Hoytville soil. The color of the A horizon ranges from very dark gray (10YR 3/1) to black (10YR 2/1).

### Joliet Series

The Joliet series consists of level or nearly level, dark-colored, very poorly drained Humic Gley soils that are underlain by limestone at a depth of 10 to 20 inches.

The Joliet soils are the very poorly drained members of the toposequence that includes the well drained Romeo soils; the well drained Dunbridge and Spinks soils, over limestone; the moderately well drained or well drained Milton and Ritchey soils; the somewhat poorly drained Randolph soils; and the very poorly drained Millsdale soils. The Joliet soils are associated with the Millsdale and Romeo soils, which are also underlain by limestone. However, the Millsdale soils are underlain by limestone bedrock at a depth of 20 to 42 inches, and the Romeo soils, which are Lithosols, are underlain by bedrock at a depth of 10 inches or less.

Surface runoff on the Joliet soils is slow or very slow. The moisture-supplying capacity is medium.

*Representative profile of Joliet silty clay loam*, in NE¼NW¼, sec. 8, T. 3 N., R. 11 E., Bloom Township, Wood County.

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Ap—0 to 6 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; very firm; neutral; abrupt wavy boundary.

B2g—6 to 16 inches, grayish-brown (2.5Y 5/2) and very dark grayish brown (10YR 3/2) silty clay loam; common, distinct, yellowish-brown (10YR 5/6 and 10YR 5/8) mottles; strong, fine, angular blocky structure; firm; neutral; abrupt wavy boundary.

IIR—16 inches +, limestone bedrock, in layers 2 to 4 inches thick; uppermost half inch is highly weathered.

The A horizon is high in organic-matter content. The color of this horizon ranges from very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) to black (10YR 2/1). There is considerable variation in the thickness and in degree of development of the B horizon. Generally, the shallower the solum, the less development there is in the profile. The texture of the B horizon ranges from clay loam or silty clay loam to clay. In places various shades of olive (hues of 2.5Y and 5Y) occur in the B horizon. There is a thin IIC horizon in some profiles. Igneous and dolomitic pebbles and cobblestones occur in the lower part of the profile. Glacial erratics and limestone slabs occur on the surface and are embedded in the profile.

### Kibbie Series

The Kibbie series consists of somewhat poorly drained Gray-Brown Podzolic soils that are intergrading to Low-Humic Gley soils. These soils formed in stratified silt, very fine sand, and fine sand. They occur on nearly level to gently sloping lacustrine outwash plains and terraces and on the delta plains.

The Kibbie soils are members of the toposequence that includes the very poorly drained Colwood soils. They have a less sandy profile than the Tedrow soils, and the lower part of their profile, which consists mostly of silt and very fine sand, contains a much higher content of stratified material. The Haskins and Digby soils, over clay, which developed in medium-textured material over clay loam to clay till or lacustrine material, have coarser textured sand and gravel throughout the profile than the Kibbie soils, and a higher degree of development in the B horizon.

Surface runoff on the Kibbie soils is slow. Internal drainage and the moisture-supplying capacity are medium.

*Representative profile of Kibbie fine sandy loam*, in NW¼NW¼ sec. 32, Blanchard Township, Hancock County.

Ap—0 to 11 inches, dark grayish-brown (2.5Y 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; single grain; very friable; slightly acid; gradual wavy boundary.

B1—14 to 25 inches, yellowish-brown (10YR 5/6) very fine sandy loam; common, medium, distinct, pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; very friable; neutral; clear wavy boundary.

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

C1—44 inches +, dark yellowish-brown (10YR 4/4) and brown (10YR 5/3) stratified fine sand and silt; gray (10YR 5/1) mottles or lime coats; massive in place, breaks to single grain; very friable to loose; 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 and commonly is 8 to 11 inches thick. The A2 horizon ranges from brown (10YR 5/3) or pale brown (10YR 6/3) to grayish brown (10YR 5/2) in color and in some places is faintly mottled. The A2 horizon is lacking in some cultivated fields. The texture of the solum depends on the thickness and sequence of the depositional layers. The B horizons are coarse clay loam, loam, sandy clay loam, silt loam, or fine sandy loam. The reaction of the solum is slightly acid or neutral. Mottling occurs at a depth between 8 and 16 inches. The depth to the C horizon ranges from 40 to 60 inches. The C horizon is dominantly layers of silt, fine sand, and very fine sand.

### Mermill Series

The Mermill series consists of dark-colored, very poorly drained Humic Gley soils that developed in medium-textured or moderately fine textured outwash or beach deposits underlain at a depth of 18 to 40 inches by very firm calcareous clayey material. In places there are thin strata of fine sand and silt in the poorly sorted material. These soils occur between the beach ridges and areas of Hoytville soils, which are at a lower elevation.

The Mermill soils are the very poorly drained members of a toposequence that includes the somewhat poorly drained Digby and Haskins soils and the moderately well drained Haney soils. They are similar to the Millgrove soils, except that they are underlain by the clayey material at a depth of 18 to 40 inches. They are less silty than the Colwood soils, which are underlain by calcareous stratified silt and fine sand or very fine sand.

Surface runoff is very slow. The moisture-supplying capacity is high in the surface layer; medium in the subsoil, and medium to low in the underlying material.

*Representative profile description of Mermill sandy clay loam*, in NE¼SE¼ sec. 10, T. 4 N., R. 10 E., Liberty Township Wood County.

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

B1g—10 to 16 inches, dark-gray (10YR 4/2) mottles; weak, faint, dark grayish-brown (10YR 4/2) mottles; weak, fine, angular blocky structure; firm; relatively free of pebbles; slightly acid.

B2gt—16 to 38 inches, dark-gray (10YR 4/1) sandy clay loam; distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; weak, fine, prismatic structure that breaks to moderate, medium, subangular blocky structure; firm; neutral; wavy boundary.

IIC1—38 inches +, dark yellowish-brown (10YR 4/4) clay loam; distinct, grayish-brown (10YR 5/2) mottles; massive; very firm; calcareous glacial till.

The organic-matter content of the A horizon ranges from 4.0 to 7.2 percent and averages 5.1 percent. The A horizon ranges from very dark gray (10YR 3/1) to very dark brown (10YR 2/2) or black (10YR 2/1) in color and from 10 to 16 inches in thickness, but it commonly is 10 or 12 inches thick. The A horizon is slightly acid or neutral in reaction. The B horizons range from slightly acid to mildly alkaline in reaction. The dominant colors of the matrix in the B horizons range from gray (10YR 5/1, 10YR 6/1 or 5Y 5/1) or dark gray (10YR 4/1) to grayish brown (2.5Y 5/2). The mottles are yellowish brown (10YR 5/4, 10YR 5/6), dark yellowish brown (10YR 4/4), light olive brown (2.5Y 5/6), dark grayish brown (10YR 4/2), or strong brown (7.5YR 5/6). The texture of the B horizons ranges from loam to clay loam, but it commonly is sandy clay loam. Some B horizon development may occur at the top of the underlying clayey material. Thin lenses and pockets of fine sand and silt occur in the B horizons of some profiles. In places a layer of sandy and fine gravelly material, generally less than 6 inches thick, occurs immediately above the fine-textured IIC horizon. The depth to the IIC horizon ranges from 30 to 40 inches.

### Millgrove Series

The Millgrove series consists of the dark-colored, very poorly drained Humic Gley soils that developed in medium-textured or moderately coarse textured outwash or beach deposits and are underlain by poorly sorted calcareous sand and gravelly material that contains a considerable amount of finer textured material. In places thin strata of fine sand and silt occur with the poorly sorted material. These soils are on nearly level or level outwash plains and terraces throughout the county. On the lake plain, they occur along the edge of the secondary and primary beach ridges.

The Millgrove soils are the very poorly drained members of the toposequence that includes the somewhat poorly drained Digby soils and the moderately well drained Haney soils. They are associated with the Mermill and Colwood soils. The Mermill soils are underlain at a depth of 18 to 40 inches by a firm or very firm, clay or clay loam IIB or C horizon. The Colwood soils are underlain by calcareous stratified silt, fine sand, or very fine sand.

Surface runoff on the Millgrove soils is very slow. The moisture-supply capacity is high in the surface layer, medium in the subsoil, and low in the underlying material.

*Representative profile of Millgrove loam*, in SW¼ SW¼ sec. 27, T. 3 N., R. 12 E., Perry Township, Wood County.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; moderate, coarse, granular structure; friable; numerous small pebbles; neutral; gradual smooth boundary.

B21g—8 to 13 inches, grayish-brown (2.5Y 5/2) loam; faint yellowish-brown (10YR 5/4) mottles; weak, coarse, subangular blocky structure; friable; some pebbles; mildly alkaline; clear smooth boundary.

B22gt—13 to 25 inches, grayish-brown (2.5Y 5/2) loam to clay loam; distinct, light olive-brown (2.5Y 5/6) mottles; weak, medium, subangular blocky structure; firm; some pebbles; mildly alkaline; clear smooth boundary.

C1—25 to 43 inches, grayish-brown (2.5Y 5/2) poorly sorted fine sand, fine gravel, and silt; distinct yellowish-brown (10YR 5/6) mottles; massive; friable; considerable fine material mixed with the gravelly and sandy material; calcareous.

The Ap horizon ranges from very dark gray (10YR 3/1) to very dark brown (10YR 2/2) or black (10YR 2/1) in color and from 7 to 14 inches in thickness but commonly is 8 or 9 inches thick. The organic-matter content of the Ap horizon ranges from 4.0 to 7.2 percent and averages 5.1 percent. The Ap horizon is slightly acid or neutral in reaction. The B horizons range from slightly acid to mildly alkaline in reaction. The dominant color of the matrix in the B horizons ranges from gray (10YR 5/1, 10YR 6/1, or 5Y 5/1) or dark gray (10YR 4/1) to grayish brown (2.5Y 5/2). The mottles are yellowish brown (10YR 5/4, 5/6), dark yellowish brown (10YR 4/4), light olive brown (2.5Y 5/6), dark grayish brown (10YR 4/2), or strong brown (7.5YR 5/6). The B horizons range from loam to clay loam but commonly are sandy clay loam. Thin lenses and pockets of sandy loam occur in some B horizons. In some areas there are numerous small pebbles, but in other areas there are none.

### Millsdale Series

The Millsdale series consists of dark-colored, very poorly drained Humic Gley soils that are underlain by limestone at a depth of 20 to 40 inches. These soils occur in level or nearly level areas.

The Millsdale soils are part of the toposequence that includes the well-drained Dunbridge, Milton, and Ritchey soils; the somewhat poorly drained Randolph soils; and the very poorly drained Joliet soils. The Hoytville soils are similar to the Millsdale soils in that they are also dark colored, but they are underlain by limestone at a greater depth. The Joliet soils are underlain by limestone at a depth of 10 to 20 inches.

Runoff on the Millsdale soils is slow or very slow. Internal drainage is slow or very slow, and the moisture-supplying capacity is high.

*Representative profile of Millsdale silty clay loam*, in SE¼NE¼ sec. 6, T. 3 N., R. 11 E., Bloom Township, Wood County.

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; firm; slightly acid; clear smooth boundary.

B21g—7 to 15 inches, dark grayish-brown (2.5Y 4/2) clay; common, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium to coarse, prismatic structure that breaks to strong, medium, angular blocky structure; very firm; slightly acid; gradual wavy boundary.

B22g—15 to 32 inches, dark grayish-brown (2.5Y 4/2) to grayish-brown (2.5Y 5/2) clay; common, distinct, yellowish-brown (10YR 5/6–5/8) mottles; moderate, medium to coarse, prismatic structure that breaks to strong, medium, angular blocky structure; very firm; some small pebbles and a few cobblestones; neutral; abrupt wavy boundary.

IIR—32 inches +, limestone bedrock; upper part of limestone in layers, 2 to 4 inches thick.

The organic-matter content of the A horizon is high. The color of the A horizon ranges from very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) to black (10YR 2/1). Various shades of olive (hues of 2.5Y and 5Y) occur in the B horizons. The texture of the B horizons ranges from fine silty clay loam to clay. In some profiles, a 1- or 2-inch zone of very pale brown (10YR 7/3), calcareous, partly weathered bedrock has formed in place above the unweathered bedrock. The quantity of glacial stones, boulders, and loose slabs of limestone on the surface and throughout the soil material varies. The depth to limestone varies within short horizontal distances.

### Milton Series

The Milton series consists of level to gently sloping, moderately well drained or well drained Grey-Brown Podzolic soils that developed in calcareous till or outwash. These soils are underlain by limestone at a depth of 20 to 40 inches.

The Milton soils are part of the toposequence that includes the well-drained Romeo, Dunbridge, and Ritchey soils; the somewhat poorly drained Randolph soils; and the very poorly drained Joliet and Millsdale soils. The Ritchey soils are similar to the Milton soils in sequence of horizons, but their solum is thinner, and limestone bedrock occurs at a depth of 10 to 20 inches. The Dunbridge soils developed in coarser textured material over limestone, and their Bt horizon is not so fine textured as that of the Milton soils. The Romeo soils are darker colored than the Milton soils, and they generally lack a Bt horizon and are underlain by limestone at a depth of less than 10 inches.

Surface runoff on the Milton soils is medium. The moisture-supplying capacity is medium.

*Representative profile of Milton loam*, in NW¼SE¼ sec. 8, T. 3 N., R. 11 E., Bloom Township, Wood County, in a level area.

Ap—0 to 6 inches, dark-brown (10YR 3/3) loam; weak, fine, granular structure; friable; neutral; clear smooth boundary.

B1—6 to 11 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) loam; weak, angular, blocky structure; friable; neutral; clear smooth boundary.

B2t—11 to 26 inches, yellowish-brown (10YR 5/6) clay; moderate, medium, angular blocky structure; firm; neutral; abrupt wavy boundary.

IIR—26 inches +, limestone bedrock.

The color of the Ap horizon ranges from very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2) to dark brown (10YR 3/3). The reaction of the Ap horizon ranges from slightly acid to mildly alkaline. In undisturbed areas, there is a 3- to 4-inch, pale-brown (10YR 6/3) to brown (10YR 5/3) A2 horizon. In places remnants of an A2 horizon underlie the Ap horizon. The B horizons range from light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/6, 5/4) or from dark brown (10YR 4/3) to brown (10YR 5/3) or strong brown (7.5YR 5/6) in color, and they range from medium acid to mildly alkaline in reaction. Some mottling occurs in the lower part of the B horizon in soils that are in the upper range of the moderately well drained class. The texture of the B2 horizon ranges from clay loam to clay. There generally is a greater number of igneous pebbles and fragments of weathered shale and limestone in the lower part of the B horizon. In some areas there is a 2- or 4-inch layer of clayey material immediately above bedrock. This B2 material appears to be derived from limestone bedrock. The depth to limestone bedrock ranges from 20 to 40 inches. In places the depth to bedrock varies within short horizontal distances. In some places the upper part of the bedrock is highly fractured and is intermixed with soil material; in other places it is very dense, and there is little fracturing or mixing with soil material.

### Muck

Muck consists of very poorly drained Bog soils derived from a mixture of well decomposed to moderately well decomposed woody and grassy material. These soils occur in level to slightly depressed broad areas, where natural drainage outlets have been obstructed by limestone or sand ridges.

The Muck soils are associated with the Warners, Wauseon, and Hoytville soils. The Warners soils have a thinner surface layer than the Muck soils, and they have a marl layer. The Wauseon soils have about the same textural profile as the Muck soils, but they have a thinner surface layer, much lower in content of organic matter. The Hoytville soils have a thinner surface layer, lower in organic-matter content, than the Muck soils, and they have a much higher percentage of clay throughout the solum.

Surface runoff on the Muck soils is very slow or ponded. The moisture-supplying capacity is high.

*Representative profile of Muck*, in SE¼SW¼ sec. 12, T. 4 N., R. 12 E., Montgomery Township, Wood County.

O1—0 to 13 inches, black (10YR 2/1) organic material; moderate to fine, granular structure; loose; slightly acid.

IIC1—13 to 14 inches, light-gray (10YR 7/1 to 7/2) loamy sand; weak, fine, granular structure; loose; neutral.

IIC2—14 to 28 inches, light brownish-gray (2.5Y 6/2) fine sandy loam; faint, light olive-brown (2.5Y 5/6) mottles; weak, fine, angular blocky structure; friable; mildly alkaline.

IIIC3—28 inches +, brown (10YR 5/3) to grayish-brown (2.5Y 5/2) silty clay loam to clay glacial till; massive; very firm; calcareous.

The depth of the organic material (muck) ranges from 8 to 36 inches. The organic-matter content ranges from about 25 percent to more than 70 percent. The reaction of the O horizon is medium or slightly acid. The IIC horizon commonly is a mottled gray (10YR 6/1), grayish-brown (2.5Y 5/2), and light olive-brown (2.5Y 5/4) sand, loamy sand, or fine sandy loam. The sandy substratum generally is 10 to 18 inches thick, but in places it extends to a depth of 44 inches. The underlying material, or IIIC3 horizon, generally ranges from silty clay loam to clay and in places is various shades of olive (hues of 2.5Y and 5Y).

### Nappanee Series

The Nappanee series consists of light-colored, somewhat poorly drained Gray-Brown Podzolic soils that are intergrading to Low-Humic Gley soils. These soils are underlain by fine-textured, calcareous till of Wisconsin Age. They occur on level to gently sloping parts of the lake plain, either on slightly elevated flats or as narrow bands on breaks to stream bottoms.

The Nappanee soils are the somewhat poorly drained members of the toposequence that includes the moderately well drained St. Clair soils and the very poorly drained Hoytville soils. The Haskins soils have a coarser textured B2 horizon than the Nappanee soils. The Fulton soils, which developed in lacustrine silty clay or clay that contained thin seams of fine sand and silt, have a wider range of texture in the B and C horizons than the Nappanee soils, and they generally contain less coarse skeletal material.

Surface runoff on the Nappanee soils is slow or medium. Internal drainage is slow.

*Representative profile of Nappanee loam*, in the SE¼SW¼ sec. 5, Bloom Township, Wood County.

Ap—0 to 6 inches, brown (10YR 5/3) loam; weak, fine, granular structure; friable; neutral; clear smooth boundary.

A2—6 to 8 inches, light brownish-gray (10YR 6/2) clay loam; common, distinct, brownish-yellow (10YR 6/6) mottles; moderate, medium, platy structure; firm; slightly acid; clear broken boundary.

B21t—8 to 12 inches, yellowish-brown (10YR 5/4) clay; many, distinct, grayish-brown (2.5Y 5/2) mottles; weak, coarse, prismatic structure that breaks to strong, medium, angular blocky structure; firm; medium acid; clear wavy boundary.

B22t—12 to 28 inches, dark grayish-brown (2.5Y 4/2) clay; many, distinct, dark grayish-brown (10YR 4/2) mottles; weak, coarse or very coarse, prismatic structure that breaks to moderate, medium, angular blocky structure; very firm; neutral; clear wavy boundary.

C1—28 inches +, mottled grayish-brown (2.5Y 5/2) and dark yellowish-brown (10YR 4/4) fine clay loam till; massive; very firm; various amounts of shale and small pebbles; calcareous.

The organic-matter content of the A horizon ranges from 2.6 to 4.4 percent. The color of the A horizon ranges from brown to dark grayish brown (hues of 10YR) and grayish brown to dark grayish brown (hues of 2.5Y). In most areas that have not been cultivated there is a thin, light brownish-gray (10YR 6/2) or grayish-brown (10YR 5/2) A2 horizon. In places remnants of an A2 horizon underlie the Ap horizon. The A2 and B horizons are strongly acid in some areas. The B horizons are mottled with various shades of grayish brown, brown, and yellowish brown and in places have weak prismatic structure that breaks to various sizes and grades to angular blocky structure. The depth to the calcareous till ranges from 24 to 36 inches.

### Ottokee Series

The Ottokee series consists of moderately well drained Gray-Brown Podzolic soils that formed in neutral to calcareous sand. These soils have thin and, in many places, discontinuous textural B2 horizons. They occur on nearly level or gently sloping, slightly elevated ridges or knolls on the lake plain or on terraces and beach ridges.

The Ottokee soils are the moderately well drained members of the toposequence that includes the somewhat poorly drained Tedrow soils and the well drained Spinks soils. The Ottokee soils in this county are mapped as undifferentiated units with the Seward soils and with the Spinks soils.

Surface runoff on the Ottokee soils is slow. The moisture-supplying capacity is low.

*Representative profile of Ottokee loamy fine sand*, in NW¼NW¼ sec. 24, T. 5 N., R. 11 E., Center Township, Wood County.

Ap—0 to 8 inches, yellowish-brown (10YR 5/4) to brown (10YR 5/3) loamy fine sand; single grain; loose; slightly acid; clear smooth boundary.

A2—8 to 24 inches, brownish-yellow (10YR 6/8) loamy fine sand to fine sand; single grain; loose; slightly acid; clear smooth boundary.

A&B—24 to 48 inches, yellowish-brown (10YR 5/8) loamy fine sand to fine sand; faint, pale-brown (10YR 6/3) and light yellowish-brown (10YR 6/4) mottles; single grain; loose; this represents the A2 horizon. Discontinuous bands, ⅛ to ¼ inch thick, of yellowish-red (5YR 5/6) fine sand; single grain; friable; this represents the B2 horizon; slightly acid; gradual wavy boundary.

A&B—48 inches +, yellowish-brown (10YR 5/8) fine sand; faint, light yellowish-brown (10YR 6/4) and pale-brown (10YR 6/3) mottles; single grain; loose; this represents the A2 horizon. Discontinuous bands, ¼ to 1 inch thick, of reddish-brown (5YR 4/4) to yellowish-red (5YR 4/6) sand; single grain; friable; this represents the B2 horizon; slightly acid.

The color of the Ap horizon ranges from very dark grayish brown (10YR 3/2) or dark brown (10YR 4/3) to yellowish brown (10YR 5/4). In places where the original A horizon has been truncated by wind erosion, the yellowish A&B horizon is exposed. The color of the

A&B horizon is various shades of brown, yellowish brown, and brownish yellow. Some deeper horizons are predominantly gray in color. The texture of the A horizon ranges from loamy fine sand to light fine sandy loam. In places fine-textured lacustrine material or till occurs below a depth of 48 inches. The bands in the B2 horizon range from 1/8 to 1/4 inch in thickness. These bands, which in places are discontinuous, tend to be closer together and thicker with increasing depth. In places the mingling of mottles and bands makes separation difficult. The typical profile is nearly free of stones and pebbles, but in some profiles there are thin layers and pockets of fine gravelly material. The depth of sand over clay varies considerably within an individual soil area.

## Randolph Series

The Randolph series consists of level to gently sloping, somewhat poorly drained to moderately well drained Gray-Brown Podzolic soils that are intergrading to Low-Humic Gley soils. These soils developed in calcareous till or outwash and are underlain by limestone bedrock at a depth of 20 to 40 inches.

The Randolph soils are part of the toposequence that includes the well-drained Romeo, Dunbridge, and Ritchey soils and the very poorly drained Joliet and Millsdale soils. They are associated with the Nappanee, Haskins, and Digby soils. The Randolph soils resemble the associated soils in color and in sequence of horizons, but they differ from them in being underlain by limestone bedrock at a depth of 20 to 40 inches.

Surface runoff on the Randolph soils is slow. The moisture-supplying capacity is medium.

*Representative profile of Randolph loam*, in SE1/4NE1/4 sec. 30, T. 3 N., R. 11 E., Bloom Township, Wood County.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) loam; moderate, fine, granular structure; friable; abundant roots; neutral; abrupt smooth boundary.

A2—6 to 11 inches, pale-brown (10YR 6/3), light yellowish-brown (10YR 6/4), yellowish-brown (10YR 5/6), and dark grayish-brown (10YR 4/2) loam; weak, medium, angular blocky structure; friable; roots plentiful; neutral; clear wavy boundary.

B2t—11 to 24 inches, dark yellowish-brown (10YR 4/4) clay loam; faint yellowish-brown (10YR 5/6) mottles; strong, medium, angular blocky structure; firm; neutral; abrupt wavy boundary.

IIR—24 inches +, hard limestone bedrock.

The color of the Ap horizon ranges from very dark grayish brown (10YR 3/2) to very dark gray (10YR 3/1) and from dark grayish brown (10YR 4/2) to dark brown (10YR 4/3). The thickness of the Ap horizon ranges from 6 to 9 inches but averages about 7 inches. The reaction of the Ap horizon is slightly acid or neutral. In undisturbed areas there is a 2- to 6-inch, pale-brown (10YR 6/3) to light-gray (10YR 7/1) A2 horizon that is mottled with yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6). In places remnants of an A2 horizon underlie the Ap horizon. The color of the matrix of the B horizon ranges from light gray (10YR 7/1), gray (10YR 5/1), or grayish brown (10YR 5/2) to dark brown (10YR 4/3) or light olive brown (2.5Y 5/4). The mottles in the B horizon range from dark grayish brown (2.5Y 4/2) or yellowish brown (10YR 5/4, 5/6) to strong brown (7.5YR 5/8). The reaction of the B horizon is slightly acid or neutral. The B horizon ranges from sandy clay loam to clay. In some areas there is a 2- or 4-inch layer of clay immediately above bedrock. This material appears to be derived from limestone. In other areas the lower part of the B horizon has characteristics that suggest development from till or drift, namely, shale fragments and igneous pebbles. The quantity of igneous pebbles, limestone fragments, and boulders on the surface and in the solum varies. The depth to bedrock ranges from 20 to 40 inches but generally is less than 32 inches. In some places the upper part of the bedrock is highly fractured and is intermixed with soil material, but in other places it is very dense and there is little fracturing or mixing with soil material.

## Rimer Series

The Rimer series consists of somewhat poorly drained Gray-Brown Podzolic soils that are intergrading to Regosols. These soils developed in 18 to 36 inches of loamy sand and light sandy loam underlain by clay or clay loam glacial till or by lacustrine material. Part of the subsoil appears to have developed in the underlying fine-textured material. These soils occur in a complex pattern on nearly level or gently sloping, slightly elevated sand ridges and knolls.

The Rimer soils are the somewhat poorly drained members of the toposequence that includes the moderately well drained Seward soils and the very poorly drained Wauseon soils. The Rimer soils are associated with the moderately well drained Seward soils that overlie clay and with the somewhat poorly drained, deep, sandy Tedrow soils.

Surface runoff on the Rimer soils is slow. The moisture-supplying capacity is medium.

*Representative profile of Rimer loamy fine sand*, in SW1/4NW1/4 sec. 3, T. 3 N., R. 11 E., Bloom Township, Wood County.

Ap—0 to 8 inches, dark-gray (10YR 4/1) loamy fine sand; weak, fine, granular structure that breaks to single grain; loose; abundant roots; slightly acid; clear smooth boundary.

A2—8 to 14 inches, dark grayish-brown (10YR 4/2) loamy fine sand; few, medium, faint, dark-brown (10YR 4/3) mottles; single grain; loose; abundant roots; slightly acid; clear wavy boundary.

B1—14 to 17 inches, yellowish-brown (10YR 5/4) loamy fine sand; common, medium, distinct, dark reddish-brown (5YR 3/4) mottles; massive in place but breaks to single grain; friable to loose; weak orterde; roots common; slightly acid; gradual irregular boundary.

B21—17 to 25 inches, light yellowish-brown (10YR 6/4) fine sand; common, medium, faint, brownish-yellow (10YR 6/6) mottles; single grain; loose; neutral; abrupt wavy boundary.

IIB22t—25 to 32 inches, yellowish-brown (10YR 5/6) clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; massive; firm; neutral; gradual wavy boundary.

IIC—32 to 42 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, distinct, olive-gray (5Y 5/2) mottles; massive; firm; calcareous.

The color of the A horizon ranges from very dark gray (10YR 3/1) to dark gray (10YR 4/1) or very dark grayish brown (10YR 3/2). The Ap horizon commonly extends to a depth of 8 to 11 inches. There is a 2- to 8-inch, dark-gray (10YR 4/1) or light brownish-gray (10YR 6/2) A2 horizon in some profiles. The sandy material commonly extends to a depth of 18 to 36 inches, and the sand is predominantly fine or very fine. The reaction ranges from medium acid to neutral. The texture of the IIB22t horizon ranges from sandy clay loam to clay. The texture of the IIC horizon ranges from fine clay loam, fine silty clay loam, silty clay, or clay till to lacustrine clay, silty clay, or fine clay loam. In places a thin layer of gravelly material occurs above the IIBt horizon.

### Ritchey Series

The Ritchey series consists of moderately well drained to well drained Gray-Brown Podzolic soils that developed in calcareous till or outwash. These soils are underlain by limestone at a depth of 10 to 20 inches. They are level to gently sloping.

The Ritchey soils are part of the toposequence that includes the well-drained Milton, Dunbridge, and Romeo soils; the somewhat poorly drained Randolph soils; and the very poorly drained Joliet and Millsdale soils. The Milton soils are similar to the Ritchey soils in sequence of horizons, but their solum is thicker, and limestone bedrock occurs at a depth of 20 to 40 inches. The Dunbridge soils developed in coarser textured material over limestone, and their Bt horizon is not so fine textured as that of the Ritchey soils. The Romeo soils are darker colored than the Ritchey soils, and they generally lack a Bt horizon and are underlain by limestone at a depth of 10 inches or less.

Surface runoff on the Ritchey soils is medium. The moisture-supplying capacity is low.

*Representative profile of Ritchey loam*, in NW¼SW¼ sec. 36, T. 1 N., R. 12 E., Big Lick Township, Hancock County.

Ap—0 to 8 inches, dark-brown (10YR 3/3) loam; moderate, medium, granular structure; friable; abundant 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; plentiful roots; few igneous pebbles; neutral; clear wavy boundary.

IIB2t—13 to 17 inches, dark-brown (7.5YR 4/4) clay; strong, fine, subangular blocky structure; very firm; plentiful 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 color of the Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) or dark brown (10YR 3/3). The reaction of the Ap horizon ranges from slightly acid to mildly alkaline. In undisturbed areas there is a 1- or 2-inch, pale-brown to brown (10YR 5/3) A2 horizon. In some cultivated areas remnants of an A2 horizon underlie the Ap horizon. The B horizons range from yellowish brown (10YR 5/4, 5/6) and dark yellowish brown (10YR 4/4) to dark brown (7.5YR 4/4, 10YR 4/3) in color and from slightly acid to mildly alkaline in reaction. Those soils that are in the upper range of the moderately well drained class have some mottling in the lower part of their B horizon. The B horizons range from loam or clay loam to clay in texture. In some areas there is a 2- or 4-inch layer of clayey material immediately above bedrock. This B2 material appears to be derived from limestone bedrock. Till appears to have had less influence on the profile where bedrock occurs at a depth of 10 to 15 inches. In places the depth to bedrock varies within short horizontal distances. In some areas the upper part of the bedrock is highly fractured and may be intermixed with soil material, but in other places it is very dense and there is little fracturing or mixing of soil material. The quantity of limestone fragments and igneous pebbles on the surface and in the solum varies considerably.

### Romeo Series

The Romeo series consists of dark-colored, very shallow, well-drained Lithosols that developed in areas where limestone bedrock of the Niagara or Monroe group is near the surface. These soils are nearly level to gently sloping.

The Romeo soils are part of the toposequence that includes the well-drained Ritchey, Milton, and Dunbridge soils; the somewhat poorly drained Randolph soils; and the very poorly drained Joliet and Millsdale soils. They are associated with the Ritchey, Milton, and Dunbridge soils. The Ritchey and Milton soils have a Bt horizon and a lighter colored, thicker solum than the Romeo soils. The Dunbridge soils are lighter colored, thicker, and coarser textured than the Romeo soils, and they have a Bt horizon

Surface runoff on the Romeo soils is slow in nearly level areas to medium in gently sloping areas. The moisture-supplying capacity is very low.

*Representative profile of Romeo loam*, in SW¼SW¼ Sec. 9, T. 3 N., R. 10 E., Henry Township, Wood County.

A1—0 to 10 inches, very dark-gray (10YR 3/1) loam; moderate, fine or medium, granular structure; friable; numerous small igneous and limestone pebbles; slightly acid.

IIR—10 inches +, limestone bedrock; upper part breaks to slabs and fragments.

The color of the A1 horizon ranges from black (10YR 2/1) to very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). In many areas the organic matter occurs as coats on the soil particles, and the crushed soil is about one chroma lighter in color than the uncrushed soil. The dark color appears to be associated with the high content of lime as well as with wetness. 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). The reaction of the solum ranges from slightly acid to mildly alkaline. The quantity of limestone fragments and igneous pebbles on the surface and in the solum varies considerably. Glacial erratics are common. Because of the shallowness of the profile, it is not possible to identify till material. The depth to limestone bedrock varies greatly within short horizontal distances. It ranges from outcrops on the surface to 12 inches but commonly is less than 10 inches. In some places the upper part of the bedrock is highly fractured and may be intermixed with soil material, but in other places it is very dense and there is little fracturing or mixing with soil material.

### St. Clair Series

The St. Clair series consists of light-colored, moderately well drained Gray-Brown Podzolic soils that developed in fine-textured calcareous till of Wisconsin (Cary) age. These soils occur in gently sloping to steep, long, narrow areas, generally adjacent to large streams. Most of these areas are 5 acres or less in size.

The St. Clair soils are the moderately well drained members of the toposequence that includes the somewhat poorly drained Nappanee soils and the very poorly drained Hoytville soils.

Surface runoff on the St. Clair soils is medium to very rapid.

*Representative profile of St. Clair silt loam*, in SE¼ SE¼ sec. 5, Grand Rapids Township, Wood County.

A1—0 to 4 inches, dark-gray (10YR 4/1) loam to clay loam; strong, coarse and medium, granular structure; friable; abundant roots; slightly acid; abrupt smooth boundary.

B1—4 to 8 inches, brown (7.5YR 5/4) clay loam; moderate, medium and fine, subangular blocky structure; friable to firm; dark grayish-brown (10YR 4/2) coats or thin clay films; plentiful roots; neutral; clear boundary.

B2t—8 to 17½ inches, brown (7.5YR 5/4) clay; strong, fine and very fine, subangular blocky structure; very firm; neutral; clear boundary.

C1—17½ to 24 inches, brown (10YR 5/3) fine clay loam; few, medium, distinct, very pale brown (10YR 7/3) mottles; moderate, fine and very fine, subangular blocky structure; firm; appears to be grading toward till; slightly calcareous; gradual boundary.

C2—24 to 42 inches, brown (10YR 5/3) fine silty clay loam till; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; gradual boundary.

The organic-matter content of the A horizon is medium. The A horizon ranges from dark gray (10YR 4/1) or grayish brown (10YR 5/2) to dark grayish brown (10YR 4/2) in color and from 4 to 6 inches in thickness. The B horizons commonly are brown (10YR 5/3). In better drained areas, mottling occurs in the lower part of the B2 and C1 horizons. The depth to calcareous till averages 24 inches.

### Seward Series

The Seward series consists of moderately well drained Gray-Brown Podzolic soils that are intergrading to Regosols. These soils developed in 18 to 36 inches of light sandy loam to loamy sand or fine sand, underlain by clay loam, silty clay loam, or clay glacial till or by lacustrine material. A thin, fine-textured Bt horizon occurs in the lower part of the solum. These soils are on slightly elevated, nearly level to gently sloping ridges and knolls.

The Seward soils are the moderately well drained members of the toposequence that includes the somewhat poorly drained Rimer soils and the very poorly drained Wauseon soils. They are associated with the somewhat poorly drained Rimer soils, which also overlie clay, and with the moderately well drained, thick, sandy Ottokee soils.

Surface runoff on the Seward soils is slow. The moisture-supplying capacity is low.

*Representative profile of Seward loamy fine sand*, in NW¼SW¼ sec. 32 T. 2 N., R. 9 E., Pleasant Township, Hancock County.

Ap—0 to 6 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; single grain to weak, fine, granular structure; very friable; abundant roots; medium acid; abrupt smooth boundary.

A2—6 to 16 inches, brown (10YR 5/3) loamy fine sand; single grain; loose; abundant roots; strongly acid; diffuse irregular boundary.

B21—16 to 25 inches, yellowish-brown (10YR 5/4) loamy fine sand; single grain; loose; roots plentiful; strongly acid; gradual wavy boundary.

B22—25 to 30 inches, brown (10YR 5/3) sandy loam; many fine, distinct, yellowish-brown (10YR 5/6 and 5/8) and strong-brown (7.5YR 5/8) mottles; weak, subangular blocky structure; firm; few roots; strongly acid; clear wavy boundary.

IIB2t—30 to 37 inches, yellowish-brown (10YR 5/4) clay loam; many, medium, distinct, gray (10YR 5/1) mottles; subangular blocky structure; firm; few roots; slightly acid; gradual irregular boundary.

IIC—37 to 50 inches, dark-brown (10YR 4/3) silty clay loam; few, fine, distinct, gray (10YR 5/1) and brownish-yellow (10YR 6/8) mottles; massive; firm; calcareous glacial till.

The color of the A horizon ranges from very dark gray (10YR 3/1) or dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) or dark brown (10YR 4/3) The Ap horizon commonly extends to a depth of 6 to 10 inches. In most profiles there is a 6- to 8-inch, brown (10YR 5/3) to dark-brown (10YR 4/3) or yellowish-brown (10YR 5/4) to brownish-yellow (10YR 6/6) A2 horizon. The texture of the B21 and B22 horizons is loamy sand, loamy fine sand, sandy loam, or fine sandy loam. The reaction of the sandy material in the solum ranges from strongly acid to slightly acid. The texture of the IIB2t horizon is silty clay loam, clay loam, or clay. In some profiles the sandy material rests directly on the underlying, unweathered, fine-textured till or lacustrine material.

### Shoals Series

The Shoals series consists of somewhat poorly drained Alluvial soils that developed in water-laid material derived from highly calcareous drift of Wisconsin age. These soils occur in small, level or nearly level areas, principally along Rocky Ford, Beaver Creek, and the Portage River. Only a few areas are larger than 15 acres in size.

The Shoals soils are part of the toposequence that includes the well-drained Genesee soils, the moderately well drained Eel soils, and the very poorly drained Sloan soils. They are associated with the Sloan soils, but they have a lighter colored, thinner surface layer than the Sloan soils.

Surface runoff on Shoals soils is very slow. The moisture-supplying capacity is high.

*Representative profile of Shoals loam*, in NW¼SE¼ sec. 7, T. 5 N., R. 12 E., Webster Township, Wood County.

Ap—0 to 8 inches, dark-gray (10YR 4/1) loam; weak, fine, subangular blocky structure; friable; roots abundant; neutral; abrupt smooth boundary.

C1—8 to 18 inches, dark grayish-brown (10YR 4/2) loam to clay loam; common, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable; roots common; neutral; diffuse wavy boundary.

C2—18 to 24 inches, yellowish-brown (10YR 5/4) loam to clay loam; many, faint, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; roots few; mildly alkaline; diffuse wavy boundary.

C3—24 to 31 inches, yellowish-brown (10YR 5/6) loam to clay loam; common, distinct, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; few roots; mildly alkaline; diffuse wavy boundary.

C4—31 to 41 inches, grayish-brown (10YR 5/2) clay loam; pockets of yellowish-brown (10YR 5/4) sandy loam; massive; mildly alkaline.

The color of the Ap horizon ranges from very dark gray (10YR 3/1) to dark gray (10YR 4/1) or from dark grayish brown (10YR 4/2) to dark brown (10YR 3/3). The color of the matrix of the C horizons ranges from dark gray (10YR 4/1) or gray (10YR 5/1) to dark grayish brown (10YR 4/2), light brownish gray (10YR 6/2), or dark brown (10YR 3/3). The mottles in the C horizons range from grayish brown (10YR 5/2), light brownish gray (10YR 6/2), or yellowish brown (10YR 5/4, 5/6) to pale brown (10YR 6/3), dark brown (10YR 4/3), or yellowish red (5YR 5/8) and reddish yellow (7.5YR 6/8). The texture of the C horizons is dominantly coarse silty clay loam, coarse clay loam, silt loam, or loam. In many profiles there are thin strata of sandy clay loam or sandy loam at a depth of 3 or 4 feet. The reaction of the Ap and C horizons is neutral or mildly alkaline.

### Sloan Series

The Sloan series consists of dark-colored Humic Gley soils that formed in alluvium derived from highly calcareous Wisconsin glacial till. These soils occur in nearly level to slightly depressed areas along nearly all of the streams in the county. They generally are near stream channels or in a narrow backwater channel, where a stream has changed its course.

The Sloan soils are the very poorly drained members of the toposequence that includes the somewhat poorly drained Shoals soils, the moderately well drained Eel soils, and the well drained Genesee soils.

Surface runoff on the Sloan soils is very slow or ponded. The moisture-supplying capacity is high.

*Representative profile of Sloan silty clay loam*, in SE¼ SW¼ sec. 17, T. 3 N., R. 9 E., Jackson Township, Wood County.

Ap—0 to 10 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; friable; moderate organic-matter content; neutral; clear smooth boundary.

C1g—10 to 26 inches, dark-gray (10YR 4/1) clay loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic, structure that breaks to weak, medium, angular blocky structure; friable; sand very noticeable; slightly acid; gradual wavy boundary.

C2g—26 to 40 inches, gray (10YR 5/1) loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, angular blocky structure; friable; mildly alkaline; clear wavy boundary.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to very dark gray (10YR 3/1) in color and is slightly acid or neutral in reaction. The A horizon commonly is 8 to 12 inches thick. In the C horizons the colors are mottled gray (10YR 5/1), yellowish brown (10YR 5/6, 5/4), reddish brown (5YR 4/3), dark brown (10YR 4/3), and yellowish red (5YR 4/6), but the gray colors predominate. The C horizons range from loam or silt loam to light silty clay loam or light clay loam, and the upper part is slightly developed in some areas. In places lenses or pockets of coarser textured material, such as sand or gravel, occur in the lower part of the profile. The C horizons range from slightly acid to calcareous in reaction.

### Spinks Series

The Spinks series consists of Gray-Brown Podzolic soils that are intergrading to Regosols. These soils developed in deep, neutral to calcareous sand, and they have thin and commonly discontinuous, textural B2 horizons. They occur on gently sloping, sloping, or moderately steep ridges or dunes on the lake plain and on terraces and beach ridges.

The Spinks soils are the well drained members of the toposequence that includes the moderately well drained Ottokee soils and the somewhat poorly drained Tedrow soils. They are associated with the Ottokee soils, but they differ from these soils in that their subsoil is free of mottles, an indication that they are better drained.

Surface runoff on the Spinks soils is slow or very slow. The moisture-supplying capacity is low.

*Representative profile of Spinks fine sand*, on a 6 percent slope, in the NW¼SW¼ sec. 33, T. 5 N., R. 10 E., Plain Township, Wood County, sample number WD–110.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sand; single grain; loose; many roots; neutral; clear smooth boundary.

A21—4 to 10 inches, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/4) fine sand; single grain; loose; roots common; neutral; clear smooth boundary.

A22—10 to 23 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; few roots; neutral; abrupt wavy boundary.

A21—23 to 30 inches, brownish-yellow (10YR 6/6) fine sand; single grain; loose; neutral; abrupt wavy boundary.

A22—30 to 37 inches, yellow (10YR 7/8) fine sand; single grain; loose; neutral; abrupt wavy boundary.

A23—37 to 49 inches, yellow (10YR 7/6) sand; single grain; loose; neutral; abrupt wavy boundary.

A24—49 to 60 inches, yellow (10YR 7/6) fine sand; single grain; loose; neutral; abrupt wavy boundary.

A25—60 to 72 inches, yellow (10YR 7/8) sand; single grain; loose; neutral; abrupt wavy boundary.

A26—72 to 78 inches +, light yellowish-brown (10YR 6/4) sand; single grain; loose, neutral.

Bt—strong-brown (7.5YR 5/6) sand; single grain; friable when moist, slightly hard when dry; varies ¼ to ½ inch in thickness; clay in this horizon appears as bridges join individual sand grains; neutral; abrupt wavy boundary. Beginning at a depth of 23 inches or more, this horizon occurs as thin bands that are 2 to 8 inches apart. These bands are separated by the A2 horizons.

The color of the Ap horizon ranges from dark grayish brown (10YR 4/2) to dark brown (10YR 4/3), brown (10YR 5/3), or yellowish brown (10YR 5/8). The yellowish-brown A2 horizon may be exposed where the original surface layer has been truncated by wind erosion. The A2 horizons range from dark brown (10YR 4/3), yellowish brown (10YR 5/4), or light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6), yellow (10YR 7/6, 7/8), or pale yellow (2.5Y 7/4) in color. The more yellow colors tend to occur deeper in the profile. The thickness, number, and continuity of the Bt horizons vary considerably within short distances, and their color ranges from pale brown (10YR 6/3), brown (7.5YR 5/4), or light yellowish brown (10YR 6/4) to strong brown (7.5YR 5/6). In all horizons except the A1 and A21, there are thin (⅛ to 1 inch), irregular seams or bands of strong-brown (7.5YR 5/6) and reddish-brown (5YR 4/4), very weakly cemented material that is slightly higher in content of clay than the material between the bands. These bands generally occur below a depth of 36 inches, but in places they are at a depth of 15 to 18 inches (fig. 10). They are closer together and are somewhat thicker below a depth of 4 to 5 feet. The solum ranges from medium acid to neutral in reaction.

### Tedrow Series

The Tedrow series consists of somewhat poorly drained Regosols that are intergrading to Low-Humic Gley soils.

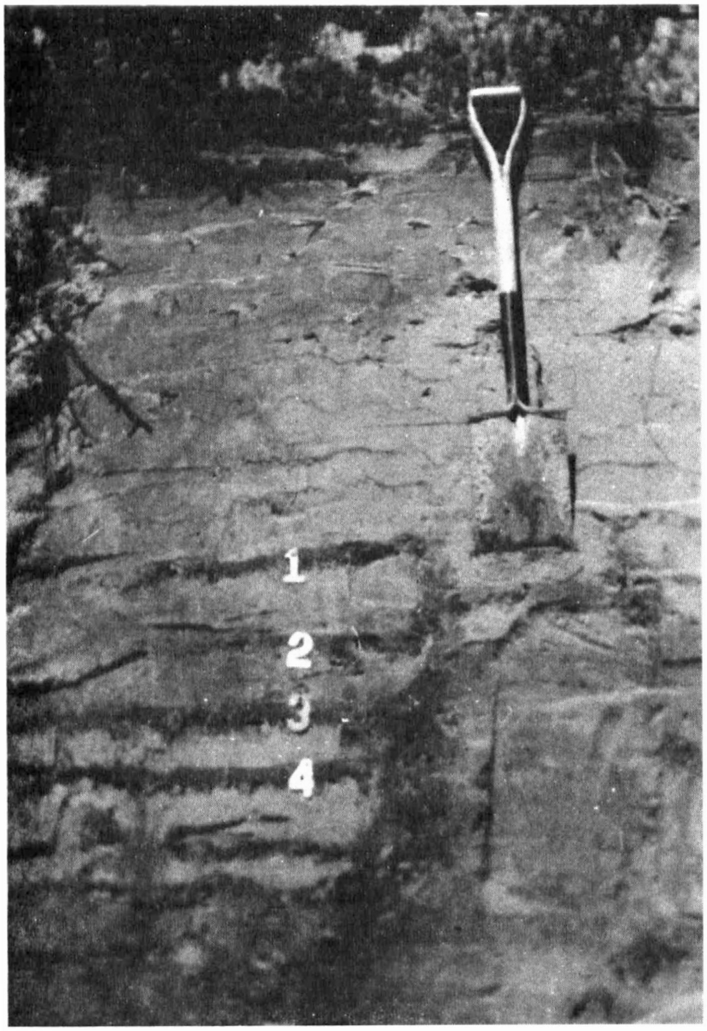


*Figure 10.*—**Profile of Spinks fine sand showing zones, or bands, of clay accumulation. Bands are numbered.**

These soils developed in deep, neutral to calcareous fine sand. They occur on nearly level to gently sloping sand ridges and knolls.

The Tedrow soils are part of the toposequence that includes the well drained Spinks soils and the moderately well drained Ottokee soils. They occur in complex patterns with the Rimer soils. The texture and color of their upper horizons are similar to that of the Rimer soils, but the clay substratum that occurs at a depth of 18 to 48 inches in the Rimer soils is lacking in the Tedrow soils.

Surface runoff on the Tedrow soils is slow. The moisture-supplying capacity is medium.

*Representative profile of Tedrow loamy fine sand*, in SE¼NE¼ sec. 20, T. 4 N., R. 10 E., Liberty Township, Wood County.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 4/3) loamy fine sand; single grain; loose; neutral to slightly acid; abrupt smooth boundary.

B21—8 to 11 inches, yellowish-brown (10YR 5/6 to 5/8) loamy fine sand; distinct, dark reddish-brown (2.5YR 3/4) and dark-red (2.5YR 3/6) mottles; single grain; loose; numerous orterde; slightly acid; gradual wavy boundary.

B22—11 to 19 inches, yellow (10YR 7/6) fine sand; single grain; loose; few, weak orterde; slightly acid.

B23—19 to 34 inches, light yellowish-brown (10YR 6/4) loamy fine sand; distinct, yellowish-red (5YR 4/6) mottles; single grain; loose; some very weak orterde; slightly acid; gradual wavy boundary.

C1—34 to 47 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; slightly acid; gradual wavy boundary.

C2—47 to 59 inches, dark-gray (5Y 4/1) fine sand; single grain; loose; calcareous; abrupt wavy boundary.

The color of the A horizon ranges from very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2, 2.5Y 4/2). The Ap horizon commonly extends to a depth of 8 to 10 inches. In some profiles there is a 5- to 10-inch, pale-brown (10YR 6/3) or yellowish-brown (10YR 5/6) A2 horizon. Mottled material generally occurs at a depth of 8 to 10 inches. The orterde (zones of accumulation of iron and organic matter without cementation) may be lacking in some profiles. The texture of the B horizons generally is loamy fine sand or fine sand. The solum ranges from slightly acid to neutral in reaction, but the soils generally are noncalcareous to a depth of 4 or 5 feet. A fine-textured substratum of glacial till or lacustrine material commonly occurs within a depth of 6 feet or more.

### Toledo Series

The Toledo series is made up of Humic Gley soils that developed in lacustrine silty clay and clay that contained thin layers or seams of fine sandy or silty material.

These soils are the very poorly drained members of the toposequence that includes the somewhat poorly drained Fulton soils. They are associated with the Colwood and Hoytville soils. The Colwood soils have a coarser textured B horizon than the Toledo soils, and they developed in silt, very fine sand, and fine sand that contained smaller amounts of clay. The Hoytville soils contain more coarse skeletal material throughout the solum than the Toledo soils, and they are underlain at a depth of 36 to 44 inches by fine clay loam or clay glacial till.

Surface runoff on the Toledo soils is very slow or ponded. The moisture-supplying capacity is high.

*Representative profile of Toledo silty clay*, on a 0 to 1 percent slope, in NW¼NE¼ sec. 23, T. 8 N., R 12 E., Ross Township, Wood County, sample number WD–99.

Ap—0 to 9 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) silty clay; weak, medium, subangular blocky structure; very firm when moist, very hard when dry; abundant roots; slightly acid; abrupt smooth boundary.

B1g—9 to 14 inches, gray (10YR 5/1) silty clay; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very firm; plentiful roots; neutral; clear smooth boundary.

B21g—14 to 28 inches, gray (10YR 6/1, 5/1) 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.

B22g—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.

C—46 to 57 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; weak, medium, subangular blocky structure; firm; some lenses or pockets of silt and scattered concretions of iron or manganese; neutral.

The organic matter content of the A horizon ranges from 3.6 to 4.9 percent. The A horizon ranges from dark gray (10YR 4/1) or very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2) or very dark grayish brown (10YR 3/2) in color and from 7 to 9 inches in thickness. The color of the matrix of the B horizons ranges from gray (10YR 5/1) to dark gray (10YR 4/1) or very dark gray (10YR 3/1). The mottles range from grayish brown (10YR 5/2), yellowish brown (10YR 5/4, 5/8), olive brown (2.5Y 4/4), or olive yellow (2.5Y 6/6) to strong brown (7.5YR 5/6). The B horizons are most commonly silty clay, but in some areas the upper part is silty clay loam. In some areas thin strata of sandy and silty materials occur in the lower part of the B horizon and in the C horizon. Concretions of iron or manganese occur in the lower horizons of many profiles. In places the depth to carbonates is only 36 inches, but generally the depth is more than 42 inches. Cracks commonly form in this soil during dry weather.

### Warners Series

The Warners series consists of dark-colored, very poorly drained Bog soils. These soils developed in a shallow (5 to 10 inches) mixture of organic and mineral materials, over a 2- to 6-inch layer of marl that varies in degree of purity. Calcareous clay or silty clay glacial till occurs at a depth of 10 to 20 inches. These soils occur in level or slightly depressed broad areas, where natural drainage outlets have been obstructed by limestone or sand ridges.

The Warners soils are associated with the Muck, Wauseon, and Hoytville soils. The associated soils lack the marl layer, which is characteristic of the Warners soils. Also, the Muck soils have a thicker surface layer and are higher in content of organic matter; the Wauseon soils have a higher percentage of sand in the solum; and the Hoytville soils have a higher percentage of clay in the solum.

Surface runoff on the Warners soils is very slow to ponded. The moisture-supplying capacity is high.

*Representative profile of Warners soils*, in NW¼SW¼ sec. 24, T. 4 N., R. 12 E., Montgomery Township, Wood County.

O1—0 to 7 inches, black (10YR 2/1) mixture of muck and mineral material; variable amounts of gray (10YR 6/1) marl; moderate to fine, granular structure; friable; mildly alkaline to calcareous; abrupt wavy boundary.

IIC1—7 to 11 inches, gray (10YR 6/1) marl; lenses or pockets of black (10YR 2/1) or very dark gray (10YR 3/1) muck; massive; friable; calcareous; gradual wavy boundary.

IIC2—11 inches +, brown (10YR 5/3) or grayish-brown (2.5Y 5/2) silty clay to clay glacial till; massive; very firm; calcareous.

The depth of the O horizon ranges from 5 to 10 inches. The texture of the mineral material in the surface layer ranges from sandy loam to silty loam. The reaction of the O horizon ranges from mildly alkaline to calcareous. The marl layer commonly is 2 to 6 inches thick. The purity of the marl varies considerably. In some cultivated areas marl fragments are mixed with the O horizon. In some profiles there is a 1- to 2-inch layer of loamy sand or sandy loam between the marl and the till.

### Wauseon Series

The Wauseon series consists of very poorly drained Humic Gley soils that developed in water-deposited sandy material in nearly level to depressed areas.

These soils are the very poorly drained members of the toposequence that includes the moderately well drained Seward and Ottokee soils and the somewhat poorly drained Rimer and Tedrow soils. They are associated with the Mermill soils, which have finer textured B horizons.

Surface runoff on the Wauseon soils is very slow or ponded. The moisture-supplying capacity is high.

*Representative profile of Wauseon loamy fine sand*, in a nearly level area in NE¼SW¼ sec. 23, T. 5 N., R. 11 E., Center Township, Wood County, sample number WD–70.

Ap—0 to 8 inches, very dark gray (10YR 3/1) loamy fine sand; single grain; loose; high organic-matter content; neutral; clear smooth boundary.

B21g—8 to 15 inches, dark-gray (10YR 4/1) to dark grayish-brown (10YR 4/2) loamy fine sand; common, distinct, light olive-brown (2.5Y 5/6) and olive-yellow (2.5Y 6/6) mottles; weak, fine, angular blocky structure; very friable; neutral; gradual wavy boundary.

B22—15 to 34 inches, distinctly mottled light olive-brown (2.5Y 5/6), olive-yellow (2.5Y 6/6), grayish-brown (2.5Y 5/2), and brownish-yellow (10YR 6/6) loamy fine sand; very friable; few calcareous concretions in lower part of horizon; slightly alkaline; gradual wavy boundary.

C1—34 to 43 inches +, light brownish-gray (2.5Y 6/2) and olive-yellow (2.5Y 6/6) sandy loam; loose; 2 inches of clay in lower part; mildly alkaline.

The organic-matter content of the A horizon is high. The A horizon ranges from very dark gray (10YR 3/1) to black (10YR 2/1) in color and is slightly acid or neutral in reaction. The A12 horizon ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The color of 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 (2.5Y 5/2). The mottles in the B horizons range from olive brown (2.5Y 4/4), light olive brown (2.5Y 5/6), or strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6), yellowish red (5YR 5/8), or reddish yellow (5YR 6/6). The B horizons are loamy fine sand, fine sand, sandy loam, or fine sandy loam and generally contain a considerable quantity of gleyed material. In places fine-textured, calcareous glacial or lacustrine materials occur at a depth of 30 to 48 inches or more. In some local areas, pockets and thin layers of silt or very fine gravel occur immediately above the clay floor.

## Laboratory Data

Data on particle size distribution, bulk density, pH, organic matter, and carbonates for 18 profiles representing 14 soil series are given in table 6. Data on exchangeable cations, nitrogen, and carbon-nitrogen ratio of two Hoytville profiles are given in table 7 (p. 92). The laboratory analyses were made by the Ohio Agricultural Experiment Station at Ohio State University, Columbus, Ohio.

Some of the profiles analyzed are described in the section "Morphology of the Soils." The other profiles are described in this section.

### Colwood Series

A profile of Colwood fine sandy loam, sample number WD–52, is described in the section "Morphology of the Soils."

### Digby Series

Profile description of Digby loam (1 percent slope), sample number WD–72.

Ap—0 to 8 inches, dark-gray (10YR 4/1) to dark grayish-brown (10YR 4/2) loam; weak to moderate, medium, granular structure; friable; many small limestone and igneous pebbles; neutral; clear smooth boundary.

A2—8 to 11 inches, grayish-brown (10YR 5/2), light yellowish-brown (10YR 6/4), and brownish-yellow (10YR 6/6) distinctly mottled loam; weak, medium, platy structure breaks to fine, angular blocky structure; friable; noticeable amount of coarse material; neutral; clear wavy boundary.

B2t—11 to 22 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure that breaks to moderate, medium and coarse, angular blocky structure; firm; noticeable amount of coarse material; neutral; gradual wavy boundary.

IIB3—22 to 28 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) sandy loam; common, fine, distinct, yellowish-brown (10YR 5/6) and brownish-yellow (10YR 6/6) mottles; moderate, medium, angular blocky structure; friable; considerable coarse material; neutral; clear wavy boundary.

IIC1—28 to 45 inches, light grayish-brown (10YR 6/2) loamy sand; single grain; loose; calcareous; abrupt irregular boundary.

IIC2—45 inches +, brown (10YR 5/3) clay loam; yellowish-brown (10YR 5/4) mottles; massive; firm; calcareous.

### Eel Series

A profile of Eel loam, sample number WD–102, is described in the section "Morphology of the Soils."

### Fulton Series

A profile of Fulton silty clay loam, sample number WD–115, is described in the section "Morphology of the Soils."

### Haney Series

A profile of Haney loam, sample number WD–50, is described in the section "Morphology of the Soils."

### Haskins Series

A profile of Haskins loam, sample number WD–111, is described in the section "Morphology of the Soils."

### Hoytville Series

Profile description of Hoytville silty clay loam, in a level field, sample number WD–59.

A1—0 to 5 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; friable; abundant fine roots; slightly acid; clear boundary.

A3g—5 to 8 inches, dark-gray (10YR 4/1) clay; distinct, yellowish-brown (10YR 5/4) mottles; moderate, very fine, angular blocky structure that breaks to moderate, coarse, granular structure; roots present; neutral; gradual boundary.

B1g—8 to 15 inches, dark-gray (10YR 4/1) clay; medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, fine, angular blocky structure; roots common; neutral; gradual boundary.

B21g—15 to 22 inches, gray (10YR 5/1) clay; medium, distinct, yellowish-brown (10YR 5/4) or olive-brown (2.5Y 4/4) mottles; moderate, fine to medium, angular blocky structure; fine roots common; some small pebbles 1 centimeter or less in diameter; neutral; diffuse boundary.

B22g—22 to 32 inches, gray (10YR 5/1) clay; distinct, yellowish-brown (10YR 5/4) or olive-brown (2.5Y 4/4) mottles; moderate, fine to medium, prismatic structure that breaks to angular blocky structure; some roots; neutral; wavy boundary.

C1g—32 to 52 inches, gray (10YR 5/1) clay loam; distinct, yellowish-brown (10YR 5/4) mottles; moderate, coarse, prismatic structure that breaks to angular blocky structure; fragments of black shale; pebbles as much as 5 centimeters in diameter; some roots; midly alkaline.

C2g—52 to 60 inches, gray (10YR 5/1) clay loam; distinct, yellowish-brown (10YR 5/4) mottles; limestone fragments and pebbles as much as 5 centimeters in diameter; fragments of black shale, as much as 2½ centimeters in size; some roots; slightly calcareous.

Profile description of Hoytville clay loam, in a level field, sample number WD–84.

Ap—0 to 9 inches, very dark gray (10YR 3/1) clay loam; massive; breaks to fine or medium, granular structure; firm when moist, very hard when dry; slightly acid.

B21g—9 to 13 inches, gray (N 5/0) clay; many, fine, distinct, dark-brown (7.5YR 3/2) and dark yellowish-brown (10YR 4/4) mottles; moderate, fine to medium, angular blocky structure; very firm when moist, very hard when dry; roots present; slightly acid; diffuse boundary.

B21g—13 to 18 inches, gray (N 5/0) clay; many, fine, distinct, dark-brown (7.5YR 3/2) and dark yellowish-brown (10YR 4/4) mottles; moderate, fine to medium, angular blocky structure; very firm when moist, very hard when dry; roots present; neutral; diffuse boundary.

B22g—18 to 27 inches, gray (5Y 5/1 to 5/2) clay; distinct, yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/6) mottles; weak, medium, prismatic structure breaks to weak or moderate, medium, angular blocky structure; very firm when moist, very hard when dry; roots present; neutral; diffuse boundary. Sampled at a depth of 18 to 22 inches and 22 to 27 inches.

B23g—27 to 42 inches, light olive-gray (5Y 6/2 to 5/2) clay; medium or coarse, prominent, yellowish-brown (10YR 5/6) mottles; weak, prismatic structure breaks to weak, medium or coarse, angular and subangular blocky structure; very firm when moist, very hard when dry; few roots; neutral; diffuse irregular boundary. Sampled at a depth of 27 to 31 inches, 31 to 36 inches, and 36 to 42 inches.

B3g—42 to 52 inches, gray (5Y 5/1 to 10YR 5/1) clay; common, coarse, distinct, dark yellowish-brown (10YR 5/4 to 4/4) mottles, and few yellowish-brown (10YR 5/6) mottles; weak, very coarse, prismatic structure breaks to weak, angular blocky structure; firm when moist, very hard when dry; some pebbles, scattered roots; mildly alkaline; calcareous around pebbles; clear irregular boundary.

C1—52 to 60 inches, gray (N 5/0 to 4/2) clay loam; common, coarse, distinct, yellowish-brown (10YR 5/6 to 5/4) and brownish-yellow (10YR 6/6) mottles; weak, coarse, prismatic structure breaks to weak, coarse, angular blocky structure; firm when moist, hard when dry; scattered roots; mildly alkaline.

C2—60 to 96 inches, gray (N 5/0) clay; coarse, distinct, yellowish-brown (10YR 5/6) mottles; very firm when moist, very hard when dry; mildly alkaline. Sampled at a depth of 60 to 72 inches, 72 to 84 inches, 84 to 96 inches.

C3—96 to 108 inches, dark grayish-brown (2.5Y 4/2) clay loam; weak, platy structure; very firm in place, very hard when dry; moderately alkaline.

TABLE 6.—*Particle-size distribution, bulk density, pH,*

[Lack of data indicates determination was

| Soil, site number, and location | Horizon | Depth | Particle-size distribution, in millimeters | | | | |
|---|---|---|---|---|---|---|---|
| | | | Very coarse sand (2–1) | Coarse sand (1–0.5) | Medium sand (0.5–0.25) | Fine sand (0.25–0.1) | Very fine sand (0.1–0.05) |
| Colwood fine sandy loam, WD–52 | | *In.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* |
| Location: NW¼NW¼, sec. 28, T. 5 N., R. 11 E., Center Township, Wood County. | Ap | 0–8 | --- | --- | --- | --- | --- |
| | B21g | 8–14 | --- | --- | --- | --- | --- |
| | B22 | 14–20 | --- | --- | --- | --- | --- |
| | B23 | 20–31 | --- | --- | --- | --- | --- |
| | B3 | 31–38 | --- | --- | --- | --- | --- |
| | C1 | 38+ | --- | --- | --- | --- | --- |
| Digby loam, WD–72 | | | | | | | |
| Location: SE¼NW¼, sec. 36, T. 3 N., R. 11 E., Bloom Township, Wood County. | Ap | 0–8 | --- | --- | --- | --- | --- |
| | A2 | 8–11 | --- | --- | --- | --- | --- |
| | B2t | 11–22 | --- | --- | --- | --- | --- |
| | IIB3 | 22–28 | --- | --- | --- | --- | --- |
| | IIC1 | 28–45 | --- | --- | --- | --- | --- |
| | IIIC2 | 45+ | --- | --- | --- | --- | --- |
| Eel loam, WD–102 | | | | | | | |
| Location: NE¼SE¼, sec. 8, T. 5 N., R. 12 E., Webster Township, Wood County. | Ap | 0–8 | 1.2 | 1.9 | 3.1 | 8.8 | 16.2 |
| | C1 | 8–14 | .3 | 1.1 | 2.1 | 7.6 | 15.3 |
| | C2 | 14–20 | .6 | .9 | 1.7 | 7.0 | 15.7 |
| | C3 | 20–26 | .4 | 1.1 | 1.9 | 10.2 | 20.2 |
| | C4 | 26–32 | .4 | 1.0 | 2.1 | 10.5 | 21.2 |
| | C5 | 32–38 | .3 | .8 | 2.1 | 11.8 | 23.0 |
| | C6 | 38–48 | 1.0 | 1.5 | 2.7 | 12.1 | 18.2 |
| Fulton silty clay loam, WD–115: | | | | | | | |
| Location: SW¼SE¼, sec. 35, T. 8 N., R. 12 E., Ross Township, Wood County. | Ap | 0–6 | .3 | .7 | 1.6 | 1.0 | 3.9 |
| | A2 | 6–7 | .5 | .5 | .7 | 1.2 | 5.3 |
| | B11 | 7–12 | .3 | .4 | .4 | .4 | 3.4 |
| | B12 | 12–17 | .1 | .4 | .4 | 2.6 | 2.6 |
| | B21gt | 17–25 | .1 | .2 | .2 | .4 | 1.9 |
| | B22gt | 25–36 | .1 | .2 | .2 | .4 | 1.8 |
| | C1 | 36–40 | .2 | .6 | .6 | .5 | 2.2 |
| | C2 | 40–49 | .4 | .4 | .2 | .2 | 1.8 |
| Haney loam, WD–50 | | | | | | | |
| Location: SW¼SW¼, sec. 27, T. 3 N., R. 12 E., Perry Township, Wood County. | Ap | 0–70 | --- | --- | --- | --- | --- |
| | B21t | 7–13 | --- | --- | --- | --- | --- |
| | B22t | 13–25 | --- | --- | --- | --- | --- |
| | B3t | 25–34 | --- | --- | --- | --- | --- |
| | C | 34+ | --- | --- | --- | --- | --- |
| Haskins loam, WD–111 | | | | | | | |
| Location: NW¼NW¼, sec. 36, T. 7 N., R. 12 E., Lake Township, Wood County. | Ap | 0–9 | 2.3 | 4.9 | 10.9 | 15.9 | 12.6 |
| | B1 | 9–14 | 1.3 | 6.5 | 13.9 | 17.8 | 12.5 |
| | B21t | 14–20 | 3.2 | 6.4 | 13.7 | 17.9 | 12.4 |
| | B31 | 20–24 | 1.4 | 4.4 | 11.5 | 12.7 | 22.2 |
| | B32 | 24–30 | 2.0 | 4.3 | 12.4 | 11.3 | 16.7 |
| | B33 | 30–41 | 2.2 | 8.4 | 22.0 | 19.3 | 17.7 |
| | IIB22t | 41–46 | 1.4 | 3.6 | 13.1 | 17.1 | 12.5 |
| | IIC1 | 46–61 | 1.8 | 3.2 | 3.2 | 3.3 | 8.1 |
| | IIC2 | 61–75 | 2.0 | 3.9 | 4.0 | 6.8 | 7.0 |
| Hoytville silty clay loam, WD–59 | | | | | | | |
| Location: NE¼SW¼, sec. 18, T. 3 N., R. 10 E., Henry Township, Wood County. | A1 | 0–5 | --- | --- | --- | --- | --- |
| | A3g | 5–8 | --- | --- | --- | --- | --- |
| | B1g | 8–15 | --- | --- | --- | --- | --- |
| | B21g | 15–22 | --- | --- | --- | --- | --- |
| | B22g | 22–32 | --- | --- | --- | --- | --- |
| | C1g | 32–52 | --- | --- | --- | --- | --- |
| | C2g | 52–60 | --- | --- | --- | --- | --- |

*organic matter, and carbonates of several soil profiles*

not made or material was not present]

| Particle-size distribution, in millimeters—Con. | | | | Textural class | Bulk density | $CaCO_3$ equivalent | pH | Organic matter |
|---|---|---|---|---|---|---|---|---|
| Total sand (2.0–0.05) | Silt (0.05–0.002) | Clay (less than 0.002) | Fine clay (less than 0.0002) | | | | | |
| *Pct.* | *Pct.* | *Pct.* | *Pct.* | | *Gm./cu. cm.* | | | *Pct.* |
| 56. 6 | 29. 2 | 14. 2 | | Fine sandy loam | | | 7. 0 | 5. 1 |
| 56. 8 | 26. 2 | 17. 0 | | Fine sandy loam | | | 7. 1 | |
| 54. 6 | 27. 1 | 18. 3 | | Fine sandy loam | | | 7. 3 | |
| 58. 6 | 24. 9 | 16. 5 | | Fine sandy loam | | 4. 1 | 7. 6 | |
| 51. 9 | 34. 0 | 14. 1 | | Loam | | 12. 6 | 7. 6 | |
| 77. 6 | 18. 8 | 3. 6 | | Loamy fine sand | | 22. 3 | 7. 8 | |
| 35. 0 | 45. 2 | 19. 8 | | Loam | | | 6. 6 | 3. 6 |
| 36. 6 | 45. 2 | 18. 2 | | Loam | | | 6. 7 | . 8 |
| 36. 6 | 28. 4 | 35. 0 | | Clay loam | | | 6. 8 | |
| 61. 2 | 21. 0 | 17. 8 | | Sandy loam | | | 7. 3 | |
| 80. 7 | 13. 7 | 5. 6 | | Loamy sand | | 23. 6 | 7. 8 | |
| 23. 7 | 39. 7 | 36. 6 | | Clay loam | | 23. 2 | 8. 0 | |
| 31. 2 | 45. 5 | 23. 3 | 9. 4 | Loam | | | 6. 6 | 3. 2 |
| 26. 4 | 45. 4 | 28. 2 | 8. 7 | Clay loam | | | 6. 8 | 1. 0 |
| 25. 9 | 45. 8 | 28. 3 | 9. 1 | Clay loam | | | 6. 8 | 1. 1 |
| 33. 8 | 40. 8 | 25. 4 | 9. 6 | Loam | | | 6. 9 | . 6 |
| 35. 5 | 38. 5 | 26. 0 | 9. 5 | Loam | | | 6. 9 | . 6 |
| 38. 0 | 37. 7 | 24. 3 | 9. 3 | Loam | | | 6. 9 | |
| 35. 5 | 38. 9 | 25. 6 | 9. 5 | Loam | | | 7. 1 | |
| 7. 5 | 64. 8 | 27. 7 | 11. 3 | Silty clay loam | 1. 35 | | 5. 3 | 2. 8 |
| 8. 2 | 61. 2 | 30. 6 | 9. 1 | Silty clay loam | | | 5. 7 | 2. 3 |
| 4. 9 | 45. 4 | 49. 7 | 22. 1 | Silty clay | 1. 52 | | 5. 9 | . 8 |
| 3. 9 | 46. 6 | 49. 5 | 19. 9 | Silty clay | 1. 53 | | 6. 9 | . 6 |
| 2. 9 | 43. 8 | 53. 4 | 22. 1 | Silty clay | 1. 57 | 1. 6 | 7. 4 | |
| 2. 7 | 50. 3 | 47. 0 | 20. 3 | Silty clay | 1. 65 | 8. 2 | 7. 8 | |
| 4. 1 | 56. 1 | 39. 8 | 12. 1 | Silty clay loam | 1. 73 | 14. 6 | 7. 9 | |
| 3. 0 | 59. 3 | 37. 7 | 11. 0 | Silty clay loam | 1. 71 | 20. 0 | 7. 9 | |
| 38. 0 | 41. 8 | 20. 2 | | Loam | | | 7. 1 | 4. 0 |
| 27. 4 | 37. 9 | 34. 9 | | Clay loam | | | 7. 0 | |
| 19. 8 | 40. 8 | 39. 4 | | Silty clay loam | | | 7. 2 | |
| 33. 0 | 35. 5 | 31. 5 | | Clay loam | | | 7. 3 | |
| 53. 9 | 34. 7 | 11. 4 | | Sandy loam | | 2. 1 | 7. 3 | |
| 46. 6 | 32. 5 | 20. 9 | 4. 6 | Loam | 1. 24 | | 6. 9 | 3. 8 |
| 52. 0 | 26. 8 | 21. 2 | 7. 8 | Sandy clay loam | 1. 63 | | 7. 2 | . 7 |
| 53. 6 | 23. 9 | 22. 5 | 9. 1 | Sandy clay loam | 1. 66 | | 7. 2 | . 5 |
| 52. 2 | 30. 4 | 17. 4 | 6. 7 | Sandy loam | 1. 67 | 1. 2 | 7. 5 | |
| 46. 7 | 39. 5 | 13. 8 | 5. 1 | Loam | 1. 65 | 6. 2 | 7. 9 | |
| 69. 6 | 19. 9 | 10. 5 | 3. 3 | Sandy loam | 1. 58 | 8. 9 | 7. 9 | |
| 47. 7 | 34. 1 | 18 2 | 6. 3 | Loam | | 9. 0 | 7. 9 | |
| 19. 6 | 42. 3 | 38. 1 | 9. 5 | Silty clay loam | 1. 72 | 20. 0 | 7. 9 | |
| 23. 7 | 42. 1 | 34. 2 | 8. 5 | Clay loam | | 24. 6 | 8. 0 | |
| 17. 8 | 44. 2 | 38. 0 | 14. 8 | Silty clay loam | | | 6. 3 | |
| 20. 8 | 36. 9 | 42. 3 | 14. 1 | Clay | | | 6. 6 | 4. 6 |
| 20. 2 | 37. 6 | 42. 2 | 17. 1 | Clay | | | 6. 8 | 1. 7 |
| 20. 7 | 33. 1 | 46. 2 | 21. 4 | Clay | | | 7. 0 | . 8 |
| 21. 2 | 35. 3 | 43. 5 | 17. 8 | Clay | | | 7. 2 | . 6 |
| 20. 9 | 39. 5 | 39. 6 | 18. 0 | Clay loam | | | 7. 5 | 1. 6 |
| 25. 0 | 44. 0 | 31. 0 | 7. 0 | Clay loam | | 20. 3 | 7. 7 | 1. 3 |

TABLE 6.—*Particle-size distribution, bulk density, pH,*

| Soil, site number, and location | Horizon | Depth | Particle-size distribution, in millimeters: Very coarse sand (2–1) | Coarse sand (1–0.5) | Medium sand (0.5–0.25) | Fine sand (0.25–0.1) | Very fine sand (0.1–0.05) |
|---|---|---|---|---|---|---|---|
| | | *In.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* |
| Hoytville clay loam, WD–84 Location: SW¼NW¼, sec. 18, T. 3 N., R. 10 E., Henry Township, Wood County. | Ap | 0–9 | 2.4 | 1.9 | 3.1 | 6.5 | 6.7 |
| | B21g | 9–13 | .5 | 1.7 | 3.0 | 5.6 | 5.2 |
| | B21g | 13–18 | .9 | 1.9 | 2.7 | 5.6 | 4.9 |
| | B22g | 18–22 | .6 | 1.5 | 2.7 | 5.4 | 5.5 |
| | B22g | 22–27 | .5 | .6 | 2.7 | 5.7 | 6.5 |
| | B23g | 27–31 | 2.7 | 3.7 | 2.8 | 5.6 | 1.4 |
| | B23g | 31–36 | 2.6 | 1.8 | 2.8 | 5.6 | 4.3 |
| | B23g | 36–42 | .9 | 2.4 | 3.3 | 6.1 | 5.7 |
| | B3g | 42–52 | 1.7 | 2.5 | 3.3 | 6.6 | 6.1 |
| | C1 | 52–60 | 2.4 | 3.6 | 3.9 | 7.0 | 6.5 |
| | C2 | 60–72 | 1.5 | 2.3 | 3.2 | 6.3 | 6.2 |
| | C2 | 72–84 | 1.2 | 2.3 | 3.2 | 6.3 | 5.6 |
| | C2 | 84–96 | 2.1 | 3.4 | 3.5 | 6.7 | 6.6 |
| | C3 | 96–108 | 3.3 | 2.1 | 1.0 | .5 | 17.3 |
| Hoytville clay, thin solum variant, WD–87 Location: SE¼NW¼, sec. 16, T. 6 N., R. 12 E., Troy Township, Wood County. | Ap | 0–7 | ----- | ----- | ----- | ----- | ----- |
| | B2g | 7–13 | ----- | ----- | ----- | ----- | ----- |
| | C1 | 13–18 | ----- | ----- | ----- | ----- | ----- |
| | C2 | 18–44 | ----- | ----- | ----- | ----- | ----- |
| Kibbie fine sandy loam, WD–112 Location: SE¼SE¼, sec. 17, T. 5 N., R. 9 E., Grand Rapids Township, Wood County. | Ap | 0–10 | 1.0 | 1.7 | 7.0 | 33.3 | 27.9 |
| | A2 | 10–16 | .9 | 2.0 | 7.4 | 38.3 | 27.6 |
| | B1 | 16–18 | .9 | 1.3 | 3.2 | 24.2 | 22.4 |
| | B21 | 18–26 | .1 | .6 | 1.8 | 10.1 | 21.9 |
| | B22 | 26–33 | .3 | .6 | .5 | 6.7 | 34.0 |
| | B23 | 33–36 | .3 | .4 | .8 | 6.8 | 28.5 |
| | B3 | 36–43 | .1 | 1.1 | 9.8 | 35.9 | 35.1 |
| | C1 | 43–57 | [1] | .2 | 3.8 | 72.0 | 22.3 |
| Mermill sandy clay loam, WD–36 Location: NE¼SE¼ sec. 10, T. 4 N., R. 10 E., Liberty Township, Wood County. | Ap | 0–9 | ----- | ----- | ----- | ----- | ----- |
| | B1g | 9–16 | ----- | ----- | ----- | ----- | ----- |
| | B2gt | 16–38 | ----- | ----- | ----- | ----- | ----- |
| | IIC1 | 38–46 | ----- | ----- | ----- | ----- | ----- |
| Millgrove loam, WD–49 Location: SW¼SW¼, sec. 27, T. 3 N., R. 12 E., Perry Township, Wood County. | Ap | 0–8 | ----- | ----- | ----- | ----- | ----- |
| | B21g | 8–13 | ----- | ----- | ----- | ----- | ----- |
| | B22gt | 13–21 | ----- | ----- | ----- | ----- | ----- |
| | C1 | 21–43 | ----- | ----- | ----- | ----- | ----- |
| | C2 | 43+ | ----- | ----- | ----- | ----- | ----- |
| Milton loam, WD–56 Location: NW¼SE¼, sec. 8, T. 3 N., R. 11 E., Bloom Township, Wood County. | Ap | 0–6 | ----- | ----- | ----- | ----- | ----- |
| | B1 | 6–11 | ----- | ----- | ----- | ----- | ----- |
| | B2 | 11–26 | ----- | ----- | ----- | ----- | ----- |
| | IIR | 26+ | ----- | ----- | ----- | ----- | ----- |
| Nappanee loam, WD–44 Location: SE¼SW¼, sec. 5, T. 3 N., R. 11 E., Bloom Township, Wood County. | Ap | 0–6 | ----- | ----- | ----- | ----- | ----- |
| | A2 | 6–8 | ----- | ----- | ----- | ----- | ----- |
| | B21t | 8–12 | ----- | ----- | ----- | ----- | ----- |
| | B22t | 12–28 | ----- | ----- | ----- | ----- | ----- |
| | C1 | 28+ | ----- | ----- | ----- | ----- | ----- |
| Spinks fine sand, WD–110 Location: NW¼SW¼, sec. 33, T. 5 N., R. 10 E., Plain Township, Wood County. | A1 | 0–4 | .1 | 2.1 | 17.8 | 59.1 | 17.2 |
| | A21 | 4–10 | .1 | 6.5 | 15.8 | 60.8 | 13.9 |
| | A22 | 10–23 | .1 | 1.4 | 15.5 | 61.8 | 18.6 |
| | A21 | 23–30 | [1] | 2.3 | 22.1 | 55.4 | 18.9 |
| | A22 | 30–37 | .1 | 1.0 | 14.4 | 60.9 | 21.7 |
| | A23 | 37–49 | .1 | 8.1 | 26.4 | 49.3 | 15.1 |
| | A24 | 49–60 | .2 | 4.0 | 22.7 | 53.3 | 18.3 |
| | A25 | 60–72 | .1 | 8.3 | 33.7 | 46.1 | 10.1 |
| | A26 | 72–78 | .1 | 1.5 | 10.4 | 43.4 | 42.9 |
| | Bt | [2] | .1 | 7.8 | 23.7 | 43.7 | 17.4 |

See footnotes at end of table.

*organic matter, and carbonates of several soil profiles*—Continued

| Particle-size distribution, in millimeters—Con. | | | | Textural class | Bulk density | $CaCO_3$ equivalent | pH | Organic matter |
|---|---|---|---|---|---|---|---|---|
| Total sand (2.0-0.05) | Silt (0.05-0.002) | Clay (less than 0.002) | Fine clay (less than 0.0002) | | | | | |
| *Pct.* | *Pct.* | *Pct.* | *Pct.* | | *Gm./cu. cm.* | | | *Pct.* |
| 20.6 | 41.8 | 37.6 | 8.7 | Clay loam | 1.32 | | 6.1 | 5.7 |
| 16.0 | 38.2 | 45.8 | 17.0 | Clay | 1.42 | | 6.5 | 2.6 |
| 16.0 | 36.1 | 47.9 | 19.5 | Clay | 1.47 | | 6.8 | 1.5 |
| 15.7 | 35.8 | 48.5 | 20.3 | Clay | | | 6.9 | 1.1 |
| 16.0 | 35.7 | 48.3 | 20.2 | Clay | 1.54 | | 7.1 | .8 |
| 16.2 | 35.5 | 48.3 | 20.1 | Clay | 1.59 | | 6.9 | .6 |
| 17.1 | 38.0 | 44.9 | 17.3 | Clay | 1.62 | | 7.2 | .7 |
| 18.4 | 37.4 | 44.2 | 16.8 | Clay | 1.59 | 3.1 | 7.3 | .8 |
| 20.2 | 36.8 | 43.0 | 14.7 | Clay | 1.61 | 2.8 | 7.6 | |
| 23.4 | 39.3 | 37.3 | 12.1 | Clay loam | | 14.5 | 7.8 | |
| 19.5 | 36.8 | 43.7 | 15.2 | Clay | | 3.0 | 7.6 | |
| 18.6 | 38.7 | 42.7 | 16.0 | Clay | | 3.9 | 7.6 | |
| 22.3 | 42.4 | 35.3 | 12.2 | Clay loam | | 15.7 | 8.1 | |
| 24.2 | 40.4 | 35.4 | 9.6 | Clay loam | | 19.0 | 7.9 | |
| | | | | | | | | |
| 20.1 | 39.3 | 40.6 | | Clay | | | 7.2 | 5.1 |
| 20.7 | 34.9 | 44.4 | | Clay | | | 7.3 | 1.5 |
| 20.5 | 36.1 | 43.4 | | Clay | | 13.6 | 7.5 | |
| 18.6 | 41.5 | 39.9 | | Silty clay loam | | 27.3 | 7.7 | |
| | | | | | | | | |
| 70.9 | 20.1 | 9.0 | 1.8 | Fine sandy loam | 1.44 | | 6.9 | 1.6 |
| 76.2 | 17.9 | 5.9 | 1.4 | Loamy fine sand | 1.65 | | 7.0 | .5 |
| 52.0 | 28.3 | 19.7 | 7.2 | Loam | | | 7.0 | .5 |
| 34.5 | 32.5 | 33.5 | 13.0 | Clay loam | 1.59 | | 7.0 | .6 |
| 42.1 | 34.0 | 23.9 | 11.0 | Loam | 1.57 | | 7.3 | |
| 36.8 | 33.6 | 29.6 | 11.9 | Clay loam | | 1.2 | 7.5 | |
| 82.0 | 9.2 | 8.8 | 4.2 | Loamy fine sand | 1.64 | 1.2 | 7.5 | |
| 98.3 | .9 | .8 | .3 | Fine sand | 1.61 | 12.0 | 8.1 | |
| | | | | | | | | |
| 56.0 | 22.5 | 21.5 | | Sandy clay loam | | | 6.2 | |
| 59.5 | 20.0 | 20.5 | | Sandy clay loam | | | 6.3 | |
| 62.1 | 16.9 | 21.0 | | Sandy clay loam | | | 7.3 | |
| 24.3 | 39.5 | 36.2 | | Clay loam | | | 8.1 | |
| | | | | | | | | |
| 34.1 | 42.5 | 23.4 | | Loam | | | 6.9 | 5.5 |
| 47.4 | 31.6 | 21.0 | | Loam | | 2.2 | 7.6 | |
| 35.5 | 37.9 | 26.6 | | Loam | | 2.9 | 7.6 | |
| 68.3 | 20.0 | 11.7 | | Sandy loam | | 12.1 | 7.8 | |
| 86.6 | 10.4 | 3.0 | | Loamy sand | | 15.7 | 8.0 | |
| | | | | | | | | |
| 36.1 | 50.9 | 13.0 | | Loam | | | 6.8 | 7.5 |
| 39.7 | 39.7 | 20.6 | | Loam | | | 7.0 | |
| 23.0 | 36.9 | 40.1 | | Clay | | | 7.0 | |
| | | | | Limestone bedrock | | | | |
| | | | | | | | | |
| 32.0 | 43.2 | 24.8 | | Loam | | | 6.9 | |
| 23.6 | 40.6 | 35.8 | | Clay loam | | | 6.1 | |
| 17.7 | 32.6 | 49.7 | | Clay | | | 5.4 | |
| 20.3 | 32.8 | 46.9 | | Clay | | | 6.6 | |
| 21.3 | 40.5 | 38.2 | | Clay loam | | | 8.1 | |
| | | | | | | | | |
| 96.3 | 1.4 | 2.3 | .7 | Fine sand | | | 7.0 | .6 |
| 97.1 | .1 | 2.8 | 1.0 | Fine sand | | | 6.6 | .5 |
| 97.4 | .0 | 2.6 | 1.3 | Fine sand | | | 6.7 | .2 |
| 98.7 | .0 | 1.3 | .2 | Fine sand | | | 6.7 | |
| 98.1 | .9 | 1.0 | .5 | Fine sand | | | 7.0 | |
| 99.0 | .0 | 1.0 | .6 | Sand | | | 7.0 | |
| 98.5 | .0 | 1.5 | .9 | Fine sand | | | 7.0 | |
| 98.3 | .0 | 1.7 | .9 | Sand | | | 6.9 | |
| 98.3 | .7 | 1.0 | .4 | Sand | | | 7.0 | |
| 92.7 | .0 | 7.3 | 3.5 | Sand | | | 6.8 | .2 |

TABLE 6.—*Particle-size distribution, bulk density, pH,*

| Soil, site number, and location | Horizon | Depth | Particle-size distribution, in millimeters | | | | |
|---|---|---|---|---|---|---|---|
| | | | Very coarse sand (2–1) | Coarse sand (1–0.5) | Medium sand (0.5–0.25) | Fine sand (0.25–0.1) | Very fine sand (0.1–0.05) |
| | | *In.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* |
| Toledo silty clay, WD–114 Location: SE¼NE¼ sec. 35, T. 8 N., R. 12 E., Wood County. | Ap | 0–8 | 1.3 | .4 | .4 | .8 | 4.0 |
| | A12 | 8–10 | .7 | .3 | .3 | .6 | 3.4 |
| | B1g | 10–20 | .6 | .5 | .3 | .3 | 3.9 |
| | B21g | 20–29 | .2 | .3 | .3 | .9 | 3.5 |
| | B22g | 29–36 | .3 | .5 | .4 | .3 | 4.8 |
| | B22g | 36–45 | (1) | .2 | .3 | .7 | 3.4 |
| | C2 | 52–58 | .5 | .3 | 1.2 | .5 | 6.0 |
| | C1 | 45–52 | .5 | .8 | .6 | 1.1 | 3.0 |
| | C3 | 58–70 | (1) | .2 | .3 | .4 | 2.6 |
| | C3 | 70–82 | (1) | .2 | .2 | .4 | 2.1 |
| | IIC4 | 82–95 | 3.0 | 4.5 | 4.4 | 7.5 | 7.4 |
| Toledo silty clay, WD–99 Location: NW¼NE¼, sec. 23, T. 8 N., R. 12 E., Ross Township, Wood County. | Ap | 0–9 | 1.6 | .8 | .6 | .3 | 5.0 |
| | B1g | 9–14 | .4 | .5 | .7 | 1.5 | 2.5 |
| | B12g | 14–28 | .3 | .6 | .6 | 1.3 | 2.5 |
| | B22g | 28–46 | .3 | .6 | .6 | 1.2 | 2.4 |
| | C1 | 46–57 | .7 | 1.1 | .9 | 1.3 | 2.7 |
| Wauseon loamy fine sand, WD–70 Location: NE¼SE¼, sec. 23, T. 5 N., R. 11 E., Center Township, Wood County. | Ap | 0–8 | ---------- | ---------- | ---------- | ---------- | ---------- |
| | B21g | 8–15 | ---------- | ---------- | ---------- | ---------- | ---------- |
| | B22 | 15–34 | ---------- | ---------- | ---------- | ---------- | ---------- |
| | C1 | 34–40 | ---------- | ---------- | ---------- | ---------- | ---------- |

[1] Trace.

### HOYTVILLE SOILS, THIN SOLUM VARIANT

A profile of Hoytville clay, thin solum variant, sample number WD–87, is described in the section "Morphology of the Soils."

### KIBBIE SERIES

A profile description of Kibbie fine sandy loam (1 percent slope), sample number WD–112.

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

A2—10 to 16 inches, grayish-brown (10YR 5/2) loamy fine sand; many, medium, distinct, dark-brown (10YR 4/3) mottles; weak, fine, granular structure; very friable; neutral; clear boundary.

B1—16 to 18 inches, light olive-brown (2.5Y 5/4) loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable; neutral; clear boundary.

B21—18 to 26 inches, yellowish-brown (10YR 5/6) clay loam; many, medium, distinct, grayish-brown (2.5Y 5/2) mottles; moderate, medium, subangular blocky structure; friable; several sandy and clayey varves that are ¼ to ½ inch in thickness; neutral; clear boundary.

B22—26 to 33 inches, light olive-brown (2.5Y 5/4) loam; many, medium, distinct, grayish-brown (2.5Y 5/2) mottles; moderate, medium, subangular blocky structure; friable to firm; alternating layers or varves of clayey and sandy material that average 1 inch in thickness; neutral; abrupt boundary.

B23—33 to 36 inches, light yellowish-brown (2.5Y 6/4) clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; neutral; clear boundary.

B3—36 to 43 inches, yellowish-brown (10YR 5/4) loamy fine sand; single grain; loose; saturated with water; neutral.

C1—43 to 57 inches, pale-brown (10YR 6/3) fine sand; single grain; loose; saturated with water; calcareous.

### MERMILL SERIES

A profile of Mermill sandy clay loam, sample number WD–36, is described in the section "Morphology of the Soils."

### MILLGROVE SERIES

A profile description of Millgrove loam, in a level field, sample number WD–49.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; moderate, coarse, granular structure; friable; some fine gravel; neutral; abrupt wavy boundary.

B21g—8 to 13 inches, dark grayish-brown (10YR 4/2) loam; faint, yellowish-brown (10YR 5/4) mottles; weak, coarse, subangular blocky structure; firm; some fine gravel; mildly alkaline; diffuse wavy boundary.

B22gt—13 to 21 inches, grayish-brown (2.5Y 5/2) loam; faint, light olive-brown (2.5Y 5/6) mottles; weak, medium, subangular blocky structure; firm; some fine gravel; mildly alkaline; clear smooth boundary.

C1—21 to 43 inches, poorly sorted calcareous sand, gravel, and silt; gravel and sand predominant; diffuse wavy boundary.

C2—43 inches +, poorly sorted calcareous, medium-textured sand that grades to very fine sand and silt.

### MILTON SERIES

A profile of Milton loam, sample number WD–56, is described in the section "Morphology of the Soils."

*organic matter, and carbonates of several soil profiles*—Continued

| Particle-size distribution, in millimeters—Con. | | | | Textural class | Bulk density | $CaCO_3$ equivalent | pH | Organic matter |
|---|---|---|---|---|---|---|---|---|
| Total sand (2.0–0.05) | Silt (0.05–0.002) | Clay (less than 0.002) | Fine clay (less than 0.0002) | | | | | |
| *Pct.* | *Pct.* | *Pct.* | *Pct.* | | *Gm./cu. cm.* | | | *Pct.* |
| 6.9 | 50.6 | 42.5 | 11.7 | Silty clay | 1.16 | ---------- | 6.1 | 4.9 |
| 5.3 | 48.4 | 46.3 | 17.0 | Silty clay | ---------- | ---------- | 6.6 | 3.0 |
| 5.6 | 46.5 | 47.9 | 19.8 | Silty clay | 1.46 | ---------- | 7.0 | 1.4 |
| 5.2 | 47.4 | 47.4 | 21.1 | Silty clay | 1.49 | ---------- | 7.3 | 1.0 |
| 6.3 | 46.6 | 47.1 | 20.2 | Silty clay | 1.54 | 1.4 | 7.5 | ---------- |
| 4.6 | 48.3 | 47.1 | 19.5 | Silty clay | 1.53 | 1.2 | 7.5 | ---------- |
| 6.0 | 52.6 | 41.4 | 13.5 | Silty clay | 1.53 | 16.0 | 7.9 | ---------- |
| 8.5 | 45.3 | 46.2 | 13.0 | Silty clay | ---------- | 20.8 | 8.0 | ---------- |
| 3.5 | 67.3 | 29.2 | 8.6 | Silty clay loam | ---------- | 20.6 | 8.0 | ---------- |
| 2.9 | 64.6 | 32.5 | 8.8 | Silty clay loam | ---------- | 19.3 | 8.0 | ---------- |
| 26.8 | 41.7 | 31.5 | 6.4 | Clay loam | ---------- | 24.6 | 8.0 | ---------- |
| | | | | | | | | |
| 6.3 | 47.4 | 46.3 | 17.1 | Silty clay | ---------- | ---------- | 6.4 | 3.6 |
| 5.6 | 44.8 | 49.6 | 19.1 | Silty clay | ---------- | ---------- | 6.9 | 1.9 |
| 5.3 | 42.6 | 52.1 | 21.7 | Silty clay | ---------- | ---------- | 7.0 | 1.0 |
| 5.1 | 43.0 | 51.9 | 22.0 | Silty clay | ---------- | ---------- | 7.2 | .4 |
| 6.7 | 49.7 | 43.6 | 15.7 | Silty clay | ---------- | 6.4 | 7.5 | ---------- |
| | | | | | | | | |
| 79.2 | 15.1 | 5.7 | ---------- | Loamy fine sand | ---------- | ---------- | 6.9 | 5.5 |
| 83.4 | 7.9 | 8.7 | ---------- | Loamy fine sand | ---------- | ---------- | 7.3 | ---------- |
| 84.1 | 7.3 | 8.6 | ---------- | Loamy fine sand | ---------- | 1.6 | 7.5 | ---------- |
| 77.2 | 12.8 | 10.0 | ---------- | Sandy loam | ---------- | 17.5 | 7.8 | ---------- |

[2] Composite horizon (irregular, thin, intermittent seams or bands of weakly cemented material that is higher in content of clay than the material between the bands. These bands generally occur below a depth of 36 inches but in places are at a depth of 15 to 18 inches.

### Nappanee Series

A profile of Nappanee loam, sample number WD–44, is described in the section "Morphology of the Soils."

### Spinks Series

A profile of Spinks fine sand, sample number WD–110, is described in the section "Morphology of the Soils."

### Toledo Series

A profile description of Toledo silty clay (0 to 1 percent slope), sample number WD–114.

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay; moderate, medium, granular structure; firm; slightly acid; clear boundary.

A12—8 to 10 inches, very dark grayish-brown (10YR 3/2) silty clay; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; strong, medium, angular blocky structure; firm; slightly acid; abrupt boundary.

B1g—10 to 20 inches, gray (N 6/0) silty clay; common, medium, prominent, strong-brown (7.5YR 5/6) mottles; strong, medium, angular and subangular blocky structure; very firm; neutral; gradual boundary.

B21g—20 to 29 inches, gray (10YR 6/1) silty clay; common, medium, prominent, strong-brown (7.5YR 5/6) mottles and a few, fine, distinct, yellowish-brown (10YR 5/6) mottles; strong, medium, subangular blocky structure; very firm; neutral; diffuse boundary.

B22g—29 to 36 inches, gray (10YR 6/1) silty clay; common, medium, distinct, yellowish-red (5YR 5/6) mottles and a few, fine, faint, distinct, strong-brown (7.5YR 5/8) mottles; strong, medium to coarse, subangular blocky structure; very firm; neutral; diffuse boundary.

B22g—36 to 45 inches, gray (10YR 6/1) silty clay; common, medium, distinct, yellowish-red (5YR 5/6) mottles and a few, fine, faint, distinct, strong-brown (7.5YR 5/8) mottles; strong, medium to coarse, subangular blocky structure; very firm; neutral; diffuse boundary.

C1—45 to 52 inches, yellowish-brown (10YR 5/8) silty clay; many, coarse, distinct, gray (10YR 6/1) mottles; massive to strong, medium, subangular blocky structure; very firm; moderately alkaline; gradual boundary.

C2—52 to 58 inches, gray (N 5/0) silty clay; common, medium, prominent, yellowish-brown (10YR 5/4) mottles; massive; very firm; lime coats on surface of light-gray (10YR 7/1) peds; moderately alkaline; abrupt boundary.

C3—58 to 82 inches, yellowish-brown (10YR 5/4) silty clay loam; weak, thin to medium, platy structure; friable to firm; light gray (10YR 7/1) lime coats; horizon made up mostly of layers of clay and silt and some thin layers of very fine sand; moderately alkaline; sampled at a depth of 58 to 70 inches and 70 to 82 inches.

C4—82 to 95 inches, brown (10YR 5/3) silty clay; massive; very firm; some igneous pebbles and small fragments of shale and limestone; moderately alkaline.

A profile of Toledo silty clay, sample number WD–99, is described in the section "Morphology of the Soils."

### Wauseon Series

A profile of Wauseon loamy fine sand, sample number WD–70, is described in the section "Morphology of the Soils."

TABLE 7.—*Chemical characteristics of two Hoytville soils*

[Lack of data indicates determination was not made]

| Soil, site number, and location | Horizon | pH | Exchangeable cations (meq. per 100 gm. of soil) | | | | Summary exchangeable cations | Total bases | Base saturation | Carbon | Nitrogen | Carbon-nitrogen ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | H | Ca | Mg | K | | | | | | |
| | | | | | | | *Meq./100 gm.* | *Meq./100 gm.* | *Pct.* | *Pct.* | *Pct.* | |
| Hoytville silty clay loam, WD-59 Location: NE¼SW¼, sec. 18, T. 3 N., R. 10 E., Henry Township, Wood County. | A1 | 6.3 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| | A3g | 6.6 | 6.0 | 23.5 | 2.9 | 0.40 | 32.8 | 26.8 | 82 | ------ | ------ | ------ |
| | B1g | 6.8 | 3.8 | 19.0 | 3.4 | .46 | 26.7 | 22.9 | 86 | ------ | ------ | ------ |
| | B21g | 7.0 | 2.0 | 17.1 | 3.5 | .47 | 23.1 | 21.1 | 91 | ------ | ------ | ------ |
| | B22g | 7.2 | 1.6 | 15.7 | 3.1 | .45 | 20.9 | 19.3 | 92 | ------ | ------ | ------ |
| Hoytville clay loam, WD-84 Location: SW¼NW¼ sec. 18, T. 3 N., R. 10 E., Henry Township, Wood County. | Ap | 6.1 | 10.6 | 21.2 | 2.5 | .47 | 34.8 | 24.2 | 70 | 3.3 | 0.32 | 10.3 |
| | B21g | 6.5 | 6.3 | 20.9 | 2.4 | .42 | 30.0 | 23.7 | 79 | 1.5 | .15 | 10.1 |
| | B22g | 6.8 | 4.7 | 19.5 | 2.5 | .45 | 27.2 | 22.5 | 83 | .87 | .11 | 7.9 |
| | B22 | 6.9 | 3.9 | 17.5 | 2.7 | .45 | 24.6 | 20.7 | 84 | .64 | .09 | 7.1 |
| | B3g | 7.1 | 3.3 | 17.2 | 2.8 | .45 | 23.8 | 20.5 | 86 | .48 | .09 | 5.2 |
| | B3g | 6.9 | 2.7 | 17.5 | 2.7 | .45 | 23.4 | 20.7 | 88 | .35 | .06 | 5.8 |
| | B3g | 7.2 | 3.0 | 15.2 | 2.4 | .42 | 21.0 | 18.0 | 86 | .41 | .07 | 5.8 |
| | B3 | 7.3 | 2.9 | 15.2 | 2.1 | .38 | 20.6 | 17.7 | 86 | ------ | ------ | ------ |

## *Additional Facts About the County*

This section gives some facts concerning the history, industries, transportation, climate, agricultural trends, and geology of the county.

Wood County was named for Col. Eleazer Derby Wood, who was the officer in charge of building Fort Meigs during the War of 1812. The area was first called the great swamp and was later known as the Black Swamp.

After the War of 1812, settlement began along the rivers. Little progress was made, however, until the first drainageways were established about the time of the Civil War. During the next 30 years, many open ditches were constructed, and much of the land was cleared and cultivated.

At the present time, about 4.5 percent of the agricultural land in the county is wooded, 3 percent is used for pasture, 89 percent is used for crops, and 3.5 percent is used for other miscellaneous agricultural purposes. Agricultural land in the northern part of the county is being converted to sites for housing developments and manufacturing plants at a rate of more than 500 acres per year.

### *Industry*

In Wood County, the income from industry is second to that of agriculture, and industrial income is increasing. Food processing plants make up the largest industrial enterprise, but there are many other plants that manufacture a wide variety of products. Most of these plants are concentrated in the northern part of the county. Glass making is an important industry at Rossford, and alfalfa dehydrating mills are located in all parts of the county, except the southeastern. There are also several quarries that are active. Many people living in Wood County work in Toledo.

Grain elevators are located in most towns in the county and are within easy reach of all farms. Three grain terminal markets are just north of the county line near Perrysburg and Rossford.

### *Transportation*

Wood County is served by three railroads. Federal, State, and county roads provide a complete network of highways. There are fewer than 20 miles of roads in the county that are not blacktop.

Great Lakes water transportation is supplied by a terminal at Rossford and by the Toledo Port Authority, which is one of the largest ports on the Great Lakes.

Pipeline carriers traverse the area, and there is a large pumping station at Cygnet.

### *Climate*

Wood County has a continental climate. There are no mountain ranges to protect it from the cold air of the polar region and no effective barriers between it and the source of warm, moist air masses from the south. Consequently, the annual range of temperature from winter to summer is much wider than that in typically marine climates. Lake Erie exercises some moderating influence on the climate in the northern part of the county, but only when winds are blowing from the northeast.

Table 8 gives temperature and precipitation data from the U.S. Weather Bureau Station at Bowling Green. The elevation at the weather station is 675 feet, which is within about 80 feet of that in most parts of the county. The highest elevation is in the extreme southern part and may account in part for the increase in precipitation from north to south. Otherwise, observations made at Bowling Green are representative of the whole area. Table 8 gives the monthly highest and lowest readings in temperature that may reasonably be expected to occur in typical years, rather than the extreme high and low that have been recorded.

In table 9 is shown the probability of freezing temperatures at Bowling Green after specified dates in spring and before specified dates in fall. The probability of

TABLE 8.—*Temperature and precipitation at Bowling Green*

[Elevation, 675 feet]

| Month | Temperature | | | | | Precipitation | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average daily [1]— | | | Two years in 10 will have at least 4 days with [2]— | | Average [1] | One year in 10 will have [3]— | | Average snowfall [4] |
| | Maximum | Minimum | Mean | Maximum temperature equal to or lower than— | Minimum temperature equal to or lower than— | | Less than— | More than— | |
| | °F. | °F. | °F. | °F. | °F. | Inches | Inches | Inches | Inches |
| January | 36.3 | 20.3 | 28.3 | 54.0 | 2.3 | 2.13 | 0.72 | 4.27 | 2.9 |
| February | 38.1 | 20.8 | 29.4 | 53.8 | 3.7 | 1.73 | .59 | 2.99 | 3.5 |
| March | 47.0 | 27.3 | 37.2 | 67.2 | 13.8 | 2.55 | 1.16 | 4.59 | 2.3 |
| April | 60.8 | 37.5 | 49.2 | 79.3 | 25.5 | 3.20 | 1.48 | 5.26 | .4 |
| May | 72.6 | 48.4 | 60.5 | 85.8 | 35.8 | 3.58 | 1.59 | 5.49 | (5) |
| June | 82.7 | 58.5 | 70.6 | 93.3 | 47.0 | 3.77 | 1.45 | 5.82 | |
| July | 86.9 | 62.2 | 74.6 | 93.9 | 51.7 | 3.22 | 1.35 | 6.01 | |
| August | 85.2 | 60.4 | 72.8 | 94.2 | 49.5 | 2.70 | 1.09 | 5.09 | |
| September | 78.1 | 53.8 | 65.9 | 91.3 | 39.7 | 2.71 | .90 | 5.70 | |
| October | 66.6 | 43.0 | 54.8 | 82.4 | 30.1 | 2.49 | .86 | 4.60 | (5) |
| November | 50.1 | 32.5 | 41.3 | 67.5 | 18.7 | 2.10 | .80 | 3.99 | 2.3 |
| December | 38.2 | 22.9 | 30.6 | 56.4 | 1.6 | 1.81 | .67 | 3.79 | 5.0 |
| Year | 61.9 | 40.7 | 51.3 | | | 31.99 | 25.67 | 38.45 | 16.4 |

[1] Based on a 30-year record, through 1960.
[2] Based on a 20-year record, through 1963.
[3] Based on a 68-year record, through 1960.
[4] Based on a 23-year record, through 1953.
[5] Trace.

TABLE 9.—*Probability of freezing temperatures of Bowling Green after specified dates in spring and before specified dates in fall*

| Probability | Dates for given probability and temperature at— | | | | | |
|---|---|---|---|---|---|---|
| | 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 | Mar. 31 | Apr. 11 | Apr. 24 | May 10 | May 23 | June 1 |
| 2 years in 10 later than | Mar. 25 | Apr. 5 | Apr. 18 | May 4 | May 17 | May 27 |
| 5 years in 10 later than | Mar. 14 | Mar. 25 | Apr. 7 | Apr. 22 | May 6 | May 19 |
| Fall: | | | | | | |
| 1 year in 10 earlier than | Nov. 13 | Nov. 1 | Oct. 20 | Oct. 7 | Sept. 23 | Sept. 11 |
| 2 years in 10 earlier than | Nov. 18 | Nov. 6 | Oct. 25 | Oct. 12 | Sept. 28 | Sept. 16 |
| 5 years in 10 earlier than | Nov. 27 | Nov. 15 | Nov. 4 | Oct. 21 | Oct. 8 | Sept. 26 |

lower temperatures is shown in this table because some vegetation will not be injured until the temperature falls 4 degrees or more below freezing. Ordinarily, these lower temperatures occur on clear, calm nights, and the temperature will not remain at these extremes for more than an hour or so in the morning.

In an average winter, the soils seldom freeze to a depth of more than 12 to 15 inches. During a long period of severe cold, if there is no protective snow cover, they may freeze to a depth of 2 feet or even 3 feet. The deepest penetration occurs under highways and in areas from which the snow has been removed. A warm period, even in midwinter, will cause the soil to gradually thaw, and within 10 days all frost may disappear. In March and April, topsoil temperatures increase practically as fast as does the air temperature, especially if the surface is bare. Heavy vegetation or a mulch on the surface will retard the warming process.

Winter generally is the season during which soil-moisture reserves are replenished. Consequently, at the start of a new growing season, the moisture percentage generally can be expected to equal or to exceed that of field capacity. Spring rainfall ordinarily is sufficient to maintain a high level of soil moisture until the end of June. During July and August, however, rainfall normally is not enough for plant needs. As a result, late in August and in September all but 20 to 25 percent of the available moisture in the root zone has been exhausted. The summer must be unusually wet to maintain an available moisture supply above 50 percent.

Wood County has about 115 clear days each year, 114 partly cloudy days, and 136 cloudy days. The highest percentage of clear days occurs in summer and early in autumn. The relative humidity reaches its lowest seasonal level of nearly 50 percent on midsummer afternoons and its highest, 85 percent, during the early morning hours. On hot dry days in summer it frequently falls below 30 percent. The wind speed averages about 11 miles per hour but may attain velocities in excess of 40 miles per hour during thunderstorms in spring and summer. Tornadoes are not unknown to Wood County, but they are much less frequent and cause less damage than in States farther west and south. They occur about once every 4 or 5 years.

### *Agricultural trends*

In recent years a considerable acreage of the land in farms, particularly in the northern part of the county, has been converted to sites for building developments. Much of this acreage was cropland, but this loss was offset to a great extent by the conversion of woodland and pasture to cropland.

Wood County is primarily a cash-grain area. Many farmers control large acreages but own no livestock. The agricultural census shows that the major change in acreage in cash crops since 1949 has been in the reduction of acreage in wheat. The acreage in other small grain, principally oats, has also decreased. There has been a considerable increase in the acreage in soybeans and a moderate increase in the acreage in corn. Table 10 shows the acreage of the principal crops in the county for stated years.

There are fewer farms in the county now than there were 10 years ago, but the farms generally are larger. The number of commercial farms has decreased from 2,657 in 1950 to 1,853 in 1959. Table 11 shows the acreage in farms, by use, for stated years.

There are more cattle in the county now than there were in 1950, but the acreage in pasture is less. It can be assumed, therefore, that some of these animals are dry-lot fed. Table 12 shows the number of livestock in the county for stated years.

TABLE 10—*Acreage of principal crops for stated years*

| Crop | 1949 | 1954 | 1959 |
|---|---|---|---|
| | *Acres* | *Acres* | *Acres* |
| Corn for all purposes | 88, 085 | 88, 433 | 99, 981 |
| Wheat harvested | 59, 880 | 51, 280 | 27, 125 |
| Oats harvested | 48, 506 | 32, 718 | 40, 542 |
| Soybeans harvested | 50, 693 | 63, 696 | 81, 459 |
| Alfalfa and alfalfa mixture | 23, 288 | 31, 937 | 17, 973 |
| Other hay | 6, 360 | 6, 822 | 5, 441 |
| Tomatoes | 2, 518 | 1, 109 | 1, 613 |
| Sugar beets | 2, 633 | 1, 778 | 4, 039 |
| Land from which hay was cut | 30, 119 | 40, 299 | 24, 326 |

### *Geology* [10]

Wood County lies entirely within the lake plain formed by the glacial lakes that preceded the present Lake Erie. This flat plain is traversed by sand ridges that extend generally east-northeastward. Most of these ridges represent beaches, dunes, and offshore bars of the lake stage known as Lake Warren. The southwestern part of the county is traversed by less extensive ridges that formed during the stage known as Lake Arkona. The lake plain between the ridges is covered by deposits of fine-textured material that was carried to the glacial lake by the streams that drained the area.

Throughout most of the county, both the sand ridges and lake desposits are underlain by till that was deposited by the glacier as it melted and receded northward in late Wisconsin time. The thickness of the glacial till ranges from a few inches in some areas where limestone is close to the surface to about 80 feet in other areas. Because of this mantle of till, the soils have been little influenced by bedrock, except in those areas where the till is thin or where bedrock is exposed.

The present topography shows much less variation than the preglacial topography. For example, the surface relief at Bowling Green is about 20 feet, whereas the relief of the underlying bedrock is about 35 feet.

Bedrock in Wood County consists of dolomite and limestone of the Silurian and Devonian systems. The Guelph dolomite of Silurian age (Niagaran) underlies both an oval shaped area that extends northeastward and southwestward from Bowling Green and some small irregular areas in the southeastern part of the county. The Columbus limestone of Devonian age (Ulsterian) underlies the northwestern part of the county. The remaining area, which makes up the largest part of the county, is underlain by upper Silurian and lower Devonian rocks that represent several formations. Although the Salina, Bass Island, and Detroit River groups have been differentiated in the surrounding area, details of the formation boundaries have not been outlined in Wood County. The rocks in the county are chiefly dolomite or dolomitic limestone, but Sylvania sandstone does enter the county and can be seen in the rapids of the Maumee River, at Otsego.

TABLE 11.—*Acreage in farms, by use, for stated years*

| Use | 1950 | 1954 | 1959 |
|---|---|---|---|
| | *Acres* | *Acres* | *Acres* |
| Cropland harvested | 287, 660 | 283, 858 | 286, 931 |
| Woodland (total) | 20, 847 | 20, 328 | 17, 262 |
| Pasture (not cropland and not woodland) | 8, 233 | 6, 720 | 6, 026 |
| Land in farms | 355, 264 | 343, 410 | 339, 989 |

TABLE 12.—*Number of livestock on farms for stated years*

| Livestock | 1950 | 1954 | 1959 |
|---|---|---|---|
| | *Number* | *Number* | *Number* |
| Cattle and calves | 24, 417 | 30, 005 | 29, 306 |
| Hogs and pigs | 31, 498 | 29, 678 | 32, 332 |
| Sheep and lambs | 8, 598 | 10, 976 | 12, 062 |
| Chickens | [1] 187, 069 | [1] 208, 738 | [1] 157, 581 |
| Turkeys raised | 8, 593 | 10, 596 | 14, 438 |

[1] Over 4 months old.

[10] This section was prepared by JOHN R. COASH, Ph. D., professor of geology, Bowling Green University.

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## Glossary

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Alluvium.** Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

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

**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; will 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.

**Contour farming.** Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

**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.

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

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

**Glacial till (geology).** Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Glacial outwash (geology).** Cross-bedded gravel, sand, and silt deposited by meltwater as it flowed from glacial ice.

**Green manure (agronomy).** A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

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

**Organic matter.** A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

**Parent material (soil).** The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

**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 or alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

| | *pH* | | *pH* |
|---|---|---|---|
| Extremely acid | Below 4.5 | 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.** As a soil separate, individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be any mineral composition. As a textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

**Solum.** The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

**Stratified.** Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

**Structure, soil.** The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The 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 profile below plow depth.

**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 generally are wide.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or very fine."

**Tile drain.** Concrete or pottery pipe placed at suitable spacings and depths in the soil or subsoil to provide water outlets from the soil.

**Topsoil.** A presumed fertile soil or soil material, 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.

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