

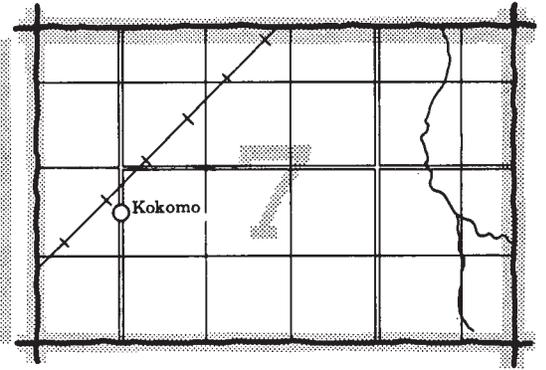
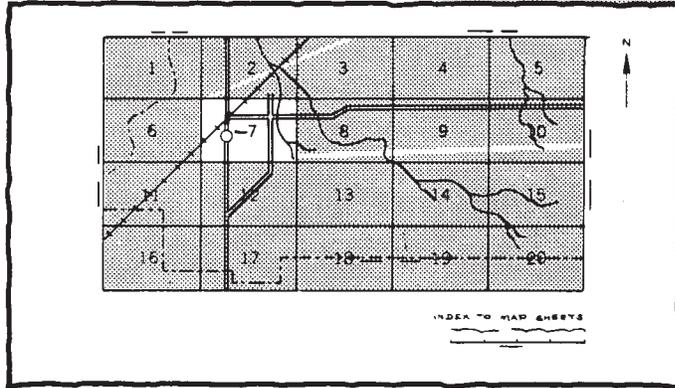
**SOIL SURVEY OF**  
**POSEY COUNTY, INDIANA**

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**UNITED STATES DEPARTMENT OF AGRICULTURE**  
**SOIL CONSERVATION SERVICE**  
**IN COOPERATION WITH**  
**PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION**

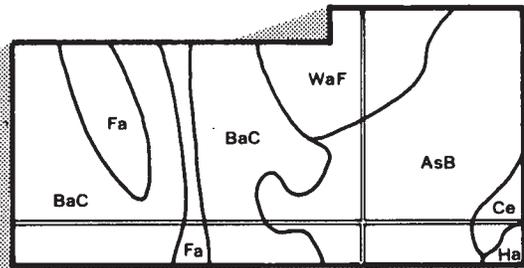
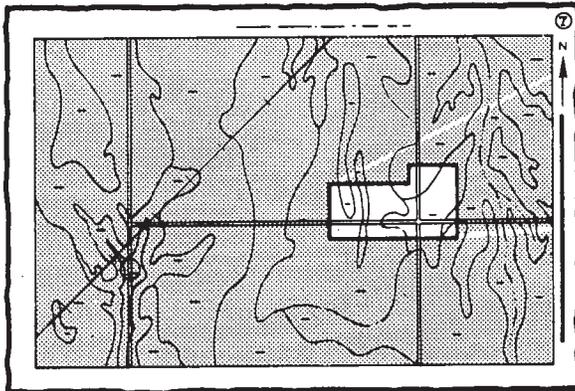
# HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

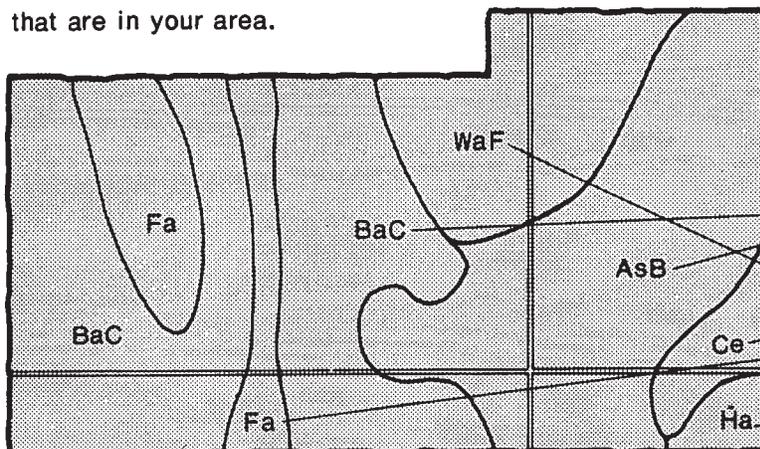


2. Note the number of the map sheet and turn to that sheet.

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



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

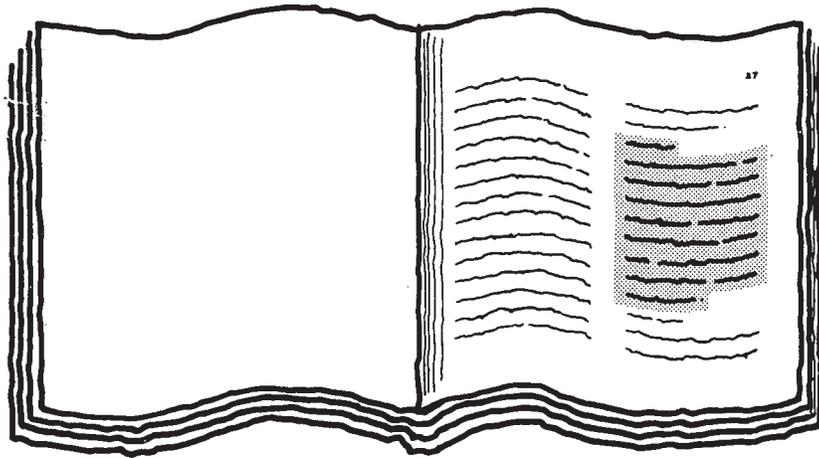


## Symbols

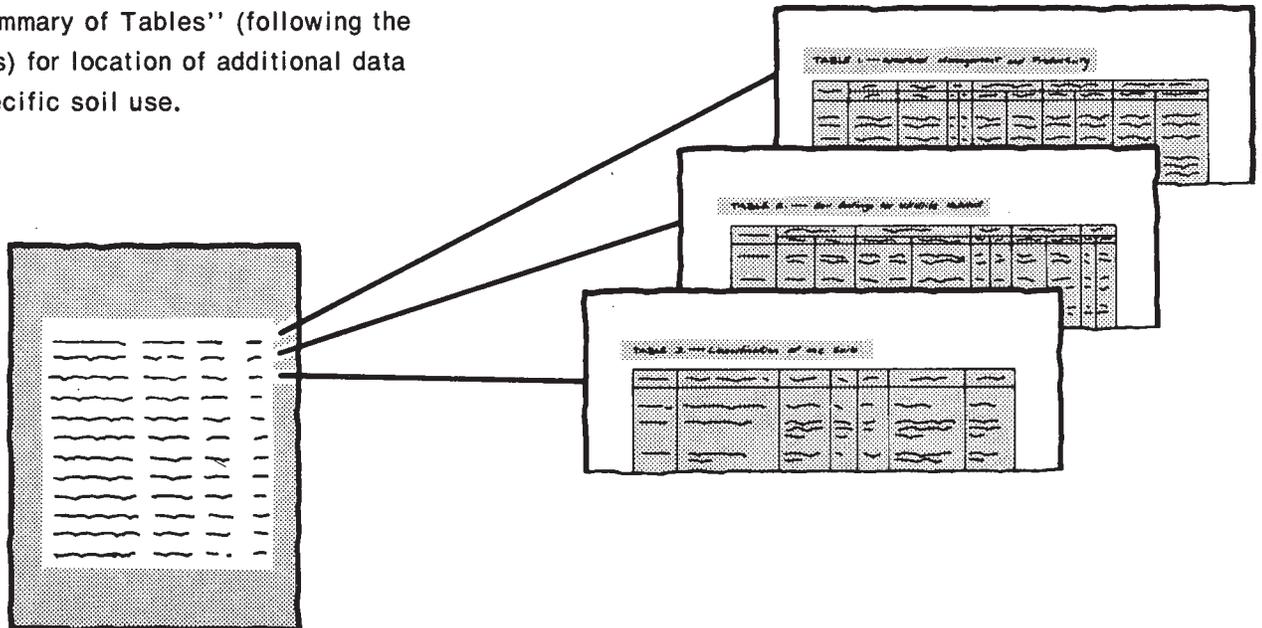
- AsB
- BaC
- Ce
- Fa
- Ha
- WaF

# THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.

A magnified view of the shaded area from the book. It shows a table with multiple columns and rows of text, representing the 'Index to Soil Map Units'.

6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1972-1977. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Posey County Soil and Water Conservation District. Financial assistance was made available by the Posey County Commissioners.

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

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## Foreword

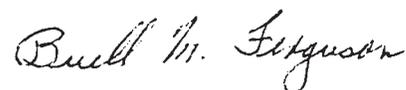
The Soil Survey of Posey County contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

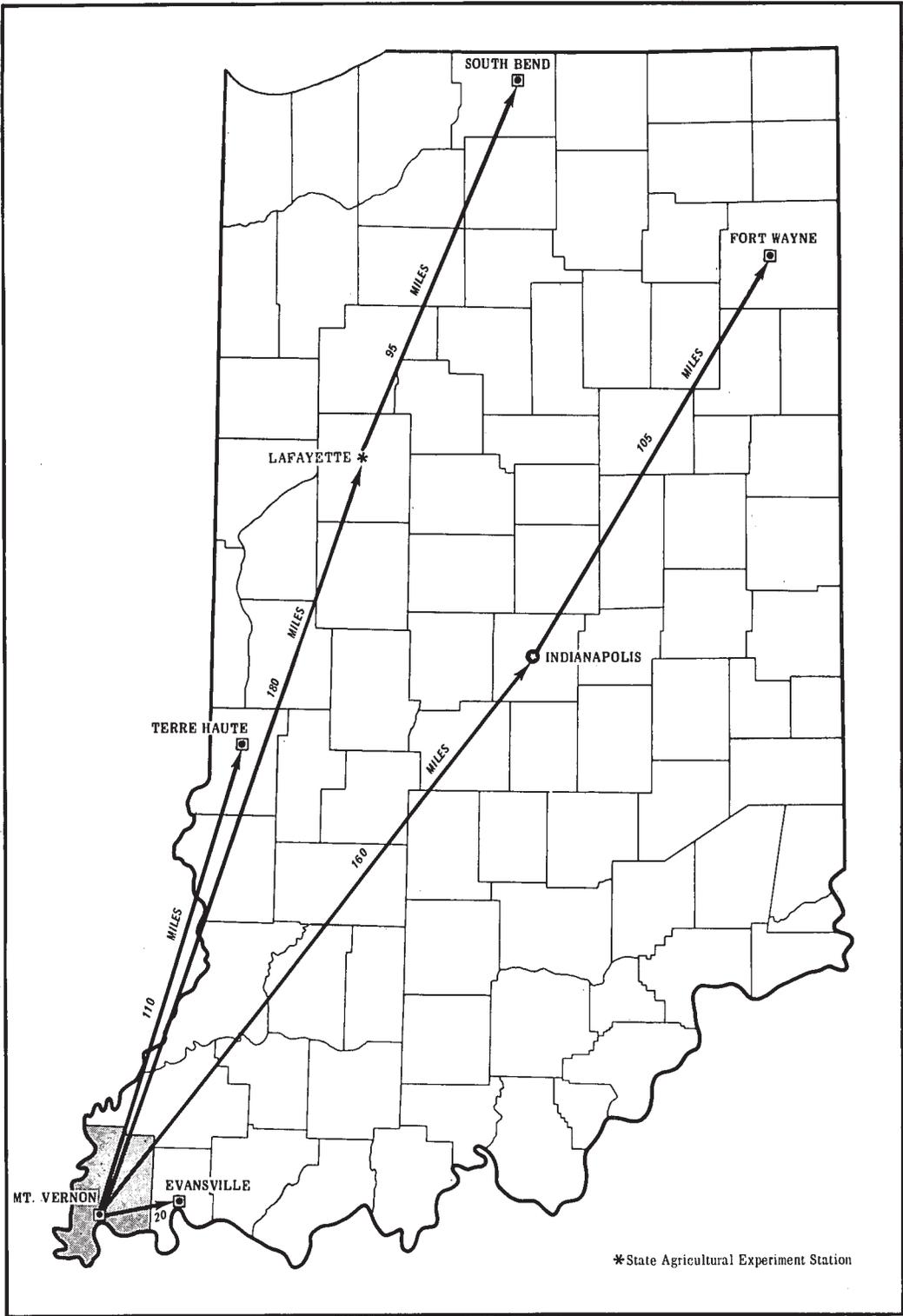
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.



State Conservationist  
Soil Conservation Service



Location of Posey County in Indiana

# SOIL SURVEY OF POSEY COUNTY, INDIANA

By Kendall M. McWILLIAMS, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,  
in cooperation with Purdue University Agricultural Experiment Station

POSEY COUNTY is in the extreme southwest corner of Indiana. It is bordered on the south by the Ohio River and the State of Kentucky and on the west by the Wabash River and the State of Illinois. Mt. Vernon, the largest city, is the county seat. The county has a land area of about 414 square miles, or 264,960 acres. It extends about 16 miles from east to west and about 30 miles from north to south. The population is about 21,700 (7). Businesses within the county employ a large part of the work force of the county. About 30 percent of the work force is engaged in manufacturing, and about 9 percent is engaged in farming.

## General nature of the county

The county consists of rolling uplands with flat plains along the Wabash and Ohio Rivers. The uplands are dissected by numerous streams and drainageways. Elevation ranges from about 335 to 573 feet above sea level.

About 90 percent of the county is actively farmed. Corn, soybeans, and wheat are the principal crops. Livestock is raised to a lesser extent. The steeper areas and undrained lowlands are used for woodland.

General features that have an effect on soil use in Posey County are discussed briefly on the following pages.

## Relief

The highest point in Posey County is about 573 feet above sea level. It is near the junction of St. Wendel Road and Island Road in Robinson Township, about 1-1/2 miles southwest of the town of St. Wendel. The lowest point is about 335 feet above sea level. It is located near the junction of the Wabash and Ohio Rivers in Point Township.

Posey County generally consists of rolling uplands and

broad flat plains. The uplands are characterized by gently sloping ridgetops and moderately sloping to steep side slopes and are dissected by numerous streams and drainageways. In general, the steeper side slopes and the narrower ridgetops are near the rivers and main streams. The flat plains are usually associated with the rivers. They are nearly level or gently sloping. Several of these plains are at different elevations and are separated by short abrupt slopes.

## Water

Drilled wells are the main source of water in Posey County. The cities of New Harmony, Poseyville, and Cynthiana obtain their municipal water supplies from deep wells. The city of Mt. Vernon pumps water from the Ohio River. The German Township Water District buys water from Evansville, in Vanderburgh County, and supplies it to the towns of Wadesville, Blairsville, and St. Wendell and to the surrounding area. Other towns and residences in Posey County depend on ground water from individual wells.

In upland areas, ground water is limited in extent. Its principal source is sandstone of Pennsylvanian age. Depth of individual wells varies from about 40 feet to more than 100 feet. On the river plains, ground water is generally abundant. These areas are underlain by sand and gravel which contain considerable ground water. The depth of individual wells ranges from about 20 to 50 feet. In some areas, water quality is a problem and special treatment is needed to remove undesirable elements.

## Climate

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Mt. Vernon for the period 1951 to 1974. Table 2 shows probable dates of

the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 34 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at Mt. Vernon on January 23, 1963, is 13 degrees below zero. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on September, 2, 1953, is 107 degrees.

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

Of the total annual precipitation, 23 inches, or 55 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5.13 inches at Mt. Vernon on January 21, 1957. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is 12 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 7 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 45 percent of the time possible in winter. The prevailing wind is from the south southwest. Average windspeed is highest, 10 miles per hour, in March.

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

## Transportation facilities

About 15 miles of Interstate Highway 64 crosses the northern end of Posey County. In addition the county has about 14 miles of federal highways, 67 miles of state highways, and about 850 miles of county roads. Most of the county roads are graveled, and a few are paved.

The Ohio River is a major route for barge traffic. A large port under construction near Mt. Vernon will provide large volume loading and unloading facilities and also storage facilities for barge transported cargo.

Two main railroad lines cross the county. No passenger service is available.

There are no large airports in Posey County, but an airport near Mt. Vernon serves small private planes. The

nearest airport served by commercial airlines is in Vanderburgh County, about 25 miles from Mt. Vernon.

## Trends in population and land use

Posey County has a population of about 21,700 people and a population density of about 52 people per square mile. Population increased 13.1 percent between 1960 and 1970 and is anticipated to increase by about 25 percent by 1980 (4).

At the present time about 5 percent of the county is urban and the rest is mostly agricultural. Recent trends have been toward a moderate rate of conversion of agricultural land to urban uses. This trend is expected to continue.

## How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

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

The areas shown on a soil map are called soil map units. Map units are made up of one kind of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are

added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

## General soil map for broad land use planning

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

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

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

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units on the general soil map and gives general ratings of the potential of each, in relation to the other map units, for major land uses. Soil properties that pose limitations to the use are indicated. The ratings of soil potential are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Each map unit is rated for *cultivated farm crops, specialty crops, woodland, urban uses, and recreation areas*. Cultivated farm crops are those grown extensively by farmers in the survey area. Specialty crops include vegetables, fruits, and nursery crops grown on limited acreage and generally requiring intensive management. Woodland refers to land that is producing either trees native to the area or introduced species. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas include campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas include those used for nature study and as wilderness.

The names of some map units and their boundaries may not match those on the recently published survey of Vanderburgh County. This is due to changes in concepts of soil series, in the application of the soil classification system, and to variations of the percentage of the major soils in the various map units.

## Well drained and moderately well drained, medium textured, nearly level to very steep soils on uplands

The map units in this group are made up mostly of soils that are subject to erosion. These soils make up about 48 percent of the county. They are used mainly for corn, soybeans, and winter wheat. Grasses and legumes are also grown, and the steeper areas are in hardwood trees. The limitations to urban development of the soils range from slight to severe.

### 1. Alford-Sylvan-Iona

*Deep, nearly level to very steep, well drained and moderately well drained soils that have a silty subsoil and that formed in loess*

Areas of this map unit are on uplands throughout the county. These areas are on ridgetops and side slopes that are higher than the surrounding land.

This map unit occupies about 46 percent of the county. It is about 41 percent Alford soils, 13 percent Sylvan soils, 12 percent Iona soils, and 34 percent soils of minor extent (fig. 1).

Alford soils are on ridgetops and upper side slopes, generally at a higher elevation than Sylvan soils. Sylvan soils are on side slopes, and Iona soils are on the broader ridgetops and saddles of ridges and in upper ends of drainageways (fig. 2). Alford and Sylvan soils are well drained, and Iona soils are moderately well drained. All of these soils have a silt loam surface layer.

Of minor extent in this map unit are the Haymond, Uniontown, Wakeland, and Wellston soils. The well drained Haymond soils and the somewhat poorly drained Wakeland soils are along narrow drainageways and streams. The well drained Wellston soils are on strongly sloping to steep side slopes. The well drained or moderately well drained Uniontown soils are on toe slopes.

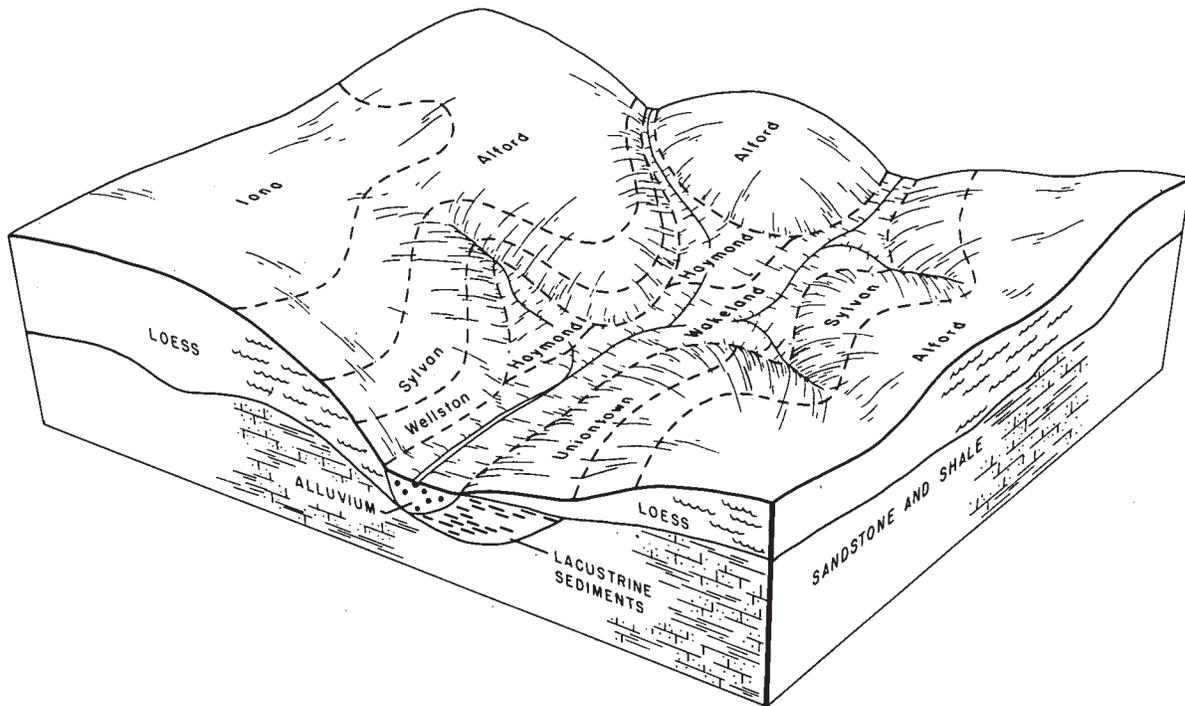


Figure 1.—Pattern of soils and underlying material in the Alford-Sylvan-Iona map unit.



Figure 2.—Typical landscape in the Alford-Sylvan-Iona map unit. Alford and Iona soils on ridgetops; Sylvan soils on side slopes.

This map unit is used mainly for crops. The steeper areas are generally in pasture or in woodland. Erosion is the main limitation to farming and most other uses.

This map unit, when protected from erosion, has fair potential for cultivated farm crops and fair potential for residential and other urban development. Slope is the main limitation. The potential for woodland and for both openland and woodland wildlife habitat is good.

## 2. Alford-Hosmer-Iona

*Deep, gently sloping to strongly sloping, well drained and moderately well drained soils that have a silty subsoil and that formed in loess*

Areas of this map unit are located in the eastern part of the county. These areas are on ridgetops and side slopes on uplands.

This map unit occupies about 2 percent of the county. It is about 31 percent Alford soils, 27 percent Hosmer soils, 17 percent Iona soils, and 25 percent soils of minor extent.

Alford and Hosmer soils are on ridgetops and side slopes. They are well drained and have a silt loam surface layer. Hosmer soils have a fragipan in the subsoil. Iona soils are on the broader ridgetops. They are moderately well drained and have a silt loam surface layer.

Of minor extent in this map unit are the well drained Wellston soils and the somewhat poorly drained Wakeland soils. Wellston soils are on side slopes. Wakeland soils are along streams and small drainageways.

This map unit is mainly cropland and woodland. Some areas are used for pasture. Erosion is the main limitation to farming.

This map unit has fair potential for cultivated farm crops. Slope and the hazard of erosion are the main limitations. The potential for urban uses is only fair because of slope and restricted permeability in the subsoil of most soils. It is good for woodland and for development of woodland wildlife habitat.

## **Very poorly drained to somewhat poorly drained, medium textured and moderately fine textured, nearly level soils on terraces**

The map units in this group are made up mostly of soils that have a seasonal high water table. These soils make up about 10 percent of the county. Most areas are drained and are used for corn, soybeans, and winter wheat. A few undrained areas are in hardwood trees. The limitations to urban development of these soils are severe.

## 3. Evansville-Henshaw-Patton

*Deep, nearly level, poorly drained and somewhat poorly drained soils that have a silty subsoil and that formed in silty sediments*

Areas of this map unit are mainly in the southern part of the county. These areas are old lake plains that are lower in elevation than the adjacent uplands and higher than the adjacent river terraces.

This map unit occupies about 6 percent of the county. It is about 42 percent Evansville soils, 29 percent Henshaw soils, and 22 percent Patton soils. The remaining 7 percent is soils of minor extent.

Evansville soils, in most places, are slightly higher in elevation than Patton soil and lower in elevation than Henshaw soils (fig. 3). Evansville and Patton soils are poorly drained, and Henshaw soils are somewhat poorly drained. Evansville and Henshaw soils have a silt loam surface layer, and Patton soils have a silty clay loam surface layer. All have a seasonal high water table.

Of minor extent in this map unit are the well drained or moderately well drained Uniontown soils and the somewhat poorly drained Wakeland soils. Uniontown soils are on the higher lakebed terraces and on toe slopes near the uplands. Wakeland soils are along streams and drainageways.

This map unit is mainly cropland. Most areas have been drained. A few undrained areas are in woodland. Wetness is the main limitation to the use of these soils for farming and for most other purposes.

This map unit, when adequately drained, has good potential for cultivated farm crops. Wetness is such a severe limitation and is so difficult to overcome that the unit has poor potential for residential and other urban uses. The potential for woodland and the development of wetland wildlife habitat is good.

## 4. Ragsdale-Reesville

*Deep, nearly level, very poorly drained and somewhat poorly drained soils that have a silty subsoil and that formed in loess*

This map unit is on nearly level lakebed plains. Topography is characterized by very gradual swells and swales. The area is large and is in the northeast part of the county.

This map unit occupies about 4 percent of the county. It is about 31 percent Ragsdale soils, 26 percent Reesville soils, and 43 percent soils of minor extent.

The very poorly drained Ragsdale soils are on the lower lying flats and depressions in the landscape. The somewhat poorly drained Reesville soils are on higher lying broad flats and slight rises in the landscape. Both of these soils have a silt loam surface layer.

Of minor extent in this map unit are the poorly drained Evansville and Patton soils and the well drained and moderately well drained Uniontown soils. Evansville soils are along drainageways and low lying flats; Patton soils are in the deeper depressions and low lying pockets; and Uniontown soils are on the higher lying swells and breaks along drainageways.

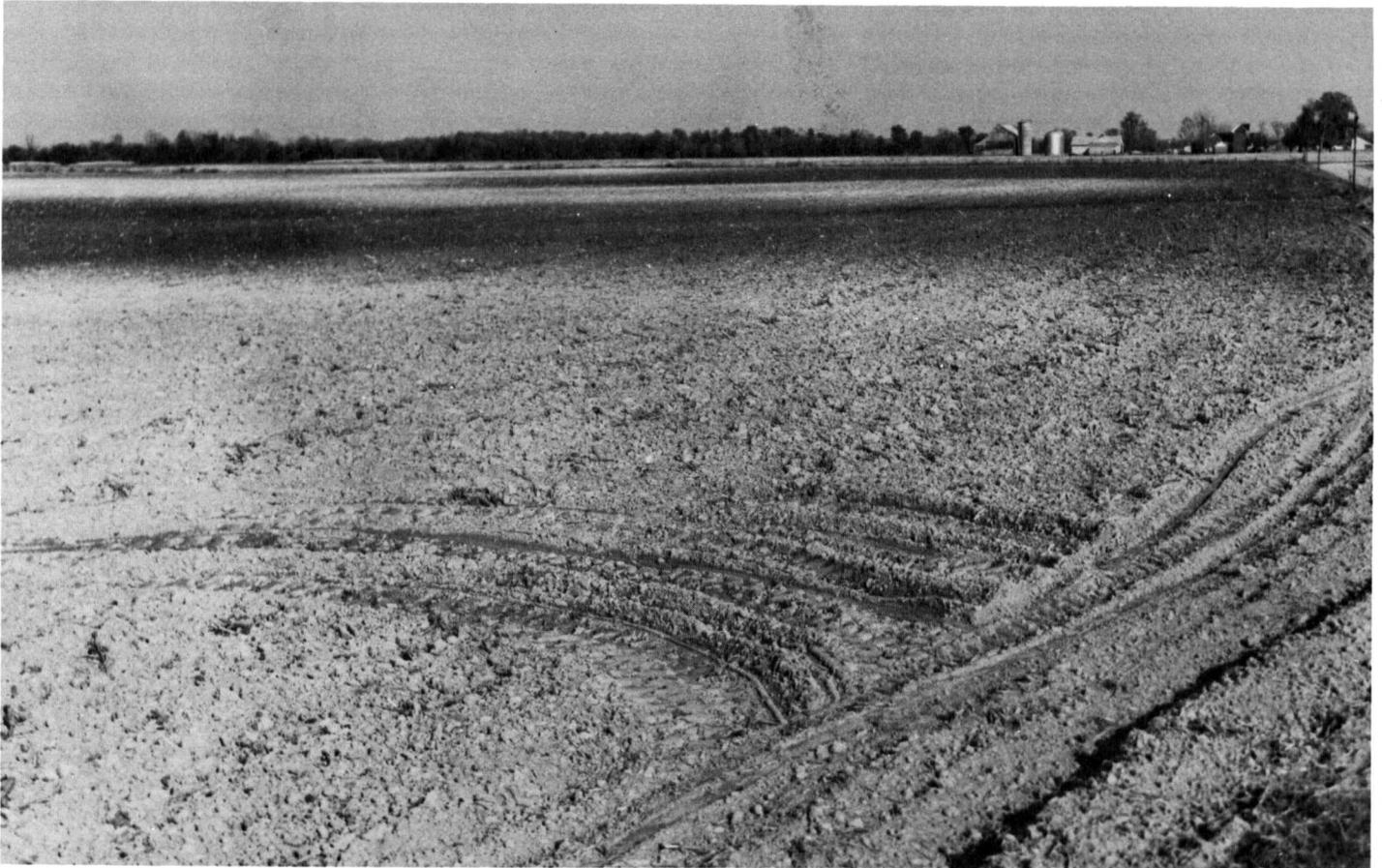


Figure 3.—An area of light-colored Henshaw soils and dark-colored Patton soils in the Evansville-Henshaw-Patton map unit.

This map unit is mainly cropland. Most of the acreage has been drained. A few undrained areas are in woodland or pasture. Wetness is the main limitation to farming and most other uses of these soils. Ponding is common in winter and spring. It is more prevalent on undrained areas.

This map unit has good potential for cultivated crops because drainage has been installed in most areas. Wetness is such a severe limitation and so difficult to overcome that the unit has poor potential for residential and other urban uses. Adequate drainage systems should be the first consideration in areas that are to be used for urban development.

**Well drained, somewhat poorly drained, and poorly drained, medium textured, nearly level to moderately sloping soils on river terraces**

The map units in this group are made up mostly of soils that formed in strongly acid outwash material.

These soils make up about 19 percent of the county. They are used mainly for corn, soybeans, and winter wheat. Some large undrained areas are in hardwood trees, and a few areas are in grasses and legumes. The limitations to urban development of the soils are slight to severe.

**5. Elkinsville-Wheeling-Vincennes**

*Deep, nearly level to moderately sloping, well drained and poorly drained soils that have a silty and loamy subsoil and that formed in alluvium*

This map unit consists of nearly level to moderately sloping soils on terraces along the Wabash River. These terraces are higher than the adjacent bottom land and lower than the adjacent uplands.

This map unit occupies about 8 percent of the county. It is about 15 percent Elkinsville soils, 14 percent Wheeling soils, and 13 percent Vincennes soils. The remaining 58 percent is soils of minor extent.

Elkinsville and Wheeling soils are in the higher areas on the landscape and are well drained. Elkinsville soils have a silt loam surface layer, and Wheeling soils have a loam surface layer. Vincennes soils are in lower areas in drainageways and depressions. They are poorly drained and have a loam surface layer.

Of minor extent in this map unit are the well drained Armiesburg Variant and Onarga soils, the poorly drained Peoga soils, and the very poorly drained Lyles, Rensselaer, Zipp, and Zipp Variant soils. Armiesburg Variant soils are on alluvial fans adjacent to the uplands. Onarga soils are in the higher areas between drainageways. Peoga soils are in lower areas in drainageways and depressions. Lyles, Rensselaer, Zipp, and Zipp Variant soils are in the lower areas in depressions.

This map unit is used as cropland. A few undrained areas along drainageways are in woodland, and a few areas are in grasses and legumes. Wetness is the main limitation to farming and most other uses of the soils. Some areas are subject to rare flooding in winter and spring.

This map unit, when adequately drained, has good potential for farm crops. Rare flooding limits the residential and other urban development of these soils. The potential for woodland is good. The potential for development of wildlife habitat is variable.

## 6. Weinbach-Ginat-Elkinsville

*Deep, nearly level and gently sloping, somewhat poorly drained, poorly drained, and well drained soils that have a silty subsoil and that formed in alluvium*

This map unit consists of nearly level or gently sloping soils on terraces along the Ohio and Wabash Rivers. These terraces are higher in elevation than the adjacent bottom lands and lower in elevation than the adjacent lakebed plains or uplands.

This map unit occupies about 11 percent of the county. It is about 21 percent Weinbach soils, 19 percent Ginat soils, and 18 percent Elkinsville soils. The remaining 42 percent is soils of minor extent.

The somewhat poorly drained Weinbach soils are usually higher in elevation than the poorly drained Ginat soils. Elkinsville soils are well drained and are slightly higher in elevation than both Weinbach and Ginat soils. All the soils have a silt loam surface layer, and both Weinbach and Ginat soils have a fragipan in the subsoil.

Of minor extent in this map unit are the poorly drained Peoga and Vincennes soils and the well drained Wheeling soils. Peoga and Vincennes soils are in low areas in old drainageways. Wheeling soils are in slightly higher areas.

This map unit is mainly cropland. Most of the acreage has been cleared, and many wet areas have been drained. Some wet undrained areas are in woodland. Wetness is the main limitation to farming and most other

uses of these soils. Some low areas are subject to rare flooding in winter and spring.

This map unit, when adequately drained, has good potential for cultivated farm crops. Wetness is such a severe limitation and so difficult to overcome, that the unit has poor potential for residential and other urban development. Rare flooding is also a hazard. Adequate drainage systems must be the first consideration in areas to be used for urban development. The potential for woodland is good.

## Well drained, somewhat poorly drained and poorly drained, medium textured and moderately fine textured, nearly level soils on bottom lands

The map units in this group are soils that border streams and rivers and are subject to flooding. These soils make up about 21 percent of the county. They are used mainly for growing corn and soybeans. Hardwood trees grow in some areas of somewhat poorly drained or poorly drained soils and along channels. The urban development of these soils is severely limited.

## 7. Nolin-Newark-Petrolia

*Deep, nearly level, well drained, somewhat poorly drained, and poorly drained soils that have a silty subsoil or underlying material and that formed in alluvium*

This map unit consists of nearly level soils on bottom lands along the Ohio and Wabash Rivers on the southern and western edges of the county. These bottom lands are lower in elevation than the adjacent river terraces.

This map unit occupies about 15 percent of the county. It is about 42 percent Nolin soils, 20 percent Newark soils, and 16 percent Petrolia soils. The remaining 22 percent is soils of minor extent.

Nolin soils are slightly higher in elevation than both Newark and Petrolia soils. Newark soils are in low areas along drainageways. Petrolia soils are in low depressions and sloughs that pond water. Nolin soils are well drained, Newark soils are somewhat poorly drained, and Petrolia soils are poorly drained. Nolin soils have a silt loam surface layer, and Petrolia and Newark soils have a silty clay loam surface layer.

Of minor extent in this map unit are the well drained Armiesburg, Genesee, and Stonelick soils and the somewhat excessively drained Landes soils. These soils are slightly higher in elevation than the major soils in the unit and are usually located near the channel of the river.

This map unit is mainly cropland. Some swampy areas are in woodland. Flooding, which is frequent in winter and spring, is the main limitation to farming and most other uses of this unit (fig. 4). Wetness is also a limitation in low areas.

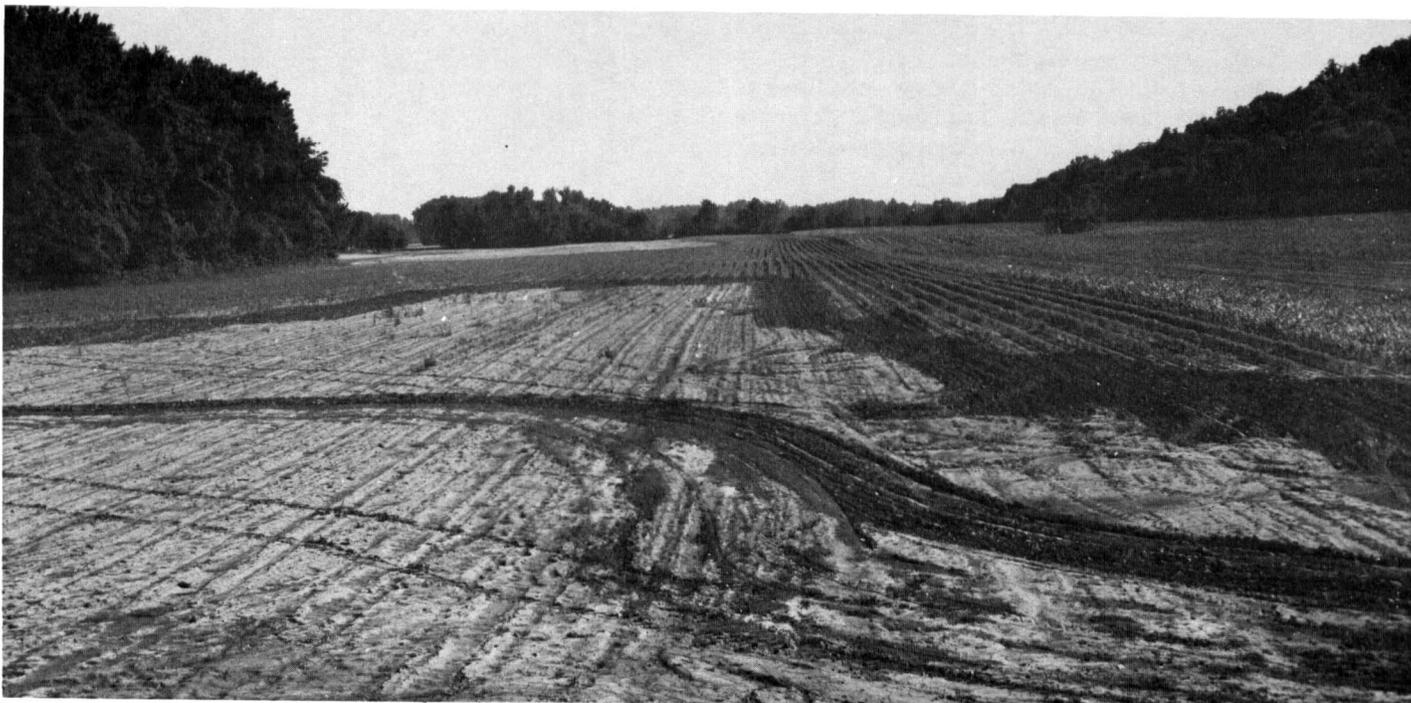


Figure 4.—Flood damage sustained before the cropping season makes replanting necessary on some areas of Nolin-Newark-Petrolia map unit.

This map unit has good potential for cultivated crops. Flooding is such a severe limitation and so expensive to overcome that the unit has poor potential for residential and other urban development. The potential for woodland is good.

### 8. Wakeland

*Deep, nearly level, somewhat poorly drained soils that have silty underlying material and that formed in alluvium*

This map unit consists of nearly level soils along the major streams and smaller drainageways throughout the county. These streams and drains are lower in elevation than the surrounding uplands.

This map unit occupies about 6 percent of the county. It is about 63 percent Wakeland soils and 37 percent soils of minor extent.

Wakeland soils are in nearly level areas along major streams and small drainageways. They are somewhat poorly drained and have a seasonal high water table. These soils are silt loam throughout the profile and lack a developed subsoil.

Of minor extent in this map unit are the well drained Haymond soils and the poorly drained Birds soils. Haymond soils are in the slightly higher areas near stream channels and on alluvial fans. Birds soils are in lower areas in depressions and old stream channels.

This map unit is mainly cropland. A few undrained areas that lack natural outlets are in woodland. Wetness

is the main limitation to farming, and local flooding of short duration is a hazard to other uses of the soils.

This map unit, when adequately drained, has good potential for cultivated crops. Its potential for residential and other urban uses is poor because of the difficulty in obtaining total protection from flooding. The potential for development of woodland wildlife habitat is good.

### **Somewhat excessively drained and well drained, coarse textured and medium textured, nearly level to steep soils on uplands**

This map unit is made up mostly of soils with limited available water capacity. Areas of these soils are on uplands paralleling the Wabash River. These soils make up about 2 percent of the county. They are used mainly for grasses and legumes. The steeper areas are in hardwood trees. Some areas are used for corn, soybeans, and winter wheat. In most areas yields are low during periods of little rainfall. These soils are slightly through severely limited for urban development.

### 9. Bloomfield-Princeton

*Deep, nearly level to steep, somewhat excessively drained and well drained soils that have a loamy and*

*sandy subsoil and that formed in wind-deposited sediments*

This map unit is in scattered areas along the Wabash River bluffs. These areas are on ridgetops and side slopes on uplands.

This map unit occupies about 2 percent of the county. About 44 percent is Bloomfield soils and 20 percent is Princeton soils. The remaining 36 percent is soils of minor extent.

Bloomfield soils are on ridgetops and side slopes and are somewhat excessively drained. Princeton soils occupy similar positions and are well drained. Bloomfield soils have a loamy fine sand surface layer, and Princeton soils have a loam surface layer.

Of minor extent in this map unit are the well drained Alford and Sylvan soils. These soils also occupy ridgetops and side slopes.

This map unit is used mainly as woodland, but some areas have been cleared and are used as pasture or cropland. Erosion and droughtiness are the main limitations to use of the soils for farming.

This map unit, when protected from erosion, has fair potential for cultivated crops. Some areas have good potential for specialty crops. Droughtiness is a hazard to farm crops. This map unit has fair potential for residential and other urban uses. Slope is the main limitation to be overcome. This map unit has good potential for woodland.

## Broad land use considerations

Deciding which land should be used for urban development is an important issue in the survey area. Each year a considerable amount of land near the larger towns and in scattered areas throughout the county is urbanized (fig. 5). This expansion of urban areas not only removes agricultural land from production, but the scattered development of these areas makes it difficult for government to provide people with services. The general soil map is most helpful for planning the general outline of urban areas, although it cannot be used to select sites for specific urban structures. In general, in the survey area, the soils that have good potential for cultivated crops have poor potential for urban development. The data on specific soils in this survey can be helpful in planning future land use patterns.

Areas where the soils are so unfavorable that urban development is prohibitive are not extensive in the survey area. The Nolin-Newark-Petrolia map unit and many areas of the Wakeland map unit are flood plains, in which flooding is a severe limitation.

In Evansville-Henshaw-Patton, Ragsdale-Reesville, and Wakeland map units and many areas of the Weinbach-Ginat-Elkinsville and Elkinsville-Wheeling-Vincennes map units, a high water table is at or near the surface part of the year. It is costly to provide drainage



Figure 5.—Area of Evansville silt loam on which land use is changing from crops to residential development.

and outlets that will lower the water table enough to permit urban development of these units.

In large areas of the county the soils can be developed at lower cost than the soils named above. These include the less sloping areas of the Alford-Sylvan-Iona, Bloomfield-Princeton, and Alford-Hosmer-Iona map units and the well drained areas of the Weinbach-Ginat-Elkinsville and Elkinsville-Wheeling-Vincennes map units. The steeper areas of these map units are less favorable for urban development. Some soils in the Alford-Hosmer-Iona map unit have properties that require special measures if sanitary facilities are to be installed.

In some areas the soils have good potential for agriculture but poor potential for urban uses. These are in the Evansville- Henshaw-Patton, Ragsdale-Reesville, Weinbach-Ginat-Elkinsville, Nolin-Newark-Petrolia, and Wakeland map units. Wetness and flooding are the main limitations to the nonfarm uses of these soils.

Melons and other specialty crops are well suited to soils of the Bloomfield-Princeton map unit and the coarser textured soils of the Elkinsville-Wheeling-Vincennes map unit. Orchards and nursery crops are well suited to the soils of the Alford-Sylvan-Iona and the Alford-Hosmer-Iona map units. These soils are all well drained, moderately well drained, or somewhat excessively drained and warm up earlier in the spring than wetter soils.

Most of the soils of the county have good potential for woodland. Commercially valuable trees are less common on the soils of the Nolin-Newark-Petrolia map unit.

The hilly Alford-Sylvan-Iona, Bloomfield-Princeton, and Alford-Hosmer-Iona map units have good potential as sites for parks and extensive recreation areas. Hardwood forests enhance the beauty of these map units. Undrained areas of the Nolin-Newark-Petrolia, Weinbach-Ginat-Elkinsville, and Elkinsville-Wheeling-Vincennes map units are good nature study areas. All these map units provide habitat for many important species of wildlife.

## Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description,

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

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

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

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Alford silt loam, 6 to 12 percent slopes, severely eroded is one of several phases within the Alford series.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 5, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

**AIA—Alford silt loam, 0 to 2 percent slopes.** This nearly level soil is deep and well drained. It is on broad ridgetops in the uplands. The dominant size of individual areas is 5 to 10 acres, but a few areas range up to 200 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil, which is about 34 inches thick, is brown and strong brown, firm, silty clay loam. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In many places the subsurface layer has been mixed with the surface layer by cultivation. In some places mottles are in the lower

part of the subsoil. In a few small areas the soil is moderately well drained.

Included with this soil in mapping are a few small areas of Reesville soils. Also included are areas of soils that have slopes of more than 2 percent.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is low. The surface layer is medium acid in areas that have not been limed. The surface layer is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland used for corn, soybeans, and winter wheat. A few areas are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. There are no limitations to its use as cropland. The use of crop residues helps improve and maintain tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, although plant competition is a moderate hazard. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is moderately limited by its shrink-swell potential and low strength. Foundations and footings should be designed to prevent structural damage caused by low strength and by shrinking of the soil when dry and swelling when wet. The use of this soil for local streets and roads is severely limited by frost action and low strength. Damage can be reduced by using more stable base material, such as sand and gravel, and by providing adequate road drainage ditches. Limitations are slight for septic tank absorption fields.

This soil is in capability class I and woodland suitability subclass 1o.

**AIB2—Alford silt loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep and well drained. It is on convex ridgetops and long side slopes in the uplands. The dominant size of individual areas ranges from 20 to 50 acres.

In a typical profile the surface layer is brown silt loam about 7 inches thick. The subsoil is about 40 inches thick. The upper part is dark brown, friable silt loam, and the lower part is dark brown and brown silty clay loam. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In some places mottles are higher in the profile. Some small areas of soil are moderately well drained.

Included with this soil in mapping are small areas of Alford soils that have slopes of less than 2 percent or that are moderately sloping and severely eroded. Small areas of Hosmer soils are also included.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. The surface layer is medium acid in areas that have not been limed. The surface layer is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland used for corn, soybeans, and winter wheat. Some areas are used for hay and pasture. A few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled when cultivated crops are grown. Crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also helps to control erosion and to improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in hardwoods. Plant competition is a moderate hazard, but seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings is moderately limited by its shrink-swell potential and low strength. Foundations and footings should be designed to prevent structural damage caused by low strength or shrinking of the soil when dry and swelling when wet. Limitations are moderate for small commercial buildings because of soil slope, low strength, and shrink-swell potential. Erosion is also a problem in disturbed areas. Topsoil removed from building sites should be stockpiled and replaced, and disturbed areas should be revegetated with adapted grasses as soon after construction as possible. Diversions may be needed to detour runoff away from disturbed areas. The use of this soil for local streets and roads is severely limited by frost action and low strength. Their effect can be reduced by using more stable base material, such as sand or gravel, and by providing adequate road drainage ditches. Limitations are slight for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

**AIB3—Alford silt loam, 2 to 6 percent slopes, severely eroded.** This gently sloping soil is deep and well drained. It is on convex ridgetops in the uplands. The dominant size of individual areas ranges from 10 to 15 acres.

In a typical profile the surface layer is brown and dark brown silt loam about 8 inches thick. The subsoil is brown, firm and friable silty clay loam and silt loam about 38 inches thick. The underlying material, to a depth of 70 inches, is dark brown and brown silt loam. In some plowed areas the surface layer is clay loam because it is mixed with the subsoil. In some places grayish brown or pale brown mottles are in the lower part of the subsoil. Small areas of soils are moderately well drained.

Included with this soil in mapping are small areas of Alford soils that have slopes of slightly more than 6 percent and small areas of Hosmer soils.

This soil has high available water capacity and moderate permeability. Surface runoff from cultivated areas is rapid. The organic-matter content is very low due to the loss of surface soil by erosion. The surface layer is medium or strongly acid in areas that have not been limed. It is firm and has a tendency to become cloddy or compacted unless tilled within a fairly narrow range in moisture content.

Most areas of this soil are cropland and are used for corn, soybeans, and winter wheat. Some areas are used for hay and pasture.

This soil is suited to corn, soybeans, and small grain. It is often difficult to establish a seedbed and raise uniform stands of crops. More than average power is required for tillage, which must be done under proper moisture conditions. There is a severe hazard of further damage from erosion. It is necessary to control erosion and surface water runoff and prevent excessive soil loss. This can be done by using crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures. The use of crop residues and cover crops reduces surface runoff and helps control erosion. It also helps to maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is effective in controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees, although few areas remain in hardwoods. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings is moderately limited by its low strength and shrink-swell potential. Foundations and footings should be designed to prevent struc-

tural damage caused by low strength and from shrinking of the soil when dry and swelling when wet. The use of this soil for small commercial buildings is moderately limited by slope, low strength, and shrink-swell potential. Erosion is also a problem in disturbed areas. Topsoil removed from building sites should be stockpiled and replaced, and disturbed areas should be revegetated with adapted grasses as soon after construction as possible. Diversions may be needed to detour runoff away from disturbed areas. The use of this soil for local streets and roads is severely limited by frost action and low strength. Their effect can be reduced by using more stable base material, such as sand or gravel, and by providing adequate road drainage ditches. Limitations are slight for septic tank absorption fields.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

**AIC2—Alford silt loam, 6 to 12 percent slopes, eroded.** This moderately sloping soil is deep and well drained. It is on side slopes and secondary ridgetops in the uplands. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is brown, friable and firm silty clay loam and silt loam about 36 inches thick. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In some places mottles are higher in the profile. There are a few small areas of soils that have calcareous material in the upper 40 inches.

Included with this soil in mapping are small areas of severely eroded Alford soils, and small areas of Hosmer soils.

This soil has high available water capacity and moderate permeability. Surface runoff from cultivated areas is rapid. The organic-matter content is low. The surface layer is medium acid in areas that have not been limed. It is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are used for hay and pasture. Some areas are used for corn, soybeans, and winter wheat; and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. If this soil is used for growing cultivated crops, the hazard of erosion is severe. Erosion and surface water runoff need to be controlled. This can be done by using crop rotations, minimum tillage, terraces, diversions, contour farming, grassed waterways and grade stabilization structures. Returning crop residues to the soil and using cover crops will reduce runoff, control erosion, and help maintain the tilth and organic-matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture, and this use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during

wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying or girdling.

The use of this soil for dwellings is moderately limited by its low strength, shrink-swell potential, and slope; and its use for small commercial buildings is severely limited by slope. Foundations and footings should be designed to prevent structural damage caused by low strength and from shrinking of the soil when dry and swelling when wet. When large areas are developed, soil erosion becomes a problem; therefore development of random lots is preferable. Existing vegetation should be retained if possible and care should be taken to disturb a minimal area. Displaced topsoil should be stockpiled and replaced, and building sites should be revegetated with adapted grasses as soon as possible. Diversions and grassed waterways can be used between lots to reduce erosion. Silting basins can be used to reduce siltation. The use of this soil for local streets and roads is severely limited by frost action and low soil strength. Roads should be constructed on the contour if possible. The effects of frost action and low strength can be reduced by adequate road drainage ditches and by using more stable base materials, such as sand and gravel. The use of this soil is moderately limited for septic tank absorption fields by slope. Septic tank absorption fields should be installed on the contour and should be designed to prevent seepage of effluent at the base of the slope.

This soil is in capability subclass IIIe and woodland suitability subclass 1c.

**AIC3—Alford silt loam, 6 to 12 percent slopes, severely eroded.** This moderately sloping soil is deep and well drained. It is on side slopes and secondary ridgetops in the uplands. The dominant size of individual areas ranges from 15 to 30 acres.

In a typical profile the surface layer is brown and yellowish brown silt loam about 8 inches thick. The subsoil is about 26 inches thick. The upper part is brown, firm silty clay loam, and the lower part is brown mottled silt loam. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In some places the surface layer is silty clay loam due to the mixing of subsoil with the plow layer. In some places the subsoil is mottled. There are small areas of soils that have calcareous material in the upper 40 inches.

Included with this soil in mapping are small areas of Alford soils that have slopes of more than 12 percent. Small areas of Hosmer soils are also included.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is very low due to the loss of surface soil

through erosion. The surface layer is medium acid or strongly acid in areas that have not been limed. The surface layer is firm and has a tendency to become cloddy or compacted unless tilled within a fairly narrow range in moisture content.

Most areas of this soil are cropland used for soybeans, corn, and winter wheat. Some areas are used for hay and pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. It is often difficult to establish a seedbed and raise uniform stands of crops. More than average power is required for tillage, which must be done under proper moisture conditions. There is a very severe hazard of further damage from erosion. It is necessary to control erosion and surface runoff and prevent excessive soil loss. This can be done by using crop rotations, minimum tillage, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures. More than one of these measures are usually needed. Crop residues can be returned to the soil and cover crops can be grown to reduce surface water runoff and control erosion. This also helps maintain and improve the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. Their use is effective in controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, although few areas remain in native hardwoods. Plant competition is a moderate limitation. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings is moderately limited by its low strength, shrink-swell potential, and slope; and its use for small commercial buildings is severely limited by slope. Foundations and footings should be designed to prevent structural damage caused by low strength and shrinking and swelling of the soil. When large areas are developed, soil erosion becomes a problem; therefore development of random lots is preferable. Existing vegetation should be retained if possible, and care should be taken to disturb a minimal area. Displaced topsoil should be stockpiled and replaced, and building sites should be revegetated with adapted grasses as soon as possible. Diversions and grassed waterways can be used between lots to reduce erosion. Silting basins can be used to reduce siltation. The use of this soil for local streets and roads is severely limited by frost action and low soil strength. Roads should be constructed on the contour if possible. The effects of frost action and low strength can be reduced by providing adequate road drainage ditches and by using more stable material, such as sand and

gravel, to strengthen the base. The use of this soil is moderately limited for septic tank absorption fields by slope. Septic tank absorption fields should be installed on the contour and should be designed to prevent seepage of effluent at the base of the slope.

This soil is in capability subclass IVe and woodland suitability subclass 1c.

**AID—Alford silt loam, 12 to 18 percent slopes.** This strongly sloping soil is deep and well drained. It is on side slopes in the uplands. The dominant size of individual areas is 15 to 30 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is brown, firm silty clay loam and silt loam. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In uncultivated areas the surface layer is dark grayish brown silt loam about 2 inches thick, and the subsurface layer is pale brown silt loam about 5 inches thick. There are small areas of soils that have residuum from sandstone or shale below a depth of 40 inches and soils that have calcareous material below a depth of 30 inches.

Included with this soil in mapping are small areas of Alford soils that are severely eroded.

This soil has high available water capacity and moderate permeability. Surface runoff is very rapid. The organic-matter content is low. The surface layer is medium acid in areas that have not been limed. It is friable and is easily tilled through a wide range in moisture content.

Most areas of this soil are used for hay and pasture. Some areas are in woodland. A few areas are used for corn, soybeans, and winter wheat.

This soil is suited to corn, soybeans, and small grain. If this soil is used for cultivated crops, the hazard of erosion is severe. It is necessary to control erosion and surface runoff and prevent excessive soil loss. This can be done by using crop rotations, minimum tillage, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures. Returning crop residues to the soil and using cover crops will reduce runoff and help control erosion and also help maintain and improve soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture, and is mostly used for this purpose. This use is an effective way to prevent erosion and excessive runoff. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control and removal of

unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by slope. When large areas are developed, soil erosion is a problem. Existing vegetation should be retained if possible, and care should be taken to disturb a minimal soil area. Displaced topsoil should be stockpiled and replaced, and disturbed areas should be revegetated with adapted grasses as soon as possible. Diversions and grassed waterways can be used between lots to reduce erosion. Silting basins can be used to reduce siltation. The use of this soil for local streets and roads is severely limited by frost action and slope. Roads should be constructed on the contour if possible. Frost action can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand and gravel. Septic tank absorption fields should be installed on the contour and should be designed to prevent seepage of effluent at the base of the slope. Lot size should be increased to accommodate modified absorption fields.

This soil is in capability subclass IVe and woodland suitability subclass 1c.

**AID3—Alford silt loam, 12 to 18 percent slopes, severely eroded.** This strongly sloping soil is deep and well drained. It is on side slopes in the uplands. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is brown and yellowish brown silt loam about 8 inches thick. The subsoil is brown, firm silty clay loam about 24 inches thick. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In some plowed areas, the surface layer is silty clay loam due to the mixing of subsoil with the surface layer. In some places, mottles are in the subsoil. There are small areas of soils that have residuum from sandstone or shale below a depth of 40 inches and soils that have calcareous material below a depth of 30 inches.

Included with this soil in mapping are areas of less eroded soils and a few small areas that have gullies 2 to 4 feet deep.

This soil has high available water capability and moderate permeability. Surface runoff is very rapid. The organic-matter content is very low due to the loss of surface soil by erosion. The surface layer is strongly acid in areas that have not been limed. It is usually friable, but it tends to be cloddy if tilled when too wet.

Most areas of this soil are farmed. Most areas are used for hay and pasture or for corn, soybeans, and small grain. A few areas are in woodland. Some areas that have been farmed in the past have been abandoned, and low-value trees and shrubs have been allowed to grow.

This soil is generally unsuited to corn and soybeans because of the severe hazard of further erosion. It is often difficult to establish a seedbed and obtain uniform stands of crops. More than average power is required for tillage, which must be done under proper moisture conditions. Crop rotations that include the growing of grasses and legumes most of the time are most effective in reducing surface runoff and controlling erosion. Small grain may be grown occasionally so that stands of grasses and legumes can be reestablished. The use of minimum tillage, diversions, grassed waterways, and crop residues helps prevent excessive soil loss. Terraces, contour farming, and grade stabilization structures are needed if this soil is used to grow cultivated crops.

This soil is suited to grasses and legumes for hay and pasture. Their use is an effective way to control erosion. Some areas are left in grass because of the difficulty of establishing seedlings. Some areas have gullies that are difficult to cross with farm machinery and are best used for hay. When this soil is used for pasture, overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by slope. When large areas are developed, soil erosion becomes a problem; therefore, development of random lots is preferable. Existing vegetation should be retained if possible, and care should be taken to disturb a minimal area. Displaced topsoil should be stockpiled and replaced, and the site revegetated with adapted grasses as soon as possible. Diversions and grassed waterways can be used between lots to reduce erosion. Silting basins can be used to reduce siltation. The use of this soil for local streets and roads is severely limited by frost action and slope. Roads should be constructed on the contour if possible. Frost action can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand and gravel. Septic tank absorption fields should be installed on the contour and should be designed to prevent seepage of effluent at the base of the slope. Lot size should be increased to accommodate modified absorption fields.

This soil is in capability subclass VIe and woodland suitability subclass 1o.

**AIE—Alford silt loam, 18 to 25 percent slopes.** This moderately steep soil is deep and well drained. It is on

side slopes in the uplands. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is very dark gray silt loam about 2 inches thick. The subsurface layer is pale brown silt loam about 5 inches thick. The subsoil is brown, firm and friable silty clay loam and silt loam about 33 inches thick. The underlying material, to a depth of 60 inches, is brown mottled silt loam. In some places, mottles are higher in the profile. Also included are small areas of soils that have residuum from sandstone or shale below a depth of 40 inches and soils on foot slopes that have calcareous material below a depth of 30 inches.

Included with this soil in mapping are a few areas of severely eroded soils, which are usually indicated by spot symbols. Also included are a few areas of Alford soils that have slopes of more than 25 percent.

This soil has high available water capacity and moderate permeability. Surface runoff is very rapid. The organic-matter content is low. The surface layer is strongly acid or medium acid in areas that have not been limed.

Most areas of this soil are used for woodland or for hay and pasture (fig. 6). A few areas are used for small grain.

This soil is generally unsuited to corn and soybeans because of the very severe hazard of erosion. Small grain is occasionally grown so that stands of grasses and legumes can be reestablished. The moderately steep slopes hinder the use of farm machinery. Excessive soil loss can be prevented by the use of minimum tillage, diversions, and grassed waterways and by returning crop residues to the soil and growing grasses and legumes in the crop rotations most of the time. These are the most effective ways to control erosion and reduce surface runoff.

This soil is suited to grasses and legumes for forage or pasture. It is difficult to use farm machinery because slopes are moderately steep. When this soil is used for pasture, overgrazing or grazing when the soil is too wet will cause surface compaction and excessive runoff. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will keep this soil in good condition.

This soil is well suited to trees, and many areas are in native hardwoods. The limitations to the use of equipment are moderate, and it is difficult to operate machinery on these slopes. The use of this soil for trees is moderately limited by plant competition and erosion. Seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by slope. When large areas are developed, soil erosion is a problem; therefore, development of random lots is preferable. Existing vegetation should be retained if possible, and care should be taken to disturb a minimal



Figure 6.—Fescue and alfalfa on Alford silt loam, 18 to 25 percent slopes, prevents excessive soil loss from erosion.

area. Displaced topsoil should be stockpiled and replaced and the site revegetated with adapted grasses as soon as possible. Diversions and grassed waterways can be used to reduce erosion. Silting basins can be used to reduce siltation. Septic tank absorption fields are difficult to install and maintain because slopes hinder the use of equipment. Commercial or public sewage systems may be needed. The use of this soil for local streets and roads is severely limited by frost action and slope. Roads should be constructed on the contour if possible. Frost action can be reduced by providing adequate drainage ditches and by using more stable base material, such as sand and gravel. More favorable sites for buildings and sanitary facilities may be available on adjacent soils.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

**Ar—Armiesburg silt loam.** This is a nearly level, deep, well drained soil on stream terraces and bottom lands along the Wabash River. It is frequently flooded. The dominant size of individual areas ranges from 20 to 30 acres.

In a typical profile the surface layer is very dark grayish brown and very dark gray silt loam about 17 inches thick. The subsoil is about 32 inches thick. The upper part is brown firm silty clay loam, and the lower part is

yellowish brown, firm and friable silty clay loam. The underlying material, to a depth of 60 inches, is dark yellowish brown silty clay loam. In some places, lighter colored silty or loamy overwash covers the original surface layer or has been mixed with the surface layer by cultivation. In some places the surface layer is silty clay loam. The subsoil extends to a depth of 60 inches in some places.

Included with this soil in mapping are a few small, slightly depressional areas of somewhat poorly drained soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is high. The surface layer is neutral or slightly acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn and soybeans are the most common crops. Some areas are used for growing small grain. A few areas are used for hay and pasture.

This soil is well suited to corn and soybeans. It is also well suited to winter wheat if flooding is prevented. Most areas need to be protected from flooding to prevent crop loss and to insure timeliness of planting. The use of crop residues improves and maintains soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. It needs protection from flooding if high

yields are to be maintained. Grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to growing trees. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by flooding. The soil is generally unsuitable for these uses. Although flooding can be prevented by dikes and levees, they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by flooding, frost action, and low strength. The effects of frost action and low strength can be reduced by using a more stable base material, such as sand or gravel. Adequate drainage ditches along roads also reduce the effects of frost action.

This soil is in capability subclass 1lw and woodland suitability subclass 1o.

**As—Armiesburg Variant silt loam.** This nearly level, deep, well drained soil is on alluvial fans on river terraces. It is subject to rare flooding. The dominant size of individual areas ranges from 15 to 40 acres.

In a typical profile the surface layer is very dark grayish brown and black silt loam about 19 inches thick. The subsoil is yellowish brown, friable silt loam about 31 inches thick. The underlying material, to a depth of 70 inches, is yellowish brown silt loam. In some places 4 to 8 inches of light colored silt loam alluvium is on the surface. In some small areas the surface layer is more than 24 inches thick. In other places small areas are up to 30 percent sand.

Included with this soil in mapping are small areas that have grayish mottles below the surface layer. Also included are small areas of Elkinsville soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is high. The surface layer is neutral or slightly acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. A few areas are in hay and pasture.

This soil is well suited to crops. Corn, soybeans, and winter wheat are the most common crops. The use of crop residues and minimum tillage improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of

grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is a moderate limitation. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding. Although flooding can be prevented by dikes and levees, they are extremely expensive when constructed well enough to provide total protection. The use of this soil for septic tank absorption fields is moderately limited by moderate permeability and flooding. Slow percolation can be overcome by increasing the length of the field bed. The use of this soil for local streets and roads is severely limited by frost action. The effects of frost action can be reduced by providing adequate road drainage ditches and by using more stable material, such as sand or gravel, as a base.

This soil is in capability class I and woodland suitability subclass 1o.

**Bd—Birds silt loam.** This is a nearly level, deep, poorly drained soil in depressions and old stream channels. It is on broad flood plains along the larger streams and is subject to frequent flooding. The dominant size of individual areas ranges from 15 to 25 acres.

In a typical profile the surface layer is grayish brown silt loam about 10 inches thick. The underlying material, to a depth of 50 inches, is gray, mottled, friable silt loam. Below this, to a depth of 60 inches, is gray and yellowish brown, stratified silt loam and silty clay loam. Some areas of this soil have grayish brown colors throughout the profile.

Included with this soil in mapping are a few small areas of Wakeland soils. Also included are spots of alkali and, in depressions on upland ridgetops, small areas of poorly drained soils that are not subject to flooding.

This soil has high available water capacity and moderately slow permeability. Surface runoff is very slow. A high water table is within 1 foot of the surface during a considerable part of the year. The organic-matter content is low. The surface layer is neutral, friable, and has good tilth.

Most of this soil has been drained and is used for crops. Corn, soybeans, and winter wheat are the most common crops. Some areas are in woodland. A few areas are used for hay and pasture.

Where it has been drained, this soil is suited to corn, soybeans, and small grain. Wetness and flooding are the main management concerns. Adequate drainage is often difficult to establish because suitable outlets are not available in many places. With proper drainage, the cropping system can include row crops most of the time. Properly installed tile drains, open ditches, and surface drains will remove excess water. Crops are often replant-

ed because of damage caused by flooding and surface water. Bedding is sometimes used when row crops are grown in undrained areas. Minimum tillage, returning crop residues to the soil, and ground cover crops will help maintain and improve the organic-matter content and tilth of the soil.

This soil is well suited to grass hay and pasture and poorly suited to deep rooted legumes, such as alfalfa, because it is wet and subject to damage during periods of flooding. Drainage of this soil is necessary for consistent high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the soil and pasture in good condition.

This soil is well suited to trees, and some areas are in natural hardwoods that can tolerate wetness. The limitations to the use of equipment are severe. Harvesting should be done during dry seasons of the year or when the ground is frozen. Seedling mortality is moderate. Replanting may be necessary. Competing vegetation must be controlled if seedlings are to survive and grow well. Tree species can be selected that will tolerate wetness. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

This use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by wetness and flooding. The soil is generally unsuitable for building sites because of flooding. Wetness can be reduced by artificial drainage such as tile drains, open ditches, or surface drains. Because a suitable outlet is often difficult to obtain, pumping may be necessary. Although flooding can be prevented by dikes and levees, they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by wetness and frost action. These can be reduced by adequate road ditches.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

**BIB—Bloomfield loamy fine sand, 2 to 6 percent slopes.** This gently sloping soil is deep and somewhat excessively drained. It is on broad ridges in the uplands. The dominant size of individual areas is about 15 acres.

In a typical profile the surface layer is dark grayish brown loamy fine sand about 11 inches thick. The subsurface layer extends to a depth of 35 inches. It is yellowish brown, loose fine sand. The subsoil, to a depth of 80 inches, is yellowish brown, loose fine sand with horizontal bands of strong brown sandy loam and loamy sand. In some places the bands are indistinct or discontinuous above a depth of 60 inches. In some places slopes are less than 2 percent.

Included in mapping in a few places are small areas of Princeton soils.

This soil has low available water capacity. Surface runoff is slow. The organic-matter content is low. The surface layer is slightly acid or neutral. It is loose or very friable in consistence and is easily tilled through a wide range in moisture content.

Most of this soil is in pasture. Many areas are used for specialty crops such as melons. A few areas are in woodland or crops.

This soil is suited to corn, soybeans, and small grain. Production is limited by the low available water capacity, particularly during years in which rainfall is below normal or is poorly distributed. Wind and water erosion is a hazard when this soil is cropped. The use of crop residues and cover crops adds organic matter to the soil, helps control erosion, and maintains and improves available water capacity.

The use of this soil for grasses and legumes for hay and pasture is an effective way to control erosion. This soil is better suited to deep rooted legumes than to other crops because it has low available water capacity. Stocking at a proper rate, pasture rotation, and the timely deferment of grazing will help keep this soil productive.

This soil is well suited to trees, and a few areas are in native hardwoods. Seedling mortality is moderate, and replanting may be necessary. Seedlings survive and grow well if not subjected to long dry periods and if competing vegetation is controlled. The control or removal of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

There are slight limitations to the use of this soil for dwellings, small commercial buildings, local streets and roads, and septic tank absorption fields. Shallow wells should be located as far as possible from septic tank absorption fields to prevent pollution of ground water supplies.

This soil is in capability subclass IIIs and woodland suitability subclass 3s.

**BIC—Bloomfield loamy fine sand, 6 to 12 percent slopes.** This moderately sloping soil is deep and somewhat excessively drained. It is on side slopes and dunes in the uplands (fig. 7). The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is brown loamy fine sand about 9 inches thick. The subsurface layer extends to a depth of about 36 inches. It is dark yellowish brown loamy fine sand in the upper part and yellowish brown fine sand in the lower part. The subsoil, to a depth of about 80 inches, is yellowish brown fine sand with horizontal bands or layers of brown fine sandy loam and loamy sand. In some places the bands are thin or indistinct above a depth of 60 inches.

Included with this soil in mapping are a few small areas of Princeton soils. Also included are small areas of soils that have slopes of less than 6 percent.

This soil has low available water capacity and rapid or moderately rapid permeability. Surface runoff is slow.



Figure 7.—Typical dunelike topography of Bloomfield loamy fine sand, 6 to 12 percent slopes.

The organic-matter content is low. The surface layer is slightly acid or neutral. The surface layer is very friable and is easily tilled through a wide range in moisture content.

Most of this soil is in pasture or hayland. Many areas are in woodland. A few areas are in crops.

This soil is suited to corn, soybeans, and small grain. If it is used for cultivated crops, wind erosion and water erosion are hazards. The low available water capacity limits the use of this soil, particularly if rainfall is below normal or is poorly distributed over the growing season. Crop rotations, minimum tillage, contour farming, and grassed waterways help prevent excessive soil loss. The use of cover crops and crop residues help control erosion and improve and maintain available water capacity by adding organic-matter to the soil.

The use of this soil for grasses and legumes for hay and pasture is an effective way to control erosion. This soil is better suited to deep rooted legumes because of the low available water capacity. Stocking at a proper rate, pasture rotation, and timely deferment of grazing will help keep this soil productive.

This soil is well suited to trees, and many areas are in native hardwoods. Seedling mortality is moderate, and replanting may be necessary. Seedlings survive and grow well if not subjected to long dry periods and if

competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by spraying, cutting, or girdling.

The use of this soil for dwellings, local streets and roads, and septic tank absorption fields is only slightly limited. Its use for small commercial buildings is moderately limited by slope. Slope may be modified by grading or leveling. Steep cuts should be avoided because of the tendency of this soil to cave. Pollution of ground water supplies may become a problem. Shallow wells should be located as far as possible from sanitary facilities.

This soil is in capability subclass IIIe and woodland suitability subclass 3s.

**BID—Bloomfield loamy fine sand, 12 to 18 percent slopes.** This strongly sloping soil is deep and somewhat excessively drained. It is on side slopes in the uplands. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is dark grayish brown loamy fine sand about 7 inches thick. The subsurface layer extends to a depth of about 31 inches. It is yellowish brown, loose fine sand. The subsoil, to a depth of 80 inches, is pale brown, loose fine sand with thin horizontal bands of strong brown fine sandy loam. In some places the horizontal bands are thin or discontinuous above a depth of 60 inches.

Included with this soil in mapping are small areas of Princeton, Sylvan, and Wellston soils. Also included are small areas where slopes are less than 12 percent.

This soil has low available water capacity and rapid or moderately rapid permeability. Surface runoff is medium. The organic-matter content is low. The surface layer is slightly acid. It is very friable and is easily tilled through a wide range in moisture content.

Most of this soil is in woodland or pasture. A few areas are in hay or crops.

This soil is generally unsuited to cultivated crops because of the severe hazard of erosion and the low available water capacity.

The use of this soil for grasses and legumes for hay and pasture is an effective way to control erosion. This soil is better suited to deep rooted legumes because of the low available water capacity. Stocking at a proper rate, pasture rotation, and timely deferment of grazing will help keep the soil productive.

This soil is well suited to trees, and many areas are in native hardwoods. Because seedling mortality is moderate, replanting may be necessary. Seedlings survive and grow well if not subjected to long dry periods and if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, local streets and roads, and septic tank absorption fields is moderately limited by slope, and its use for small commercial buildings is severely limited. Slope may be modified by grading or by cutting and filling. Roads and absorption fields should be constructed on the contour if possible. Disturbed areas should be revegetated as quickly after construction as possible to prevent excessive soil loss from erosion or soil blowing. Possible pollution of ground water supplies may be a problem, and shallow wells should be located as far as possible from sanitary facilities.

This soil is in capability subclass IVe and woodland suitability subclass 3s.

**BIF—Bloomfield loamy fine sand, 18 to 35 percent slopes.** This moderately steep to steep, deep, somewhat excessively drained soil is on side slopes in the uplands along the Wabash River. The dominant size of individual areas ranges from 20 to 30 acres.

In a typical profile the surface layer is dark grayish brown loamy fine sand about 6 inches thick. The subsurface layer extends to a depth of 35 inches. It is pale brown, loose fine sand. The subsoil, to a depth of 80 inches, is pale brown, loose fine sand with thin horizontal bands of strong brown sandy loam. In some places the horizontal bands are thin or discontinuous in the upper 60 inches.

Included with this soil in mapping are small areas of Sylvan and Wellston soils. Also included are a few areas where slopes are more than 35 percent.

This soil has low available water capacity and rapid or moderately rapid permeability. Surface runoff is rapid. The organic-matter content is low. The surface layer is slightly acid. It is very friable and is easily tilled through a wide range in moisture content.

Most areas of this soil are in woodland. A few areas are in pasture.

This soil is generally not suited to cultivated crops because the hazard of erosion is very severe. The moderately steep to steep slopes limit the use of farm machinery.

This soil is suited to pasture grasses and legumes. The moderately steep to steep slopes limit the use of farm machinery for hay crops. This soil is better suited to deep rooted legumes than to hay because of the low available water capacity. Stocking at a proper rate, pasture rotation, and timely deferment of grazing will help keep this soil productive.

This soil is well suited to trees, and most areas are in native hardwoods. The limitations to the use of equipment are moderate. Slope hinders the use of some logging machinery. The hazard of erosion is moderate. Logging roads should be constructed on the contour, and clear cutting should be avoided. Seedlings survive and grow well if not subjected to long dry periods and if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, local streets and roads, and septic tank absorption fields is severely limited by slope. Slope may be modified by grading or by cutting or filling, although this is usually impractical on this soil. All construction should be designed according to the slope. Disturbed areas should be revegetated as soon as possible after construction to prevent excessive soil losses from erosion and soil blowing. Alternative methods of waste disposal should be explored. Because ground water supplies may be polluted shallow wells should be located as far as possible from sanitary facilities.

This soil is in capability subclass VIIe and woodland suitability subclass 3s.

**Eka—Elkinsville silt loam, 0 to 2 percent slopes.** This nearly level soil is deep and well drained and is on river terraces. It is subject to rare flooding. The dominant size of individual areas ranges from 15 to 20 acres, but some areas are more than 100 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 7 inches thick. The subsoil is about 49 inches thick. In the upper part it is yellowish brown, friable and firm silt loam, and in the lower part it is dark yellowish brown firm silty clay loam. The underlying material, to a depth of 72 inches, is yellowish brown silt loam. In some places the upper part of the subsoil is silty clay loam. In some places brownish or grayish mot-

ties are below a depth of 36 inches. Some areas of this soil have sand at a depth of 36 to 60 inches. In a few small areas the content of sand is more than 15 percent throughout the profile.

Included with this soil in mapping are a few small areas of soils that have a sand surface layer. Also included are a few small areas of Onarga, Pekin, and Wheeling soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is moderate. The surface layer is medium acid or strongly acid in areas that have not been limed. It is easily tilled through a fairly wide range in moisture content.

Most of this soil is cropland. Most areas are used for corn, soybeans, and small grain. A few areas are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain (fig. 8). There are no limitations to its use for cultivated crops. The return of crop residues to the soil improves and maintains its tilth and also its organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to growing trees. Plant competition is severe, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by flooding, and its use for septic tank absorption fields is moderately limited by rare flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by frost action. Frost action can be reduced by providing adequate drainage and by using more stable base materials, such as sand and gravel.

This soil is in capability class 1 and woodland suitability subclass 1c.

**EkB2—Elkinsville silt loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep and well drained and is on river terraces. It is subject to rare flooding. The dominant size of individual areas ranges from 5 to 10 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 40 inches thick. It is yellowish brown, firm silt loam. The underlying material, to a depth of 60 inches, is yellowish brown silt loam. Some areas of this soil have sand at depths ranging from 36 to 60 inches. In some

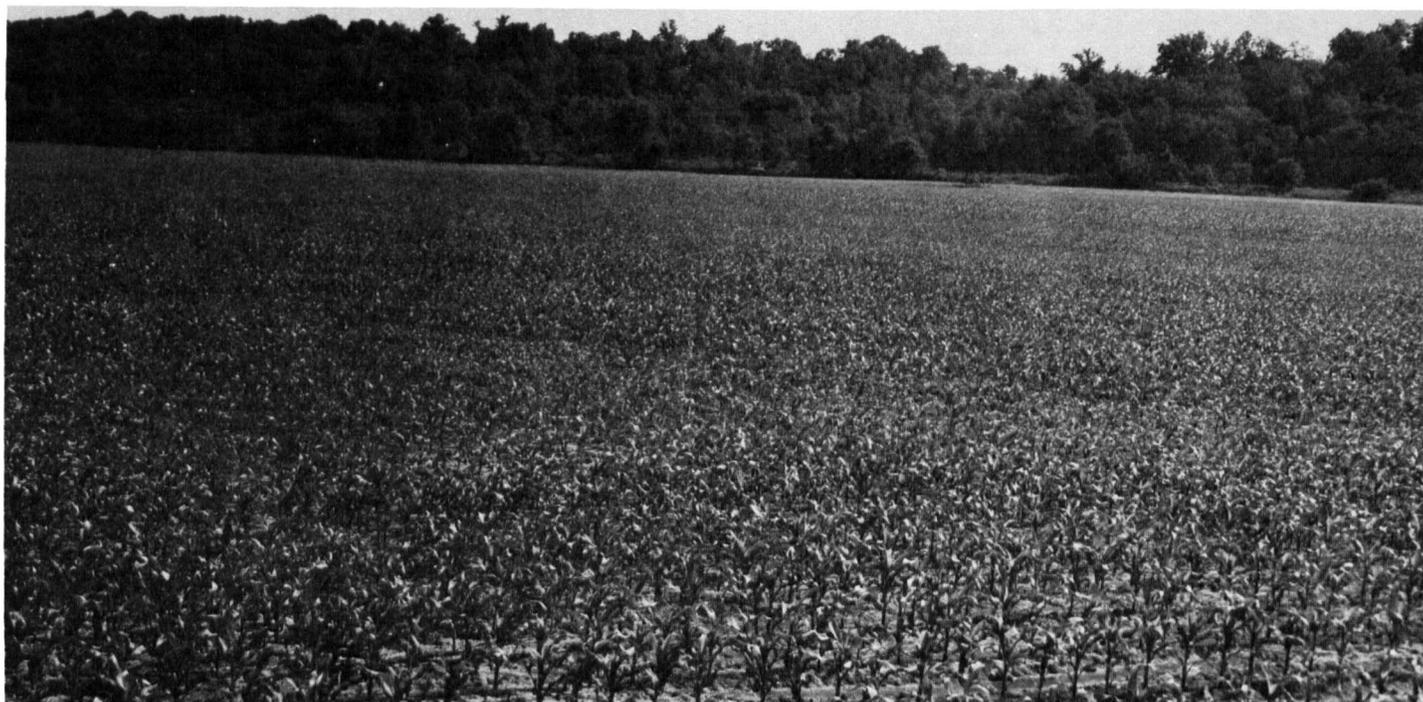


Figure 8.—Corn grows well on Elkinsville silt loam, 0 to 2 percent slopes.

small areas, the soil is more than 15 percent sand. In some places the clay content of the control section is less than 18 percent.

Included with this soil in mapping are a few small areas of soil that has a sand surface layer. Also included are a few small areas of severely eroded Elkinsville soils with slopes of more than 6 percent.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is moderate. The surface layer is medium acid or strongly acid in areas that have not been limed. The surface layer is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland and are used for corn, soybeans, and small grain. A few areas are used for growing hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled when cultivated crops are grown. Crop rotation, minimum tillage, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. The use of crop residues and cover crops also helps control erosion and improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep pasture and soil in good condition.

This soil is well suited to trees. Although plant competition is severe, seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by frost action. Frost action can be reduced by providing adequate drainage ditches and by using more stable base materials, such as sand and gravel. The use of this soil for septic tank absorption fields is moderately limited by rare flooding.

This soil is in capability subclass 1Ie and woodland suitability subclass 10.

**Ev—Evansville silt loam.** This is a nearly level, deep, poorly drained soil on low terraces and lake plains. It is rarely flooded. The dominant size of individual areas is 50 to 100 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is

about 26 inches thick. The upper part is grayish brown, mottled, firm silty clay loam, and the lower part is olive gray, firm silty clay loam. The underlying material, to a depth of 60 inches, is light olive brown mottled silty clay loam. In some places the surface layer is very dark grayish brown. In other areas, the subsoil is strongly acid. In some small areas, there is 10 to 20 inches of silty overwash over a buried soil that has a dark colored surface layer.

Included with this soil in mapping are small areas of Uniontown and Zipp soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is moderate. The surface layer is neutral. It is friable and is easily tilled through a fairly wide range in moisture content.

Almost all of this soil has been drained and is used for crops. Corn, soybeans, and wheat are the most common crops. A few areas are used for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is a major limitation to crop production. Artificial drainage—open ditches, surface drains, or tile—is needed to remove excess water. With proper drainage, a cropping system that includes row crops most of the time can be used. Minimum tillage, returning crop residues to the soil, and growing cover crops also help maintain good tilth.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep rooted legumes because of poor drainage and the seasonally high water table. Artificial drainage of this soil is necessary for high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, but very few areas are wooded. The limitations to the use of equipment are severe. Logging and harvesting operations are confined to dry seasons of the year or to periods when the ground is frozen. Seedling mortality and the hazard of windthrow are moderate. Replanting may be necessary. Although plant competition is severe, seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness and rare flooding. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system. Flooding can be prevented by dikes and levees, but these are extremely expensive when constructed well enough to assure total protection. The use of this soil for

septic tank absorption fields is severely limited by wetness. Commercial or public sewage systems are needed.

The use of this soil for local streets and roads is severely limited by wetness, frost action, and low strength. The effects of frost action and low strength may be reduced by using a more stable base material, such as sand or gravel, and by providing adequate road drainage ditches.

This soil is in capability subclass 1lw and woodland suitability subclass 2w.

**Ge—Genesee loam.** This is a nearly level, deep, well drained soil on bottom lands along the Ohio and Wabash Rivers. It is flooded frequently. The dominant size of individual areas ranges from 5 to 13 acres.

In a typical profile the surface layer is dark grayish brown loam about 9 inches thick. The underlying material, to a depth of 29 inches, is brown loam. To a depth of 43 inches, it is brown silt loam. Below this, to a depth of 60 inches, the underlying material is yellowish brown silt loam. In some places this soil has 6 to 12 inches of silty or sandy overwash. In some places there are no free carbonates above a depth of 40 inches. Small areas of this soil are less than 15 percent sand. Small areas have 16 to 26 inches of loam or silt loam over fine and medium sand.

Included with this soil in mapping are small areas of Stonelick soils. Also included are very narrow areas along drainageways where slopes are 2 to 6 percent.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. Organic-matter content is low. The surface layer is mildly alkaline or neutral. It is friable and is easily tilled through a wide range in moisture content.

Most of this soil is cropland. Corn and soybeans are grown almost exclusively. A few areas are in trees.

This soil is well suited to corn and soybeans. Because it is flooded almost every year during the late winter and early spring months, this soil is not suited to winter wheat. This flooding usually happens before the cropping season and rarely causes complete crop loss, but it occasionally delays planting and causes some areas to be replanted. If protected from flooding, this soil is well suited to all crops commonly grown in the area. Controlling Johnsongrass is a problem on this soil. Minimum tillage, planting cover crops, and returning crop residues to the soil will improve and maintain the tilth and organic-matter content of this soil.

This soil is poorly suited to perennial grasses and legumes for hay and pasture unless it is protected from flooding. Annual warm season forage crops may be used for grazing during the summer and early fall. If this soil is protected from flooding, it is well suited to grass and legume hay and pasture. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Restricted use during wet periods will help keep this soil productive.

This soil is well suited to trees. A few areas are in native hardwoods that can tolerate periodic wetness. Although plant competition is moderate, seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

This soil is generally unsuitable for dwellings, small commercial buildings, local streets and roads, and septic tank absorption fields because of the severe limitation of flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection from flooding.

This soil is in capability subclass 1lw and woodland suitability subclass 1o.

**Gn—Ginat silt loam.** This is a nearly level, deep, poorly drained soil with a fragipan. It is in depressions and drainageways on terraces. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 4 inches thick. The subsoil extends to a depth of 48 inches. The subsoil above the fragipan extends to a depth of 25 inches and is light brownish gray, mottled, firm silt loam. The subsoil between 25 and 48 inches is the fragipan. The upper part of this fragipan is light brownish gray mottled very firm silt loam, and the lower part is mottled, light brownish gray and yellowish brown, very firm silt loam. The underlying material, to a depth of 60 inches, is yellowish brown, mottled silt loam. In some places the surface layer is covered with 3 to 6 inches of loamy overwash. In some places the fragipan begins below a depth of 30 inches.

Included with this soil in mapping are a few small areas of Peoga, Vincennes, and Weinbach soils.

This soil has moderate available water capacity and very slow permeability. Surface runoff is slow. The organic-matter content is low. Reaction of the surface layer varies widely as a result of local liming practices. In areas that have not been limed it is strongly acid. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Some areas of this soil have been drained, and most areas are in crops. Corn, soybeans, and winter wheat are the most common crops. Many undrained areas are in woodland. A few areas are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Wetness is a major limitation to use of this soil, and artificial drainage is needed to obtain maximum production. Open ditches and surface drains will remove excess water. Tile drainage is usually not satisfactory because the tile must be installed above the fragipan. During extremely dry years crops may be damaged by lack of moisture because the fragipan limits root penetration. Minimum tillage, using cover crops, and returning crop

residues to the soil will help maintain and improve the tilth and organic-matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep rooted legumes because of poor drainage and a seasonally high water table. Artificial drainage is needed to obtain maximum production. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, and many areas are in native hardwoods that will tolerate wetness. The limitations to the use of equipment are severe. Harvesting operations are confined to the dry seasons of the year or to periods when the ground is frozen. The hazard of windthrow is moderate, and the hazards of seedling mortality and plant competition are severe. Replanting may be necessary, although seedlings will survive and grow if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness and rare flooding. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system. Flooding can be prevented with dike and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by wetness, frost action, and low strength. The effects of frost action and low strength may be reduced by using a more stable base material, such as sand or gravel, and by providing adequate road drainage ditches. The use of this soil for septic tank absorption fields is severely limited by wetness and very slow permeability. Because slow percolation is difficult to overcome, alternative methods or sites should be investigated.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

**Ha—Haymond silt loam.** This is a nearly level, deep, well drained soil on bottom lands and alluvial fans near small streams and drainageways. It is subject to frequent local flooding. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The underlying material, to a depth of 47 inches, is yellowish brown, friable silt loam in the upper part and yellowish brown, mottled, friable silt loam in the lower part. Below this, to a depth of 60 inches, the underlying material is light brownish gray, mottled silt loam. In some places stratified coarser textured material

is in the profile. In some places, the surface layer is covered with 6 to 10 inches of loamy or sandy overwash. Some small areas of strongly acid soils are on alluvial fans, and in small areas the soil is not mottled.

Included with this soil in mapping are small areas of Wakeland soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is low. The surface layer is neutral or slightly acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most of this soil is cropland. Some areas are used for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. It is subject to local flooding of short duration, but usually not during the cropping season. Returning crop residues to the soil, using cover crops, and minimum tillage will help improve and maintain the tilth and organic-matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

This soil is generally unsuitable for dwellings, small commercial buildings, and septic tank absorption fields, because flooding is a severe limitation. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection from flooding. The use of this soil for local streets and roads is severely limited by flooding and frost action. Frost action can be reduced by providing adequate road drainage ditches and by using a more stable base material, such as sand or gravel.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

**HeA—Henshaw silt loam, 0 to 2 percent slopes.** This nearly level soil is deep and somewhat poorly drained. It is on low terraces. The dominant size of individual areas ranges from 5 to 15 acres.

In a typical profile the surface layer is grayish brown silt loam about 8 inches thick. The subsoil is about 36 inches thick. The upper part is light olive brown, firm silty clay loam; the next part is light olive brown, mottled, firm silty clay loam; and the lower part is olive brown, mottled silty clay loam. The underlying material, to a depth of 60 inches, is mottled, light olive brown and light brownish gray silty clay loam with strata of silt loam. In some places the underlying material is at depths of less than

60 inches. In some places the profile is neutral throughout.

Included with this soil in mapping are small areas of Iona, Uniontown, and Reesville soils. Also included are small areas where slopes are 2 to 6 percent.

This soil has high available water capacity and moderately slow permeability. Surface runoff is slow. The organic-matter content is moderate. Reaction of the surface layer varies widely as a result of local liming practices. The surface layer is friable and easily tilled through a fairly wide range in moisture content.

Most of this soil is cropland. Some areas are used for hay and pasture. A few areas are used for trees.

This soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation to use and management. Tile drainage, surface drains, or open ditches will remove excess water. With adequate drainage, a cropping system that includes row crops most of the time may be used. Minimum tillage, returning crop residues to the soil, and using cover crops help maintain and improve organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. Grasses are better suited than deep rooted legumes because of a seasonally high water table. Overgrazing and grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. The limitations to the use of equipment are moderate. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. Although plant competition is moderate, seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness. Wetness can be reduced by a properly designed drainage system. Tile drains, surface drains, or open ditches will remove excess water. The use of this soil for septic tank absorption fields is severely limited by wetness and moderately slow permeability. Public or commercial sewage disposal systems are needed. Use of local streets and roads is severely limited by frost action. Frost action may be overcome by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel.

This soil is in capability subclass 11w and woodland suitability subclass 1o.

**HoB2—Hosmer silt loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep and well drained and has a fragipan. It is on ridgetops in the uplands. The dominant size of individual areas is 15 to 20 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The part of the subsoil above the fragipan extends to a depth of about 29 inches. It is brown and yellowish brown, firm and friable silt loam. The fragipan extends to a depth of 80 inches. It is mottled yellowish brown, very firm silt loam. In some places there is a subsurface layer. In some places the fragipan is below a depth of 36 inches.

Included with this soil in mapping are small areas of severely eroded Hosmer soils and nearly level Hosmer soils. A few small areas of Alford soils are also included.

This soil has moderate available water capacity and very slow permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is medium acid or strongly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are used for hay and pasture or for woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled when cultivated crops are grown. Crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. Returning crop residues to the soil and planting cover crops also help to control erosion and improve and maintain tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

This soil has only slight limitations for dwellings without basements. Its use for dwellings with basements is moderately limited by wetness. Drainage is needed to lower the water table if basements are to be installed. Foundation drainage tile, sand backfilling, and sealing basement walls should also be considered. The use of this soil for small commercial buildings is moderately limited by slope. Slope can be modified by grading, and construction should be designed to complement the slope. A minimal area should be disturbed, and disturbed areas should be revegetated as soon as possible to prevent erosion. The use of this soil for local streets and roads is severely limited by frost action. Frost action can

be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is severely limited by very slow permeability. An alternative means of sewage disposal is needed.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

**HoC3—Hosmer silt loam, 6 to 12 percent slopes, severely eroded.** This moderately sloping soil is deep and well drained and has a fragipan. It is on side slopes and narrow ridgetops in the uplands. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The part of the subsoil above the fragipan extends to a depth of 24 inches. It is strong brown, firm silt loam. The fragipan extends to a depth of 80 inches. It is brown, mottled, very firm silt loam. In some places, the depth to fragipan is less than 20 inches.

Included with this soil in mapping are small areas of eroded Hosmer soils and both gently sloping and strongly sloping Hosmer soils. A few small areas of Alford soils are also included.

This soil has moderate available water capacity and very slow permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is medium acid or strongly acid in areas that have not been limed. The surface layer is friable or firm and has a tendency to become cloddy or compacted unless tilled at the proper moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are used for hay and pasture or for woodland.

This soil is suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled when cultivated crops are grown. One or more such methods as crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. The return of crop residues to the soil and use of cover crops also help to control erosion and improve and maintain the tilth and organic-matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs

may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings without basements is moderately limited and its use for small commercial buildings is severely limited by slope. These structures should be designed to complement the slope. The slope can also be modified to some extent by grading or by cutting and filling. A minimal area should be disturbed, and disturbed areas should be revegetated as soon after construction as possible. The use of this soil for dwellings with basements is moderately limited by wetness and slope. Drainage is needed to lower the water table if basements are installed. Installing foundation drain tile, backfilling basement walls with pervious material, and sealing basement walls should be considered. The use of this soil for local streets and roads is severely limited by frost action. Frost action can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is severely limited by very slow permeability. An alternative means of sewage disposal is needed.

This soil is in capability subclass IVe and woodland suitability subclass 2o.

**HoD3—Hosmer silt loam, 12 to 18 percent slopes, severely eroded.** This strongly sloping soil is deep and well drained and has a fragipan. It is on side slopes in the uplands. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The part of the subsoil above the fragipan is strong brown, firm silt loam and extends to a depth of 20 inches. The part of the subsoil that is the fragipan extends to a depth of 80 inches. It is brown, mottled, very firm silt loam. In some places residuum from sandstone with textures of loamy sand or sand is in the upper 60 inches of the profile. In some small gullied areas the fragipan is at or near the surface.

Included with this soil in mapping are small gullied areas with the fragipan at or near the surface. Also included are small areas of uneroded moderately sloping Hosmer soils. A few small areas of Alford soils are also included.

This soil has moderate available water capacity and very slow permeability. Surface water runoff is very rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is medium or strongly acid in areas that have not been limed. The surface layer is friable or firm and has a tendency to be cloddy or compacted unless tilled within a fairly narrow range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are used for hay and pasture or for woodland.

This soil is generally unsuited to cultivated crops because of the severe hazard of erosion. Small grain may

be occasionally grown so that stands of grasses and legumes can be reestablished. Minimum tillage, diversions, grassed waterways, and returning crop residues to the soil help prevent excessive soil loss. Crop rotations that include the growing of grasses and legumes most of the time are most effective in reducing surface runoff and erosion.

This soil is suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods. The limitations to the use of equipment are moderate. Slope hinders the use of some machinery. Logging roads should be on the contour, and clear cutting should be avoided. The hazards of erosion and plant competition are moderate. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by slope. Structures should be designed to complement the slope. Slope may be modified to some extent by grading or by cutting and filling. A minimal area should be disturbed, and disturbed areas should be revegetated as soon after construction as possible. Topsoil, if any, should be stockpiled before construction and replaced after construction to help reestablish vegetation. In some places diversion terraces are needed upslope to divert runoff, and debris basins may be needed to trap sediment from construction sites. The use of this soil for septic tank absorption fields is severely limited by very slow permeability and slope. Alternative means of sewage disposal are needed. The use of this soil for local streets and roads is severely limited by frost action and slope. Frost action can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand and gravel. Roads should be constructed on the contour as much as possible.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

**loA—Iona silt loam, 0 to 2 percent slopes.** This nearly level soil is deep and moderately well drained. It is on ridgetops in the uplands. The dominant size of individual areas is 5 to 15 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown, friable silt loam; the next part is yellowish brown, firm silty clay loam; and the lower part is mottled, yellowish brown, firm silty clay loam.

The underlying material, to a depth of 60 inches, is mottled, brownish yellow and light brownish gray silt loam. In some small areas the soil is medium acid or strongly acid to a depth of 60 inches. In some places the soil is not mottled above a depth of 40 inches.

Included with this soil in mapping are small areas of Reesville soils. Also included are small areas of Iona soils that have slopes of more than 2 percent.

This soil has high available water capacity and moderately slow permeability. Surface runoff is slow. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is usually medium acid or strongly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are in hay and pasture. A few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. There are no limitations to its use for crops. The return of crop residues to the soil and minimum tillage improve and maintain tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, thinning, or girdling.

The use of this soil for dwellings without basements and for small commercial buildings is moderately limited by wetness, shrink-swell, and low strength. Drainage is needed in most areas to lower the water table. Foundations and footings and basement walls should be designed to prevent structural damage caused by low strength and shrinking and swelling of the soil. Because its use for dwellings with basements is severely limited by wetness, houses without basements should be considered in developments. Areas should be graded to divert surface water away from buildings. The use of this soil for local streets and roads is severely limited by frost action and low strength. Frost action can be reduced by drainage. Low strength can be minimized by filling the roadbed with more stable material, such as sand or gravel, and by compaction. The use of this soil for septic tank absorption fields is severely limited by wetness and moderately slow permeability. This may be compensated for by installing a larger fieldbed or by installing the fieldbed at a depth below the subsoil after the water table has been adequately lowered.

This soil is in capability class I and woodland suitability subclass 1o.

**loB2—Iona silt loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep and moderately well drained. It is on ridgetops in the uplands. The dominant size of individual areas is 15 to 25 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 31 inches thick. The upper part is yellowish brown, firm silt loam; the next part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. The underlying material, to a depth of 60 inches, is mottled brownish yellow and light brownish gray silt loam. In some places small areas are medium acid or strongly acid to a depth of 60 inches. In some places the soil does not have mottles above a depth of 40 inches.

Included with this soil in mapping are small areas of steeper severely eroded Iona soils and nearly level Iona soils.

This soil has high available water capacity and moderately slow permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is usually medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are in hay and pasture. A few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion is a hazard when this soil is used for crops. Erosion and surface runoff need to be controlled. The use of crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures helps prevent excessive soil loss. The return of crop residues to the soil and growing cover crops also help to control erosion and improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. This use is effective in controlling erosion. Overgrazing or grazing when the soil is wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings without basements is moderately limited by wetness, low strength, and high shrink-swell potential. Drainage is needed in most areas to lower the water table. Foundations and footings and

basement walls should be designed to prevent structural damage caused by the low strength and shrinking and swelling of the soil. Because wetness is a severe limitation for dwellings with basements, houses without basements should be considered in developments. The use of this soil for small commercial buildings is moderately limited by slope, wetness, and low strength. These limitations can be modified by grading or by leveling and filling. The use of this soil for local streets and roads is severely limited by frost action and low strength. Frost action can be reduced by providing adequate road drainage ditches. Low strength can be overcome by using more stable base materials, such as gravel or sand, and by compaction. The use of this soil for septic tank absorption fields is severely limited by moderately slow permeability and wetness. Installing the field bed below the subsoil helps to overcome the moderately slow permeability in adequately drained areas.

This soil is in capability subclass 1le and woodland suitability subclass 1o.

**loB3—Iona silt loam, 2 to 6 percent slopes, severely eroded.** This gently sloping soil is deep and moderately well drained. It is on ridgetops and short side slopes in the uplands. The dominant size of individual areas is 5 to 15 acres.

In a typical profile the surface layer is brown and yellowish brown silt loam about 7 inches thick. The subsoil is about 26 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, mottled, firm silty clay loam. The underlying material, to a depth of 60 inches, is mottled, yellowish brown and light brownish gray silt loam. In some places the soil is neutral to strongly acid below a depth of 60 inches. In some small areas the soil does not have mottles above a depth of 40 inches.

Included with this soil in mapping are small areas with slopes of more than 6 percent.

This soil has high available water capacity and moderately slow permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is usually medium acid in areas that have not been limed. The surface layer is friable, but has a tendency to become cloddy or compacted unless tilled within a fairly narrow range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are in hay and pasture. A few areas are in woodland.

This soil is suited to corn, soybeans, and small grains. Erosion is a hazard when this soil is used for crops. Erosion and surface runoff need to be controlled. Crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. The return of crop residues to the soil and growing cover

crops also help to control erosion and improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. This use is effective in controlling erosion. Overgrazing or grazing when the soil is wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to growing trees, and a few areas are in native hardwoods. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings without basements is moderately limited by wetness, low strength, and high shrink-swell potential. Drainage is needed in most areas to lower the water table. Foundations and footings and basement walls should be designed to prevent structural damage caused by the low strength and shrinking and swelling of the soil. Because use of this soil for dwellings with basements is severely limited by wetness, houses without basements should be considered in developments. The use of this soil for small commercial buildings is moderately limited by slope, wetness, and low strength. These limitations can be modified by grading or by leveling and filling. The use of the soil for local streets and roads is severely limited by frost action and low strength. Frost action can be reduced by providing adequate road drainage ditches. Low strength can be overcome by using more stable base materials, such as gravel or sand, and by compaction. The use of this soil for septic tank absorption fields is severely limited by moderately slow permeability and wetness. These limitations can be overcome by installing the field bed below the subsoil after the water table is adequately lowered.

This soil is in capability subclass IIIe and woodland suitability subclass 1c.

**Ju—Junius loamy sand.** This is a nearly level, deep, poorly drained soil on broad flats and depressions on river terraces. The dominant size of individual areas ranges from 10 to 30 acres, but some areas are more than 100 acres.

In a typical profile the surface layer is 11 inches thick. The upper part is brown loamy sand, and the lower part is dark grayish brown and very dark grayish brown loamy sand. The subsoil is light brownish gray, mottled, very friable loamy sand about 23 inches thick. The underlying material, to a depth of 53 inches, is light brownish gray and dark yellowish brown loamy sand. Below this, to a depth of 65 inches, it is light brownish gray and strong brown stratified loam and sandy loam. In some places the surface layer and upper part of the subsoil are finer textured. In some places the upper part of the subsoil has dominantly brownish colors.

Included with this soil in mapping are small areas of Lyles and Plainfield Variant soils.

This soil has low available water capacity and rapid permeability. Surface runoff is slow. The organic-matter content is low. Reaction of the surface layer is slightly acid or neutral. The surface layer is easily tilled through a wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are used for growing melons. A few areas are used for hay and pasture or woodland.

This soil is suited to corn, soybeans, and small grain. Because it has a low available water capacity, however, the soil is too droughty to achieve maximum yields during periods of low or poorly distributed rainfall. The addition of organic-matter, the use of crop residues, and minimum tillage help maintain and improve water holding capacity. Wetness is a hazard, especially in spring. Properly designed tile drainage systems and surface drains will lower the water table. Open ditches are not recommended for this soil because of the tendency of the banks to cave in.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet will cause surface compaction. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Limitations to the use of equipment are moderate. Logging operations are confined to dry seasons of the years. The hazards of seedling mortality, windthrow, and plant competition are moderate. Wetness tolerant species are favored in timber stands. Replanting may be necessary. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system.

The use of this soil for local streets and roads is moderately limited by frost action and wetness. These hazards may be overcome by providing adequate road drainage ditches. The use of this soil for septic tank absorption fields is severely limited by wetness. Alternative methods of sewage disposal should be considered or alternate sites located.

This soil is in capability subclass IIIw and woodland suitability subclass 3w.

**Ld—Landes sandy loam.** This is a nearly level, deep, well drained soil on flat areas on bottom lands. It is

subject to occasional flooding. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is very dark grayish brown and very dark gray sandy loam about 19 inches thick. The subsoil is about 17 inches thick. The upper part is brown, very friable sandy loam, and the lower part is dark yellowish brown, very friable sandy loam. The underlying material, to a depth of 60 inches, is yellowish brown sand and loamy sand. In some places 6 to 12 inches of lighter colored silty or sandy overwash is on the surface. In some places the underlying material is coarser textured. Some areas have horizons in which the content of gravel is as much as 35 percent.

Included with this soil in mapping are small areas of Genesee and Stonelick soils. Also included are narrow areas along drainageways with slopes of 2 to 6 percent.

This soil has moderate available water capacity and moderately rapid permeability. Surface runoff is medium. The organic-matter content is high. The surface layer is neutral or mildly alkaline. It is very friable and is easily tilled through a wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. Droughtiness is the main hazard. The moderate available water capacity limits production during years when rainfall is below normal or is poorly distributed. This soil is well suited to drought-resistant crops such as grain sorghum. Some areas of this soil are subject to frequent flooding, but this usually does not occur during the cropping season. Such areas are poorly suited to winter wheat unless protected from flooding. The return of plant residues to the soil, minimum tillage, and planting cover crops help conserve soil moisture.

This soil is well suited to grass and legume hay and pasture although it is rarely used for this purpose. It is better suited to deep rooted legumes because of the moderate available water capacity. Some areas that are subject to occasional flooding should be protected to obtain maximum production. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotations, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. The hazard of plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by flooding. The soil is generally not suitable for this use. It has severe limitations for septic tank absorption fields because of flooding. Flooding can be prevented by dikes and levees, but they

are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is moderately limited by frost action and flooding. Frost action can be reduced by providing adequate road drainage ditches and by compaction.

This soil is in capability subclass II<sub>s</sub> and woodland suitability subclass 1<sub>o</sub>.

**Ly—Lyles sandy loam.** This is a nearly level, deep, very poorly drained soil in flat areas and depressions on river terraces. This soil is subject to frequent flooding. The dominant size of individual areas is 20 to 30 acres, but some areas are more than 150 acres.

In a typical profile the surface layer is very dark gray sandy loam about 20 inches thick. The subsoil is about 35 inches thick. The upper part is dark gray, mottled, friable sandy loam; the next part is dark gray, mottled, friable loam with pockets of sandy loam; the next part is gray and strong brown, firm sandy loam; and the lower part is dark gray and gray, mottled sandy loam with strata of sandy clay loam. The underlying material, to a depth of 60 inches, is light gray sand. In small areas the surface layer is more than 24 inches thick. Some small areas of soil have a higher clay content. Some areas are silt loam.

Included with this soil in mapping are small areas of Junius and Plainfield Variant soils. Also included are small areas on alluvial fans where slopes are 2 to 5 percent. Some of these areas are calcareous.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is high. Reaction of the surface layer varies due to local liming practices. It is neutral in most areas. The surface layer is friable and is easily tilled through a wide range in moisture content.

Most areas of this soil have been drained and are in crops. Corn, soybeans, and winter wheat are the most common crops. Some areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation to the use of this soil for crops. Artificial drainage is needed to remove excess water. Properly designed tile systems, open ditches, or surface drains generally are needed. The return of crop residues to the soil and minimum tillage help improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep rooted legumes because of poor drainage and a seasonally high water table. Artificial drainage is needed to consistently obtain maximum yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is suited to trees. Limitations to the use of equipment are severe. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. The hazards of seedling mortality and plant competition are severe, and the hazard of windthrow is moderate. Replanting may be necessary. Seedlings survive and grow well if competing vegetation is controlled. Species which are tolerant of wetness should be selected.

The use of this soil for dwellings, small commercial buildings and septic tank absorption fields is severely limited by wetness and flooding. The soil is generally not suited to building sites because of flooding. A properly designed drainage system is needed in conjunction with storm drains to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system. Commercial or public sewage systems are needed. Flooding can be prevented by dikes and levees, but these are extremely expensive when constructed well enough to provide total protection. The use of this soil for local streets and roads is severely limited by frost action and wetness. Frost action can be reduced by providing adequate road drainage ditches and by compaction.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

**Nk—Newark silty clay loam.** This is a nearly level, deep, somewhat poorly drained soil in old channels, depressions, and drainageways on bottom land. It is subject to frequent flooding. The dominant size of individual areas ranges from 10 to 30 acres.

In a typical profile the surface layer is brown silty clay loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown mottled, firm silty clay loam, and the lower part is grayish brown mottled, firm silty clay loam. The underlying material, to a depth of 60 inches, is mottled light brownish gray and yellowish brown silty clay loam. In some places this soil has 6 to 12 inches of silt loam or loam overwash on the surface or mixed in the plow layers. In a few places it is silt loam throughout the profile. In a few areas the soil is more sandy than is typical for the series.

Included with this soil in mapping are a few small areas of Nolin and Petrolia soils. Also included are a few small areas of moderately well drained soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is low. The surface layer is neutral. It is usually friable, but is sometimes firm in areas that have been flooded and has a tendency to be cloddy if tilled when too wet.

Most of this soil is cropland. Corn and soybeans are the most common crops. Some areas are wooded.

This soil is well suited to corn and soybeans. Because most areas are subject to frequent flooding, this soil is not suited to winter wheat. Flooding usually happens

before the regular cropping season and only rarely causes complete crop loss. It occasionally delays planting or causes some areas to be replanted. Wetness is also a limitation. Water is often impounded on this soil for long periods. Artificial drainage is needed to achieve maximum production. Tile drainage, surface drains, or open ditch drainage can be used to remove excess water, although it is often difficult to obtain an outlet. Minimum tillage, planting cover crops, and returning crop residues to the soil will improve and maintain the tilth and organic-matter content of this soil. Controlling johnsongrass is a problem on this soil.

This soil is poorly suited to perennial grass and legume hay and pasture because of flooding. Because wetness is a limitation, most areas would benefit from artificial drainage. Annual warm-season grasses can be used for grazing during the summer and early fall. If this soil is protected from flooding, it is well suited to grass and legume hay and pasture. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Restricted use during wet periods will help keep this soil productive.

This soil is well suited to trees. Some areas are in native hardwoods that can tolerate wetness during the winter months. Limitations to the use of equipment are moderate. Logging operations are confined to dry seasons of the year. The hazards of windthrow and plant competition are moderate. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by flooding and wetness. The soil is generally unsuitable for building sites because of flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection from flooding. To remove excess water, a properly designed drainage system is needed in conjunction with storm sewers. Pumping frequently is needed because adequate outlets are not available for a drainage system. Commercial or public sewage disposal systems are needed. The use of this soil for local streets and roads is severely limited by flooding.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

**No—Nolin silt loam.** This is a nearly level, deep, well drained soil on broad, flat and undulating areas of bottom lands. It is subject to frequent flooding. The dominant size of individual areas ranges from 50 to 100 acres, but some areas are more than 500 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 38 inches thick. The upper part is brown, firm silt loam, and the lower part is brown, mottled silt loam. Between 48 and 55 inches the underlying material is

brown silt loam. Below this, to a depth of 70 inches, the underlying material is stratified brown loam and yellowish brown fine sand. In some areas the surface is covered with recent deposits of overwash ranging in texture from silty clay loam to loamy sand. One area in Point Township is in a slightly higher position on the landscape, has a slightly acid solum, and is subject to flooding only occasionally. In some small areas the soil has a dark colored surface layer, and in some areas the soil is more than 15 percent sand.

Included with this soil in mapping are a few small areas of Newark soils. Also included, along old channels and drainageways, are long, narrow areas of gently sloping Nolin soils.

This soil has high available water capacity and moderate permeability. Surface runoff from cultivated areas is slow. The organic-matter content is low. The surface layer is generally neutral but may be mildly alkaline in areas that receive deposits of sediment when flooded. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most of this soil is cropland. Corn and soybeans are grown almost exclusively. A few areas are wooded.

This soil is well suited to corn and soybeans. Because it is flooded almost annually late in winter and early in spring, it is not suited to winter wheat. This flooding usually happens before the regular cropping season, and only rarely causes complete crop loss. It occasionally delays planting and occasionally causes some areas to be replanted. If protected from flooding, this soil is well suited to all crops commonly grown in this area. Minimum tillage, growing cover crops, and returning crop residues to the soil will improve and maintain the tilth and organic-matter content of this soil. Controlling Johnsongrass is a problem.

This soil is poorly suited to perennial grasses and legumes unless it is protected from flooding. Annual warm-season forage crops may be used for grazing or green chop during the summer and early in the fall. If this soil is protected from flooding, it is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Restricted use during wet periods and timely deferment of grazing will help keep the pasture and soil in good condition.

This soil is well suited to trees. A few areas are in native hardwoods that tolerate wetness during the winter months. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

This soil is generally not suitable for dwellings and small commercial buildings. For local streets and roads and septic tank absorption fields, flooding is a severe hazard. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well

enough to assure total protection. Alternative sites for residential or industrial development should be selected.

This soil is in capability class I and woodland suitability subclass 1o.

**OnA—Onarga fine sandy loam, 0 to 2 percent slopes, rarely flooded.** This nearly level soil is deep and well drained. It is on terraces along the Wabash River. It is subject to rare flooding. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is about 15 inches thick. It is very dark grayish brown fine sandy loam in the upper part and very dark gray fine sandy loam in the lower part. The subsoil is about 29 inches thick. The upper part is brown and very dark grayish brown, friable sandy clay loam; the next layer is dark yellowish brown, friable fine sandy loam; and the lower part is brown, very friable fine sandy loam. The underlying material, to a depth of 60 inches, is yellowish brown and light yellowish brown loamy fine sand. In a few small areas the surface layer is more than 24 inches thick. In some places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas where the slope is 2 to 4 percent. Also included in small depressions are areas of Lyles soils.

This soil has moderate available water capacity and moderately rapid permeability. Surface runoff is slow. The organic-matter content is high. Reaction of the surface layer varies widely due to local liming practices, but it is medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a wide range in moisture content.

Most areas of this soil are cropland. Most areas are used for corn, soybeans, and wheat. A few areas are used for hay and pasture.

This soil is suited to corn, soybeans, and small grain. Production is limited by the moderate available moisture capacity, particularly during years when rainfall is below normal or is poorly distributed. Wind erosion is a hazard when this soil is dry. The use of cover crops, minimum tillage, and return of crop residues to the soil will help control wind erosion and conserve soil moisture. These practices also maintain and improve available moisture capacity by adding organic matter to the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control wind erosion. This soil is better suited to deep rooted legumes because it has only moderate available water capacity. Stocking at a proper rate, pasture rotation, and timely deferment of grazing will help keep this soil productive.

This soil has not been rated for woodland suitability because it does not support a sufficient number of well-stocked stands of trees. At the present time, almost all areas are in crops and are of minor importance for timber production. Few characteristics of this soil would limit its use for trees. During periods of below normal

rainfall during the first year or two after planting, seedling mortality may become a problem.

Rare flooding severely limits the use of this soil for dwellings and small commercial buildings and moderately limits its use for septic tank absorption fields. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. Shallow wells should be located as far as possible from sanitary facilities to prevent pollution of ground water supplies from seepage.

This soil is in capability subclass IIs and woodland suitability subclass is not assigned.

**Pa—Patton silty clay loam.** This is a nearly level, deep, poorly drained soil on lake plains and terraces. It is rarely flooded. The dominant size of individual areas ranges from 15 to 20 acres, but some areas are more than 100 acres.

In a typical profile the surface layer is very dark gray silty clay loam about 16 inches thick. The subsoil is about 22 inches thick. The upper part is dark gray, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, firm silty clay loam. The underlying material, to a depth of 60 inches, is light brownish gray, mottled silt loam. In some places it has 4 to 10 inches of light colored silt loam overwash on the surface. In a few small areas the soil has a moderately dark colored surface layer.

Included with this soil in mapping are small areas of Henshaw and Wakeland soils.

This soil has high available water capacity and moderate permeability. Runoff is slow. The organic-matter content is high. The surface layer is neutral. It is friable and is easily tilled through a fairly wide range in moisture content.

Almost all areas of this soil have been drained and are used for crops. Corn, soybeans, and small grain are the most common crops. A few areas are used for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is a major limitation to crop production. Artificial drainage by open ditches, surface drains, or tile is needed to remove excess water. With proper drainage, a cropping system that includes row crops most of the time can be used. Minimum tillage, returning crop residues to the soil, and growing cover crops will help maintain and improve organic-matter content and good tilth.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep rooted legumes, because it is poorly drained and has a seasonally high water table. Artificial drainage of this soil is necessary for high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet peri-

ods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, but very few areas are used for this purpose. The limitations to the use of equipment are severe. Logging operations are confined to dry seasons of the year or when the ground is frozen. The hazards of seedling mortality and windthrow are moderate, and plant competition is severe. Replanting may be necessary. Seedlings survive and grow well, however, if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by spraying, cutting, or girdling.

The use of this soil for dwellings with basements and small commercial buildings is severely limited by wetness, low strength, and rare flooding. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system. Dikes and levees can prevent flooding, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for dwellings without basements is severely limited by wetness, low strength, and rare flooding. Footings should be located below the depth of freezing, and foundations should be backfilled with sand or gravel. The use of this soil for septic tank absorption fields is severely limited by wetness. Commercial or public sewage systems are needed. Use of this soil for local streets and roads is severely limited by frost action, low strength, and wetness. Adequate road drainage ditches should be provided, and roads should be bedded with more stable base material such as sand or gravel.

This soil is in capability unit IIw and woodland suitability subclass 2w.

**PeA—Pekin silt loam, 0 to 2 percent slopes.** This nearly level soil is deep and moderately well drained and has a fragipan. It is on river terraces but is rarely flooded. The dominant size of individual areas ranges from 5 to 10 acres.

In a typical profile the surface layer is brown silt loam about 10 inches thick. The subsoil above the fragipan extends to a depth of 28 inches. The upper part is yellowish brown friable silt loam; the next part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. Below this is the fragipan. It is yellowish brown, mottled, very firm silty clay loam and extends to a depth of 58 inches. The underlying material, to a depth of 80 inches, is dark yellowish brown silt loam. In some places the depth to coarse textured underlying material is less than 60 inches. In some places there is a thin subsurface horizon.

Included with this soil in mapping are small areas of Elkinsville and Weinbach soils.

This soil has moderate available water capacity and very slow permeability. Surface runoff is slow. The organic-matter content is low. The surface layer is medium acid in areas that have not been limed. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and small grain are the most common crops. Some areas are in woodland, and a few areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Droughtiness is a limitation during periods of lower than normal rainfall, because the fragipan limits depth of root penetration. Minimum tillage, growing cover crops, and returning crop residues to the soil help maintain and improve the tilth and organic-matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding. Flooding can be controlled by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection.

The use of this soil for septic tank absorption fields is severely limited by very slow permeability and wetness. Commercial or public sewage systems are needed. More favorable sites may be available on adjoining soils. Use of this soil for local streets and roads is severely limited by frost action. This can be reduced by providing adequate road drainage ditches and by using a more stable base material, such as sand or gravel.

This soil is in capability subclass II<sub>s</sub> and woodland suitability subclass 3<sub>o</sub>.

**PeB2—Pekin silt loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep, moderately well drained, and has a fragipan. It is on river terraces and is subject to rare flooding. The dominant size of individual areas ranges from 5 to 10 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil above the fragipan extends to a depth of about 30 inches. The upper part is yellowish brown, friable silt loam; the next part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. Below this is the fragipan. It is yellowish brown, mottled, very firm silty clay loam and extends to a depth of 8 inches. The underlying material, to a depth of 80 inches, is yellowish

brown silt loam. In some places the depth to coarse textured underlying material is less than 60 inches. In some places, there is a thin subsurface horizon.

Included with this soil in mapping are small areas of Elkinsville and Wheeling soils. Also included are small areas of severely eroded Pekin soils.

This soil has moderate available water capacity and very slow permeability. Surface runoff is rapid. The organic-matter content is low. The surface layer is medium acid in areas that have not been limed.

Most areas of this soil are cropland. Corn, soybeans, and small grain are the most common crops. Some areas are in woodland, and a few areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. The main hazard is erosion. Crop rotations, minimum tillage, contour farming, terraces, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. The return of crop residues to the soil and the use of cover crops also help to control erosion and improve and maintain the tilth and organic-matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. Use of this soil for septic tank absorption fields is severely limited by very slow permeability and wetness. Commercial or public sewage systems are needed. More favorable sites may be available on adjoining soils. The use of this soil for local streets and roads is severely limited by frost action. Frost action can be reduced by using more stable base material, such as sand or gravel, and by providing adequate road drainage ditches.

This soil is in capability subclass II<sub>e</sub> and woodland suitability subclass 3<sub>o</sub>.

**Pg—Peoga silt loam.** This is a nearly level, deep, poorly drained soil in flat areas and depressions on river terraces. This soil is subject to rare flooding. The dominant size of individual areas is 15 to 30 acres.

In a typical profile the surface layer is mottled grayish brown silt loam about 9 inches thick. The subsurface layer is light gray, mottled silt loam about 9 inches thick. The subsoil is about 32 inches thick. The upper part is

light gray, mottled, firm silty clay loam, and the lower part is grayish brown, firm silty clay loam. The underlying material, to a depth of 60 inches, is mottled light brownish gray and yellowish brown silt loam. In some places the surface layer is loam. In some small areas the solum is thinner than 48 inches. In some small areas the content of sand is more than 15 percent.

Included with this soil in mapping are small areas of Ginat and Weinbach soils. Also included are small areas of Elkinsville soils on small slightly higher swells.

This soil has high available water capacity and slow permeability. Surface runoff is slow. The organic-matter content is low. The surface layer varies widely due to local liming practices. It is usually medium or strongly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Wetness is the main limitation to its use as cropland. Artificial drainage—properly designed tile systems, open ditches, or surface drains—is needed to remove excess water. The return of crop residues to the soil and minimum tillage help improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep rooted legumes because it is poorly drained and has a seasonal high water table. Artificial drainage is needed to achieve maximum yields. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotations, timely deferment of grazing, and restricted use during wet periods will keep the pasture and soil in good condition.

This soil is well suited to trees, and some areas are in native hardwoods that tolerate wetness. The limitations to the use of equipment are severe. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. The hazards of seedling mortality and plant competition are severe. Replanting may be necessary. The hazard of windthrow is moderate. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding and wetness. Dikes and levees will prevent flooding, but they are extremely expensive when constructed well enough to assure total protection. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system. The use of this soil for septic tank absorption fields is severely limited by slow permeability

and wetness. An alternative method of sewage disposal is needed. More favorable sites may be available on adjacent soils. Use of this soil for local streets and roads is severely limited by frost action, low strength, and wetness. The effects of these limitations can be reduced by providing adequate road drainage ditches, by using a more stable base material, such as sand or gravel, and by compaction.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

**Ph—Petrolia silty clay loam.** This is a nearly level, deep, poorly drained soil in old channels and depressions on bottom lands. It is subject to frequent flooding. The dominant size of individual areas ranges from 15 to 50 acres, but some areas are more than 300 acres.

In a typical profile the surface layer is dark grayish brown silty clay loam about 12 inches thick. The underlying material, to a depth of 54 inches, is dark gray, mottled silty clay loam. Below this, to a depth of 70 inches, the underlying material is gray, mottled silty clay loam. In some places this soil has up to 12 inches of silty or loamy overwash on the surface. In some places the surface layer is dark colored. In some small areas the soil is more than 15 percent sand.

Included with this soil in mapping are small areas of Newark soils.

This soil has high available water capacity and moderately slow permeability. Runoff is very slow or ponded. Organic-matter content is moderate. The surface layer is neutral. It is firm. The soil has a tendency to become compacted or cloddy unless tilled within the proper range in moisture content.

Most areas of this soil are woodland or cropland. Corn and soybeans are the most common crops. Some areas are ponded with floodwater during much of the growing season. These areas are often used for growing trees that will tolerate wetness.

This soil is suited to corn and soybeans. It is not suited to winter wheat because it is subject to frequent flooding. This flooding causes crop loss in some years and delays planting most years. Some areas are ponded with floodwater during much of the growing season. Artificial drainage and protection from flooding are needed to obtain maximum yields. Tile drains or open ditches will remove excess water, but outlets are difficult to obtain. Minimum tillage and return of crop residues to the soil will improve and maintain the tilth and organic-matter content of this soil.

This soil is poorly suited to perennial grasses and legumes because it is subject to frequent flooding. Annual warm-season grasses may be used for grazing during the summer and early in fall. Wetness is also a limitation. Tile drains and open ditches will remove excess water. If this soil is protected from flooding and if wetness is reduced, it is well suited to grasses and legumes for hay and pasture. Overgrazing and grazing

when the soil is too wet will cause surface compaction and poor tilth. Restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in native hardwoods that can tolerate wetness (fig. 9). Limitations to the use of equipment are moderate. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. The hazard of seedling mortality is moderate, and plant competition is severe. Replanting may be necessary. Seedlings survive and grow well, however, if competing vegetation is controlled. Unwanted trees and shrubs may be controlled or removed by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by flooding and wetness. It is generally not suitable for building sites because of flooding. Flooding can

be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping often is needed because adequate outlets are not available for a drainage system. Commercial or public sewage disposal systems are needed. Alternative sites for residential or industrial development should be located. Use of this soil for local streets and roads is severely limited by frost action and wetness. Frost action may be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

**PnB—Plainfield Variant loamy fine sand, 0 to 6 percent slopes.** This nearly level and gently sloping soil is



*Figure 9.*—Water-tolerant cypress and maple trees in an undrained, unprotected area of Petrolia silty clay loam. Water is ponded much of the year on this soil.

deep and excessively drained. It is on dunes on river terraces. The dominant size of individual areas ranges from 10 to 15 acres.

In a typical profile the surface layer is brown and very dark grayish brown loamy fine sand about 12 inches thick. The subsoil is about 18 inches thick. The upper part is dark yellowish brown, very friable sand, and the lower part is yellowish brown, very friable sand. The underlying material, to a depth of 65 inches, is brownish yellow and yellowish brown fine to coarse sand. Some areas of this soil have a thinner surface layer. Some areas have a darker surface layer.

Included with this soil in mapping are a few areas of Onarga and Wheeling soils.

This soil has low available water capacity and rapid permeability. Surface runoff is slow. The organic-matter content is moderate. The surface layer is medium or slightly acid in areas that have not been limed. It is very friable and is easily tilled through a wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and small grain are the most common crops. A few areas are used for hay and pasture or for specialty crops such as melons.

This soil is suited to corn, soybeans, and small grain. Production is limited by the low available water capacity, particularly during years in which rainfall is below normal or is poorly distributed. Wind and water erosion are minor hazards when it is used as cropland. The return of crop residues to the soil, minimum tillage, cover crops, and additions of organic matter will help conserve soil moisture and reduce erosion.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to deep rooted legumes because of the low available water capacity. Stocking at a proper rate, pasture rotation, and timely deferment of grazing will help keep the pasture and soil productive.

This soil is well suited to trees, although very few areas are used for this purpose. Seedlings survive and grow well if not subjected to long dry periods and if competing vegetation is controlled. The control or removal of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

This soil has only slight limitations for dwellings, small commercial buildings, and local streets and roads. Limitations for septic tank absorption fields are also slight, but this use of the soil may pollute nearby shallow wells. It is difficult to establish and maintain lawns on this soil. Irrigation is needed during periods of low or poorly distributed rainfall.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

**PrB2—Princeton loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep and well drained. It is on narrow ridgetops and dunes in the up-

lands. The dominant size of individual areas ranges from 10 to 15 acres.

In a typical profile the surface layer is brown loam about 8 inches thick. The subsoil is about 40 inches thick. The upper part is strong brown, firm clay loam, and the lower part is strong brown, friable sandy loam. The underlying material, to a depth of 80 inches, is very pale brown and yellowish brown fine sand that contains bands of brown loamy fine sand. In some places, the surface layer is fine sandy loam. In some places this soil has thin horizons of silt loam.

Included with this soil in mapping are small areas of Alford and Bloomfield soils and small areas of nearly level Princeton soils. Also included are small areas of severely eroded Princeton soils in which the surface layer and subsoil combined are less than 40 inches thick.

This soil has moderate to high available water capacity and moderate permeability. Runoff is slow. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is medium or slightly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a wide range of moisture content.

Most areas of this soil are cropland. Corn, soybeans, and wheat are the most common crops. Many areas are in woodland, hay, or pasture. Some areas are in specialty crops such as melons.

This soil is well suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled when cultivated crops are grown. Crop rotation, minimum tillage, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. Returning crop residues to the soil and growing cover crops also help control erosion, conserve soil moisture, and improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grass and legume hay and pasture. This use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

This soil has slight limitations for dwellings and septic tank absorption fields. Its use for small commercial buildings is moderately limited by slope. Slopes can be modified by grading. Disturbed areas should be revegetated as soon after construction as possible. The use of this soil for local streets and roads is moderately limited by frost action and low strength. Frost action can be re-

duced by providing adequate road drainage ditches and by compaction. The base can be strengthened with a more suitable material.

This soil is in capability subclass IIe and woodland suitability subclass 10.

**PrC2—Princeton loam, 6 to 12 percent slopes, eroded.** This moderately sloping soil is deep and well drained. It is on side slopes in the uplands. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is brown loam about 7 inches thick. The subsoil is about 43 inches thick. The upper part is brown, firm loam; the next part is brown, firm clay loam; the next part is strong brown, friable sandy loam; and the lower part is brown, very friable sandy loam. The underlying material, to a depth of 60 inches, is very pale brown sand that contains bands of brown loamy fine sand. Below this, to a depth of 80 inches, is brown and yellowish brown stratified loamy fine sand and sand. In some places thin horizons of silt loam are in the profile. In some places the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Alford and Bloomfield soils. Also included are small areas of severely eroded Princeton soils in which the surface layer and subsoil combined are less than 40 inches thick and areas of Princeton soils that have slopes of more than 12 percent.

This soil has moderate to high available water capacity and moderate permeability. Runoff is medium. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is medium or slightly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range of moisture content.

Most areas of this soil are cropland. Corn, soybeans, and wheat are the most common crops. Many areas are in woodland or hay and pasture.

This soil is suited to corn, soybeans, and small grain. Conservation measures are needed to control erosion and surface runoff. Crop rotation, minimum tillage, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to prevent excessive soil loss. The return of crop residues to this soil and planting cover crops also help control erosion, conserve soil moisture, and improve and maintain tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to growing trees, and many areas are in native hardwoods. Plant competition is mod-

erate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and septic tank absorption fields is moderately limited and its use for small commercial buildings is severely limited by slope. Slope can be modified by grading or by cutting and filling. A minimal area should be disturbed, and disturbed areas should be revegetated as soon after construction as possible. Topsoil should be stockpiled and replaced. Absorption fields should be designed to conform to the slope. The use of this soil for local streets and roads is moderately limited by frost action, slope, and low strength. Frost action can be reduced by providing adequate road drainage ditches and by compaction. The base can be strengthened with a more suitable material.

This soil is in capability subclass IIIe and woodland suitability subclass 10.

**Ps—Psamments.** This is a nearly level or gently sloping, deep, excessively drained soil on bottom lands. It is subject to frequent flooding. The dominant size of individual areas is 10 to 20 acres.

This soil is stratified sand ranging from very coarse through fine sand. It is calcareous throughout, and gravel from 2 to 25 millimeters in size are few or common. In some areas thin layers of finer textured material are on the surface or within the profile at various depths.

Included with this soil in mapping are small areas of Stonelick soils.

This soil has low available water capacity and very rapid permeability. Surface runoff is slow. The organic-matter content is low. Reaction of the surface layer is moderately alkaline. Particles in the surface layer have a loose, or noncoherent, consistence.

Most areas of this soil are idle. They support willows and cottonwoods as well as annual weeds.

This soil is poorly suited to the crops commonly grown in the area because it is subject to flooding, has low available water capacity, and lacks plant nutrients. Dikes and levees, irrigation, and fertilizers are needed to make this soil suitable for crop production.

This soil is also poorly suited to grasses and legumes for hay and pasture because of flooding, low available water capacity, and a lack of plant nutrients. Dikes and levees, irrigation, and fertilizer are needed to make this soil suitable for pasture and hay crops.

This soil is well suited to trees, although very few areas are used for this purpose. Seedling mortality is a severe limitation. Replanting may be necessary. If seedlings are protected from flooding and are irrigated, they survive and grow well. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, local streets and roads, and septic tank ab-

sorption fields is severely limited by flooding. Dikes and levees can prevent flooding but are extremely expensive when constructed well enough to assure total protection. Alternative sites should be located for residential or commercial development.

This soil is in capability subclass VIIc and woodland suitability subclass 3s.

**Ra—Ragsdale silt loam.** This is a nearly level, deep, very poorly drained soil in flat areas and depressions on terraces. It is frequently ponded with surface water runoff from adjacent higher lying areas. The dominant size of individual areas ranges from 15 to 20 acres.

In a typical profile the surface layer is very dark gray silt loam about 19 inches thick. The subsoil is grayish brown, mottled, friable silty clay loam about 24 inches thick. The underlying material, to a depth of 65 inches, is grayish brown and yellowish brown silt loam. In some places the subsoil extends below a depth of 52 inches. In some small areas the surface layer is silty clay loam. In some places the soil has as much as 10 inches of light colored silt loam overwash on the surface. In a few small areas there is no argillic horizon.

Included with this soil in mapping are small areas of Henshaw and Reesville soils.

This soil has high available water capacity and slow permeability. Surface runoff is very slow. The organic-matter content is high. The surface layer is neutral or slightly acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil have been drained and are used for corn and soybeans. A few areas are used for small grain occasionally. A few areas are used for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation to use and management. Artificial drainage—tile, surface drains, or open ditches—is needed to remove excess water. With proper drainage, a cropping system that includes row crops most of the time can be used. Minimum tillage, the return of crop residues to the soil, and using cover crops will help maintain and improve organic-matter content and tilth.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep-rooted legumes because it has very poor drainage and a seasonally high water table. Artificial drainage is needed to obtain maximum yields. Overgrazing or grazing when the soil is too wet will cause compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, but very few areas are used for this purpose. The hazard of windthrow is moderate. Equipment limitations, seedling mortality, and plant competition are severe. Logging operations are confined to dry seasons of the year or to periods when the

ground is frozen. Replanting may be necessary. Competing vegetation should be controlled for seedlings to survive and grow well. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness and flooding. It is generally not suitable for building sites because of flooding. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are not available for a drainage system. The use of this soil for septic tank absorption fields is severely limited by wetness, flooding, and slow permeability. Commercial or public sewage systems are needed. Use of this soil for local streets and roads is severely limited by wetness, frost action, and low strength. The effect of these limitations can be reduced by providing adequate road drainage ditches and by using a more stable base material, such as sand or gravel.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

**Rh—Rahm silt loam.** This is a nearly level, deep, somewhat poorly drained soil on bottom lands along the Ohio River. It is subject to flooding. The dominant size of individual areas ranges from 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The underlying recently deposited material is grayish brown, mottled, firm silt loam. It extends to a depth of 26 inches. Below this, and extending to a depth of 72 inches, is the subsoil of an older buried soil. It is light brownish gray, mottled, firm silty clay in the upper part and mottled, light brownish gray and brown, firm silty clay in the lower part. The underlying material, to a depth of 80 inches, is brown, mottled silty clay. In some small areas the soil does not have a buried horizon. Some small areas have less than 20 inches of neutral alluvium overlying the buried subsoil.

Included with this soil in mapping are small areas of Woodmere soils. Also included are small areas in depressions that are poorly drained.

This soil has high available water capacity and slow permeability. Surface runoff is slow. The organic-matter content is moderate. The surface layer is neutral. It is friable or firm and is easily tilled through a fairly narrow range of moisture content.

Most areas of this soil are cropland. Corn and soybeans are the most common crops. A few areas are wooded.

This soil is well suited to corn and soybeans and some small grain. It is not suited to winter wheat because it is subject to flooding late in winter and early in spring. Use and management is also limited by wetness. Artificial drainage, either tile or open ditch, will remove excess water. If this soil is protected from flooding, it is well

suiting to most crops commonly grown in the area. The return of crop residues to the soil and using cover crops help improve and maintain tilth and organic-matter content. Controlling Johnsongrass is a problem.

This soil is poorly suited to grasses and legumes for hay and pasture because it is subject to flooding. Protection from flooding is needed if permanent vegetation is to be established and maintained. Annual warm-season forage crops can be grazed or used for green chop during the summer and early fall. Because wetness is also a limitation, artificial drainage, either tile or open ditch, is needed to achieve maximum production. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods that tolerate wetness. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by flooding and high shrink-swell potential. The soil is generally not suited for building sites because of flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. Structures should be properly designed to prevent damage caused by shrinking and swelling of the soil. Sand and gravel backfill should be used around foundations and under driveways and sidewalks. Footing drains with adequate outlets should be provided. Use of this soil for local streets and roads is severely limited by frost action, shrink-swell, and low strength. These can be reduced by providing adequate road drainage ditches and by using a more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is severely limited by wetness, slow permeability, and flooding. A properly designed drainage system is needed in conjunction with storm drains to successfully lower the water table. Commercial or public sewage systems may be needed.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

**RIA—Reesville silt loam, 0 to 2 percent slopes.** This nearly level soil is deep and somewhat poorly drained. It is on uplands and low terraces. The dominant size of individual areas ranges from 5 to 10 acres.

In a typical profile the surface layer is grayish brown silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 5 inches thick. The subsoil, which is about 23 inches thick, is yellowish brown, mottled, firm silty clay loam. The underlying material, to a depth of 63 inches, is light brownish gray and strong brown silt loam. In a few places this soil has more gray colors in the subsoil than is typical for the

series. In some places this soil is not calcareous above 60 inches. There are small areas of soils that are dominantly brownish in the upper part of the subsoil.

Included with this soil in mapping are small areas of Ragsdale and Uniontown soils.

This soil has high available water capacity and moderately slow permeability. Surface runoff is slow. The organic-matter content is low. The surface layer is usually neutral or slightly acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and small grain are the most common crops. A few areas are used for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation. Artificial drainage, open ditches, surface drains, or tile help to remove excess water. With proper drainage, a cropping system that includes row crops most of the time may be used. Other conservation practices, such as minimum tillage, crop residue, and cover crops, will help maintain and improve organic-matter content and tilth.

This soil is well suited to grasses and legumes for hay and pasture. Grasses are better suited than deep-rooted legumes unless artificial drainage is provided, because of a seasonally high water table. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, but very few areas are used for this purpose. The limitation to the use of equipment is moderate. Logging operations are confined to dry seasons of the year or when the ground is frozen. Plant competition is a moderate hazard, but seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs may be controlled by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness. A properly designed drainage system is needed in conjunction with storm drains. Limitations are severe for septic tank absorption fields because of moderately slow permeability and wetness. Commercial or public sewage systems are needed. The use of this soil for local streets and roads is severely limited by frost action and low soil strength. Damage can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

**Rn—Rensselaer clay loam, clay loam substratum.**

This is a nearly level soil that is deep and very poorly drained. It is in flat areas and in depressions on river terraces. It is subject to rare flooding. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is about 19 inches thick. It is very dark gray clay loam in the upper part and black clay loam in the lower part. The subsoil, which is about 30 inches thick, is dark gray and gray, mottled, firm clay loam. The underlying material, to a depth of 60 inches, is light gray and strong brown, mottled clay loam.

In some places the surface layer is covered with 6 to 10 inches of lighter colored silty overwash. Some small areas of soils have less than 18 percent clay in their subsoil. In some small areas the content of clay is 35 to 40 percent in the subsoil.

Included with this soil in mapping are small areas of Petrolia and Vincennes soils.

This soil has high available water capacity and slow permeability. Surface runoff is slow. The organic-matter content is high. The surface layer is generally neutral in most areas. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil have been drained and are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in woodland, and some areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation to use of this soil for crops. Artificial drainage is needed to remove excess water. Properly designed tile systems, open ditches, and surface drains help remove excess water. The use of crop residues and minimum tillage helps to improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep-rooted legumes because of poor drainage and a seasonal high water table. Artificial drainage is needed to achieve maximum yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods that will tolerate wetness. Limitations to the use of equipment are severe. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. Seedling mortality and windthrow hazard are severe. Plant competition is moderate. Replanting may be necessary, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding and wetness. Flooding can be controlled by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. A properly designed drainage system is needed in conjunction with storm drains to successfully lower the water table. Pumping frequently is needed where adequate outlets are difficult

to obtain for a drainage system. The use of this soil for septic tank absorption fields is severely limited by wetness and slow permeability.

Commercial or public sewage systems are needed. The use of this soil for local streets and roads is severely limited by wetness, low strength, and frost action. The effects of these limitations can be reduced by providing adequate road drainage ditches, and by using more stable base material, such as sand or gravel.

This soil is in capability subclass 1lw and woodland suitability subclass 2w.

**St—Stonelick fine sandy loam.** This is a nearly level, deep, well drained soil on bottom lands. It is subject to frequent flooding. The dominant size of individual areas is 10 to 15 acres, but some areas are more than 100 acres in size.

In a typical profile the surface layer is brown fine sandy loam about 10 inches thick. The underlying material, to a depth of 43 inches, is brown loam in the upper part, yellowish brown fine sandy loam in the middle part, and yellowish brown loamy fine sand in the lower part. Below this, to a depth of 70 inches, is very pale brown sand. In some places there are soils which are not calcareous in the upper 30 inches. In some places there are small areas of soils that have less than 20 inches of sandy material over a buried profile of Stonelick soils and soils that have more than 18 inches of loamy sand or coarser material in the control section.

Included with this soil in mapping are small areas of Psammets and Genesee soils. Also included are long narrow areas along drainageways that have slopes of up to 6 percent.

This soil has moderate available water capacity and moderately rapid permeability. Surface runoff is slow. The organic-matter content is low. The surface layer ranges from neutral to moderately alkaline. It is easily tilled through a wide range in moisture content.

Most areas of this soil are cropland. Corn and soybeans are the most common crops. Some areas are used for small grain and some are in woodland.

This soil is well suited to corn and soybeans. Droughtiness is a hazard during periods of below normal rainfall or if rainfall is poorly distributed. Most areas of this soil are subject to annual flooding. This soil is also well suited to winter wheat if protected from flooding. The use of plant residue, minimum tillage, and cover crops will help to conserve soil moisture and improve organic-matter content. Controlling johnsongrass is a problem.

This soil is poorly suited to perennial grasses and legumes for hay and pasture unless it is protected from flooding. Annual warm-season forage crops may be used for grazing or green chop during summer or early fall. It is better suited to deep-rooted legumes because of the limited available moisture capacity. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation,

timely deferment of grazing, and restricted use during wet periods will help to keep pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Plant competition is a moderate hazard, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, local streets and roads, and septic tank absorption fields is severely limited by flooding. It is generally not suited to these uses. Flooding may be controlled by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

**SyB3—Sylvan silt loam, 2 to 6 percent slopes, severely eroded.** This gently sloping soil is deep and well drained. It is on ridgetops in the uplands. The dominant size of individual areas is about 5 to 10 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, firm silt loam, and the lower part is strong brown, friable silt loam. The underlying material, to a depth of 60 inches, is mottled, light brownish gray and yellowish brown silt. In some places the subsoil has individual layers of silty clay loam. In some places the surface layer and subsoil have eroded away, and the underlying material is at or near the surface. In some small areas the soil does not have carbonates above 60 inches or is moderately well drained.

Included with this soil in mapping are small areas of moderately sloping Sylvan soils that are eroded or slightly eroded.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is neutral or slightly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are in crops. Corn, soybeans, and winter wheat are the most common crops. Some areas are used for hay and pasture.

This soil is suited to corn, soybeans, and small grain. It is necessary to control erosion and surface runoff. Crop rotation, minimum tillage, diversions, terraces, contour farming, grassed waterways, and grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also help to control erosion and improve and maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. This use is effective in controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pastures and soil in good condition.

This soil is well suited to trees. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings is moderately limited by its shrink-swell potential and low strength. Its use for small commercial buildings is moderately limited by shrink-swell, low strength, and slope. Foundations should be designed to prevent structural damage caused by low strength and by shrinking and swelling of the soil. Foundation drains should be installed and backfilled with sand or gravel. Slope may be modified to some extent by grading or by cutting and filling. Limitations are slight for septic tank absorption fields. Use of this soil for local streets and roads is severely limited by low strength and frost action. Limitations may be overcome by providing adequate road drainage ditches and by using more stable base materials, such as sand or gravel.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

**SyC3—Sylvan silt loam, 6 to 12 percent slopes, severely eroded.** This moderately sloping soil is deep and well drained. It is on side slopes and narrow ridgetops in the uplands. The dominant size of individual areas ranges from 15 to 20 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil, which is about 20 inches thick, is yellowish brown, firm silt loam. The underlying material, to a depth of 60 inches, is mottled, light brownish gray and yellowish brown silt. About 25 percent of this soil includes areas in which the surface layer and most of the subsoil have been removed by erosion. In these areas the light colored, calcareous underlying material is at or near the surface. There are small areas of soils that lack free carbonates above 60 inches.

Included with this soil in mapping are small areas of strongly sloping and gently sloping Sylvan soils and Sylvan soils that are less eroded.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is neutral or slightly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and wheat are the most common crops. Some areas are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. It is necessary to control erosion and surface water runoff. Using crop rotation, minimum tillage, diversions, terraces, contour farming, grassed waterways, or grade stabilization structures helps prevent excessive soil loss. The use of crop residues and cover crops helps control erosion and improve and maintain tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is effective in controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings is moderately limited by its shrink-swell potential, slope, and low strength, and its use for small commercial buildings is severely limited by slope. Foundations and footings should be designed to prevent structural damage caused by low strength and shrinking and swelling of the soil. Foundation drains should be installed and backfilled with sand or gravel. Slope may be modified to some extent by grading or by cutting and filling. Structures should be designed to conform with the slope. A minimal area should be disturbed, and disturbed areas should be revegetated as soon as possible.

The use of this soil for local streets and roads is severely limited by its low strength and frost action. These limitations may be overcome by providing adequate road drainage ditches and by using a more stable base material, such as sand or gravel. Roads should be constructed on the contour if possible. Use of this soil for septic tank absorption fields is moderately limited by slope. Absorption fields may be installed on the contour and should be designed to prevent seepage of effluent at the base of the slope.

This soil is in capability subclass IVe and woodland suitability subclass 2c.

**SyD3—Sylvan silt loam, 12 to 18 percent slopes, severely eroded.** This strongly sloping soil is deep and well drained. It is on sides slopes in the uplands. The dominant size of individual areas is 15 to 20 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 20 inches thick. The upper part is yellowish brown, firm silt loam; and the lower part is strong brown, friable silt loam. The underlying material, to a depth of 60 inches, is light

grayish brown and brown silt. In about 25 percent of the acreage, the surface layer and subsoil have been removed by erosion. In these areas the light colored, calcareous underlying material is at or near the surface. There are small areas of soils that are not calcareous to a depth of 60 inches and soils that have residuum from sandstone below a depth of 60 inches.

Included with this soil in mapping are small areas of moderately sloping and moderately steep Sylvan soils and a few areas that have gullies 2 to 4 feet deep.

This soil has high available water capacity and moderate permeability. Surface runoff is very rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is neutral or slightly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and wheat are the most common crops. Some areas are used for hay and pasture.

This soil is generally not suited to corn and soybeans because of the severe hazard of erosion. Crop rotations that include grasses and legumes most of the time are most effective in reducing surface runoff and controlling erosion. It is difficult to use most farm machinery on these slopes. Small grain may be grown occasionally so that stands of grasses and legumes can be reestablished. The use of minimum tillage, diversions, terraces, grassed waterways, and crop residues helps to prevent excessive soil loss.

This soil is well suited to grasses and legumes for hay and pasture. Their use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings, small commercial buildings, septic tank absorption fields, and sewage lagoons is severely limited by slope. When large areas are developed, soil erosion is a problem. Development of random lots is preferable. Existing vegetation should be retained if possible and care should be taken to disturb a minimal area. Displaced topsoil should be stockpiled and replaced, and disturbed areas should be revegetated as soon as possible. Diversions and grassed waterways can be used between lots to reduce erosion. Silting basins can be used to reduce siltation. Septic tank absorption fields should be installed on the contour and should be designed to prevent seepage of effluent at the base of the slope. Lot size should be increased to accommodate

modified absorption fields. Public or commercial sewage systems may be needed.

The use of this soil for local streets and roads is severely limited by slope, low strength, and frost action. Frost action and low strength may be overcome by providing adequate road drainage ditches and by using more stable base material, such as sand and gravel. Roads should be constructed on the contour if possible.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

**SyF—Sylvan silt loam, 18 to 40 percent slopes.**

This moderately steep and steep soil is deep and well drained. It is on side slopes in the uplands. The dominant size of individual areas is 15 to 100 acres.

In a typical profile the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is brown, friable silt loam about 16 inches thick. The underlying material, to a depth of 60 inches, is light brownish gray and yellowish brown silt. In some places the underlying material is less than 25 inches below the surface. There are small areas of soils that have residuum from sandstone at a depth of less than 60 inches and soils that do not have calcareous material above a depth of 60 inches.

Included with this soil in mapping are small areas of Bloomfield soils. Also included are small areas of eroded and severely eroded Sylvan soils and areas where gullies are 5 to 30 feet deep.

This soil has high available water capacity and moderate permeability. Surface runoff is very rapid. The organic-matter content is low. The surface layer is neutral or slightly acid in areas that have not been limed. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are woodland. Many areas are used for hay and pasture.

This soil is generally not suited to corn, soybeans, and small grain because of the severe hazard of erosion. Steepness of slopes limits the use of farm machinery. Crop rotations that include grasses and legumes most of the time are most effective in reducing surface runoff and controlling erosion. If this soil is used for crops, terraces, diversions, grassed waterways, and grade stabilization structures are needed to help prevent excessive soil loss.

This soil is suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Steepness of slopes limits the use of farm machinery. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in native hardwoods (fig. 10). The limitation to the use of

equipment is moderate. Machinery is difficult to operate on these slopes. The hazard of erosion, seedling mortality, and plant competition are moderate. Logging roads should be on the contour and clear cutting should be avoided. Replanting may be necessary. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by cutting, spraying, or girdling.



Figure 10.—Native hardwoods on Sylvan silt loam, 18 to 40 percent slopes, protect the soil from erosion and provide merchantable timber.

The use of this soil for dwellings, small commercial buildings, local streets and roads, and septic tank absorption fields is severely limited by slope. It is very difficult and expensive to control erosion and surface runoff. Moderately steep and steep slopes hinder the use of equipment. Extreme care must be taken in designing structures on this soil. Commercial or public sewage systems are needed. More favorable sites for residential or industrial development should be located.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

**UnA—Uniontown silt loam, 0 to 2 percent slopes.**

This nearly level soil is deep and well drained and moderately well drained. It is on broad ridges on terraces. The dominant size of individual areas ranges from 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 26 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, mottled, friable silt loam. The underlying material, to a depth of 60 inches, is pale brown, mottled silt.

In some places the subsoil extends to a depth of more than 40 inches. In a few areas the underlying material is strongly acid to slightly acid to a depth of more than 60 inches. In some places grayish mottles are in the lower part of the subsoil.

Included with this soil in mapping are small areas of Henshaw and Reesville soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is neutral through medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. There are no hazards or limitations to its use as cropland. The use of crop residues and minimum tillage help to maintain and improve organic-matter content and tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees, although plant competition is a moderate hazard. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs may be controlled by site preparation or by cutting, spraying, or girdling.

This soil has moderate limitations for dwellings and small commercial buildings. Foundations and footings should be properly designed to prevent the structural damage caused by low strength. Wetness may become a problem in dwellings with basements. The soil is severely limited for local streets and roads by frost action. Frost action may be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic

tank absorption fields is severely limited by moderate permeability and wetness. These limitations can be overcome by installing the absorption system deeper in the more permeable underlying material in drained areas. The size of the absorption field should be increased.

This soil is in capability class I and woodland suitability subclass 2o.

**UnB2—Uniontown silt loam, 2 to 6 percent slopes, eroded.** This gently sloping soil is deep and well drained or moderately well drained. It is on ridges and side slopes on terraces. The dominant size of individual areas ranges from 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 29 inches thick. The upper part is yellowish brown, friable silt loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown, friable silt loam. The underlying material, to a depth of 60 inches, is mottled, yellowish brown and light brownish gray silt loam. In some places the subsoil extends below a depth of 40 inches. In a few areas the underlying material is strongly acid or slightly acid to a depth of 60 inches.

Included with this soil in mapping are small areas of moderately sloping Uniontown soils.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is neutral to medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled. Crop rotation, minimum tillage, diversions, terraces, contour farming, grassed waterways, or grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also help to control erosion and to improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep pasture and soil in good condition.

This soil is well suited to trees. Plant competition is a moderate hazard, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings is moderately limited. Foundations and footings should be designed to prevent the structural damage caused by low strength. Wetness may become a problem in houses with basements. The soil is moderately limited for small commercial buildings because of slope. Slope may be modified to some extent by grading or by cutting and filling. Use of the soil for local streets and roads is severely limited by frost action. Road drainage ditches should be provided and a more stable base material, such as sand or gravel, should be used. The use of this soil for septic tank absorption fields is severely limited by moderate permeability and wetness. Absorption tanks may be installed below the subsoil in the more permeable underlying material in drained areas. The size of the absorption field should be increased.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

**UnB3—Uniontown silt loam, 2 to 6 percent slopes, severely eroded.** This gently sloping soil is deep and well drained or moderately well drained. It is on ridgetops and side slopes on terraces. The dominant size of individual areas ranges from 5 to 10 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, friable silt loam. The underlying material, to a depth of 60 inches, is mottled, yellowish brown and light brownish gray silt loam. In some places the surface layer and subsoil have been removed by erosion, and the light colored, calcareous, underlying material is at or near the surface. There are small areas of soils that are slightly or medium acid to a depth of more than 60 inches.

Included with this soil in mapping are small areas of moderately sloping Uniontown soils.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is neutral to medium acid in areas that have not been limed. The surface layer is firm and is easily tilled within the proper range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and wheat are the most common crops. Some areas are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled. Crop rotation, minimum tillage, diversions, terraces, contour farming, grassed waterways, or grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also help to control erosion and to improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control

erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees although plant competition is a moderate hazard. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings is moderately limited by low strength. Wetness may also become a problem in dwellings with basements. The use for small commercial buildings is moderately limited by slope and low strength. Foundations and footings should be designed to prevent the structural damage caused by low strength. Slope may be modified to some extent by grading or cutting and filling. The use of this soil for local streets and roads is severely limited by frost action. The effects of frost action can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand and gravel. The use of this soil for septic tank absorption fields is severely limited by moderate permeability and wetness. Absorption tanks should be placed below the subsoil in the more permeable underlying material, and the size of absorption fields should be increased in drained areas.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

**UnC3—Uniontown silt loam, 6 to 12 percent slopes, severely eroded.** This moderately sloping soil is deep and well drained and moderately well drained. It is on side slopes on terraces. The dominant size of individual areas ranges from 10 to 15 acres.

In a representative profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, friable silt loam. The underlying material, to a depth of 60 inches, is mottled, light brownish gray and yellowish brown silt loam. In about 25 percent of the acreage, the surface layer and subsoil have been removed by erosion and the light colored calcareous underlying material is at or near the surface. In some small areas, this soil is less eroded and the surface layer is darker. Some areas are slightly acid or medium acid to a depth of more than 60 inches. In some places the subsoil is silt loam.

Included with this soil in mapping are small areas of gently sloping and strongly sloping Uniontown soils.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. Reaction of the surface layer varies due to local liming practices. It is neutral in most areas. The surface layer is firm and is easily tilled within the proper range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled. Crop rotation, minimum tillage, diversions, terraces, contour farming, grassed waterways, or grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also helps to control erosion and to improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is a moderate hazard, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings is moderately limited. Slope and low strength are the dominant limitations. Foundations and footings should be designed to prevent the structural damage caused by low strength. Wetness may become a problem for houses with basements. The use for small commercial buildings is severely limited by slope. Slope may be modified by grading. Special practices are needed to help prevent erosion and sedimentation during construction. The use of this soil for local roads and streets is severely limited by frost action. Road drainage ditches should be provided and a more stable base material should be used, such as sand and gravel. The use of this soil for septic tank absorption fields is severely limited by moderate permeability and wetness. Absorption tanks may be placed below the subsoil in the more permeable underlying material in drained areas. The size of absorption field should be increased, and installation should be on the contour.

This soil is in capability subclass IVe and woodland suitability subclass 2o.

**Vn—Vincennes loam.** This nearly level soil is deep and poorly drained. It is in flat areas and drainageways on river terraces. It is subject to rare flooding. The dominant size of individual areas is 20 to 40 acres.

In a typical profile the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 33 inches thick. The upper part is light brownish gray, mottled, friable loam; the lower part is light brownish gray mottled, firm clay loam. The underlying material, to a depth of 60 inches, is grayish brown, mottled sandy loam, loam, and clay loam. There are some areas that have a more clayey subsoil. In some places the soil is

slightly acid or neutral, and in small areas the surface layer is dark colored. In some places the underlying material is clay or silty clay. In some places the content of gravel is as much as 50 percent in individual horizons.

Included with this soil in mapping are small areas of Ginat, Peoga, and Zipp Variant soils.

This soil has high available water capacity and slow permeability. Surface runoff is slow. The organic-matter content is low. Reaction of the surface layer varies widely due to local liming practices. It is usually medium or strongly acid in areas that have not been limed. This soil is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil have been drained and are used for crops. Corn, soybeans, and winter wheat are the most common crops. Some areas are in woodland. A few areas are in hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation to the use of this soil for crops. Artificial drainage is needed to remove excess water. Properly designed tile systems, open ditches, and surface drains will help to remove excess water. The use of crop residues and minimum tillage improves and maintains the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep rooted legumes because of poor drainage and a seasonal high water table. Artificial drainage is needed to achieve maximum yields. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods that will tolerate wetness. The limitations to the use of equipment are severe. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. The hazards of seedling mortality and plant competition are severe. Replanting may be necessary. The hazard of windthrow is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness and rare flooding. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping frequently is needed where adequate outlets are difficult to obtain for a drainage system. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by wetness, frost action, and low strength. These limitations may be re-

duced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is severely limited by wetness and slow permeability. Public or commercial sewage systems are usually needed. More favorable sites may be available on adjacent soils.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

**Wa—Wakeland silt loam.** This nearly level soil is deep and somewhat poorly drained. It is along upland drainageways and streams. It is subject to frequent local flooding. The dominant size of individual areas ranges from 20 to 30 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The underlying material, to a depth of 60 inches, is grayish brown, mottled, friable silt loam in the upper part and is gray, mottled, firm silt loam in the lower part. In some places strata of sandy or loamy material are in the profile or on the surface. In a few small areas, this soil is strongly acid. In some places it is slightly more than 18 percent clay in the 10- to 40-inch control section.

Included with this soil in mapping are a few small areas of Haymond and Birds soils. Also included are small areas of poorly drained soils.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is low. The surface layer is neutral or slightly acid. It is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and small grain are the most common crops. A few areas are in woodland or hay and pasture. Many areas have been drained.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation to its use for crops. It is also subject to frequent flooding of short duration during the winter and early spring. Properly installed tile drainage, surface drains, or open ditches will help remove excess water. With adequate drainage, a cropping system that includes row crops most of the time may be used. The use of minimum tillage, crop residue, and cover crops helps to maintain and improve the organic-matter content and tilth of the soil.

This soil is well suited to grasses and legumes for hay and pasture. Grasses are better suited to this soil than deep-rooted legumes because the water table is seasonally high. This soil is subject to occasional flooding, but it is usually of short duration. Overgrazing or grazing when the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Limitations to the use of equipment

are moderate. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. The hazards of windthrow and plant competition are moderate. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

This soil is generally not suitable for dwellings, small commercial buildings, and septic tank absorption fields because of the severe limitation of flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by flooding and frost action. Frost action can be reduced by providing adequate drainage ditches and by using more stable base material such as sand and gravel.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

**WbA—Weinbach silt loam, 0 to 2 percent slopes.**

This nearly level soil is deep and somewhat poorly drained. It has a fragipan and is in low areas on river terraces. This soil is subject to rare flooding. The dominant size of individual areas ranges from 10 to 20 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is pale brown silt loam about 4 inches thick. The subsoil above the fragipan is about 8 inches thick. It is light brownish gray, mottled, friable silt loam. The fragipan is about 25 inches thick. It is light brownish gray, mottled, very firm silty clay loam. The underlying material, to a depth of 60 inches, is dark yellowish brown, mottled silty clay loam. In some places the fragipan extends to a depth of 60 inches and in some places the fragipan begins below a depth of 30 inches. In some pedons the fragipan has chroma of 1.

Included with this soil in mapping are small areas of Ginat and Pekin soils. Also included are small areas of a somewhat poorly drained soil that is more than 15 percent sand. This soil lacks a fragipan but has a very firm silty clay layer at a depth of about 30 inches.

This soil has moderate available water capacity and very slow permeability. Surface runoff is slow. The organic-matter content is moderate. Reaction of the surface layer varies widely due to local liming practices. It is medium acid or strongly acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in hay and pasture or woodland. Many areas are drained.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation. Artificial drainage is needed to remove excess water. Properly designed open ditches and surface drains will help remove excess

water. Tile drainage is generally not satisfactory because the very slowly permeable fragipan restricts water movement to the tile. During extremely dry years crop yields are reduced by lack of moisture, because the fragipan limits root penetration. The use of minimum tillage, cover crops, and crop residue will help to maintain and improve the organic-matter content and tilth of the soil.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep-rooted legumes because it has somewhat poor drainage and the water table is seasonally high. Artificial drainage is needed to obtain maximum production. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods.

Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings without basements and small commercial buildings is severely limited by rare flooding. The use of this soil for dwellings with basements is severely limited by rare flooding and wetness. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. A properly designed drainage system is necessary in conjunction with storm sewers to effectively lower the water table. Pumping often is needed where adequate outlets are not available for a drainage system. The use of this soil for local streets and roads is severely limited by frost action and wetness. Frost action may be reduced by providing adequate drainage ditches and by using a more stable base material such as sand or gravel. Use of this soil for septic tank absorption fields is severely limited by wetness and very slow permeability. Alternative methods of sewage disposal are needed. Commercial or public sewage systems may be necessary.

This soil is in capability subclass 1lw and woodland suitability subclass 2o.

**WeD3—Wellston silt loam, 12 to 18 percent slopes, severely eroded.** This strongly sloping soil is deep and well drained. It is on side slopes in the uplands. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is yellowish brown and brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is brown, firm and friable silt loam, and the lower part is pale brown and strong brown, friable loam. The underlying material, to a depth of 60 inches, is pale brown and strong brown

gravelly sandy loam. In some small areas the soil is silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Bloomfield soils. Also included are small areas of soils that have layers of silty clay residuum derived from shale at a depth of more than 20 inches, small areas of Hosmer soils, and a few areas where sandstone and shale crop out.

This soil has high available water capacity and moderate permeability. Surface runoff is very rapid. The organic-matter content is low. Reaction of the surface layer varies widely due to the local liming practices. It is strongly acid or medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are in hay and pasture. Many areas are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas formerly in crops have been abandoned and are in trees and shrubs.

This soil is generally not suited to corn, soybeans, and small grain because of the severe hazard of erosion. It is often difficult to establish a seedbed and obtain stands of crops. More than average power is required for tillage, which must be done under proper moisture conditions. Some farm machinery is difficult to operate on these slopes. Crop rotations that include grasses and legumes most of the time are most effective in reducing surface runoff and controlling erosion. Small grain may be grown occasionally so that stands of grasses and legumes can be established. The use of minimum tillage, diversions, terraces, grassed waterways, and crop residues helps prevent excessive soil loss.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees. The limitations to the use of equipment are moderate. Machinery is difficult to operate on these slopes. The hazard of erosion is moderate. Logging roads should be on the contour, and clear cutting should be avoided. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by slope. Extreme care must be taken to design structures to complement the slope because depth to bedrock limits excavation. When large areas are developed, erosion and siltation are problems. Only minimal amounts of soil should be disturbed, and disturbed areas

should be revegetated as soon as possible. Displaced topsoil should be stockpiled and replaced. Diversions and grassed waterways can be used between lots to reduce erosion. Silting basins can be used to reduce siltation. Absorption fields should be designed to prevent seepage of effluent downslope. Public or commercial sewage systems are needed. The use of this soil for local streets and roads is severely limited by slope and frost action. Streets and roads should be constructed on the contour if possible. Frost action can be reduced by providing adequate drainage ditches and by using more stable base material, such as sand and gravel.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

**WeE—Wellston silt loam, 18 to 25 percent slopes.**

This moderately steep soil is deep and well drained. It is on side slopes in the uplands. The dominant size of individual areas ranges from 25 to 30 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is pale brown silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is brown, firm and friable silt loam. The underlying material, to a depth of 60 inches, is pale brown and strong brown gravelly sandy loam. There are small areas of soils that are silt loam to a depth of 60 inches and small areas of eroded and severely eroded Wellston soils.

Included with this soil in mapping are small areas of Bloomfield soils. Also included are areas where sandstone crops out and small areas of soils that have horizons of silty clay residuum derived from shale below a depth of 30 inches.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is low. The surface layer is usually strongly acid or medium acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are in woodland. Some areas are in hay and pasture.

This soil is poorly suited to crops because of the severe hazard of erosion. It is difficult to justify the conversion of this soil from woodland to cropland because of the cost of controlling erosion and surface runoff. Slope limits the use of farm machinery. Rotations that include grasses and legumes most of the time are effective in controlling erosion. Small grain may be grown occasionally to reestablish grasses and legumes.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way to control erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in native hardwoods. The limitation to the use of equipment is moderate, and it is difficult to operate machinery on these slopes. The hazard of erosion is moderate. Logging roads should be built on the contour and clear cutting should be avoided. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings, small commercial buildings, and septic tank absorption fields is severely limited by slope. Extreme care must be taken to design structures to complement the slope, because the depth to bedrock limits excavation. When large areas are developed, soil erosion and siltation are problems. A minimal area should be disturbed, and disturbed areas should be revegetated as soon as possible. Displaced topsoil should be stockpiled and replaced. Diversions and grassed waterways can be used to reduce siltation. Absorption fields should be designed to prevent seepage of effluent downslope. Public or commercial sewage systems may be needed. The use of this soil for local streets and roads is severely limited by slope and frost action. Streets and roads should be constructed on the contour if possible. Frost action may be reduced by providing adequate drainage ditches and by using more stable base material, such as sand and gravel.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

**WeF—Wellston silt loam, 25 to 35 percent slopes.**

This steep soil is deep and well drained. It is on side slopes on uplands. The dominant size of individual areas ranges from 30 to 40 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is pale brown silt loam about 8 inches thick. The subsoil is about 36 inches thick. The upper part is brown, friable and firm silt loam, and the lower part is pale brown and strong brown loam. The underlying material, to a depth of 60 inches, is pale brown and strong brown gravelly sandy loam. There are some small areas of eroded and severely eroded Wellston soils.

Included with this soil in mapping are small areas of soils that have horizons of silty clay residuum derived from shale below a depth of 30 inches. Also included are areas where sandstone crops out.

This soil has high available water capacity and moderate permeability. Surface runoff is very rapid. The organic-matter content is low. The surface layer is generally strongly acid or medium acid. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are in woodland. Some areas are in hay and pasture. It is difficult to justify the conversion of this soil from woodland to other uses.

This soil is poorly suited to crops because of the severe hazard of erosion. Steep slopes also limit the use of farm equipment.

This soil is suited to grasses and legumes for hay and pasture. This use is effective in controlling erosion. Equipment limitations make it difficult to establish and maintain forage crops. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted uses during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in native hardwoods. Slope is a moderate limitation to the use of equipment. The hazard of erosion is moderate. Logging roads should be constructed on the contour, and clear cutting should be avoided. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by cutting, spraying, or girdling.

This use of this soil for dwelling, small commercial buildings, and septic tank absorption fields is severely limited by slope. Extreme care must be taken to design structures to complement the slope, because the depth to bedrock limits excavation. When large areas are developed, erosion and siltation are problems. A minimal area should be disturbed, and disturbed areas should be revegetated as soon as possible. Displaced topsoil should be stockpiled and replaced. Diversions and grassed waterways can be used between lots to reduce siltation. Absorption fields should be designed to prevent seepage of effluent downslope. Public or commercial sewage systems are needed. The use of this soil for local streets and roads is severely limited by slope and frost action. Streets and roads should be constructed on the contour if possible. Frost action can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

**WhA—Wheeling loam, 0 to 2 percent slopes.** This nearly level soil is deep and well drained. It is in flat areas on river terraces and is subject to rare flooding. The dominant size of individual areas ranges from 15 to 20 acres.

In a typical profile the surface layer is brown loam about 10 inches thick. The subsoil is about 46 inches thick. The upper part is strong brown, firm clay loam, and the lower part is strong brown and yellowish brown, friable sandy clay loam. The underlying material, to a depth of 60 inches, is brown sandy loam. In some places, the solum is less than 40 inches thick; the surface layer is sandy loam; or individual horizons that are up to 20 percent gravel are in the lower part of the

profile. Small areas of soils are less than 15 percent sand.

Included with this soil in mapping are small areas of Ginat, Pekin, and Weinbach soils and small areas of gently sloping Wheeling soils. Also included are small areas of soils that have a loamy sand or sand surface layer.

This soil has high available water capacity and moderate permeability. Surface runoff is slow. The organic-matter content is moderate. Reaction of the surface layer varies widely due to local liming practices. It is strongly acid or medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in hay and pasture or woodland.

This soil is well suited to corn, soybeans, and small grain. There are no limitations to its use as cropland. The use of crop residues helps improve and maintain tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. A few areas are used for this purpose. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Stocking at a proper rate, timely deferment of grazing, pasture rotations, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Plant competition is a moderate hazard. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding. Flooding may be controlled by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is moderately limited by flooding, frost action and low strength. Damage can be reduced by providing adequate road drainage ditches and by using more stable base material such as sand or gravel. Seepage, wetness, and flooding are moderate limitations for septic tank absorption fields. Measures should be taken to prevent seepage from septic tank absorption fields from contaminating nearby shallow wells. Drainage is needed in some areas.

This soil is in capability class I and woodland suitability subclass 2o.

**WhB—Wheeling loam, 2 to 6 percent slopes.** This gently sloping soil is deep and well drained. It is on low swells and side slopes on river terraces and is subject to rare flooding. The dominant size of individual areas is 15 to 20 acres.

In a typical profile the surface layer is brown loam about 8 inches thick. The subsoil is about 40 inches thick. The upper part is strong brown, firm clay loam, and the lower part is strong brown, friable sandy clay loam. The underlying material, to a depth of 60 inches, is yellowish brown and brown fine sand and medium sand. In some places the solum is less than 40 inches thick. In some places the surface layer is sandy loam. In a few areas individual horizons that are up to 20 percent gravel are in the lower part of the profile. In a few small areas the soils are less than 15 percent sand.

Included with this soil in mapping are small areas of Pekin soils. Also included are areas of eroded and severely eroded Wheeling soils and small areas where the surface layer is sand or loamy sand.

This soil has high available water capacity and moderate permeability. Surface runoff is medium. The organic-matter content is moderate. Reaction of the surface layer varies widely due to local liming practices. It is strongly acid or medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in hay and pasture or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and surface runoff need to be controlled. Crop rotation, minimum tillage, diversions, contour farming, grassed waterways, or grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also helps control erosion and improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by rare flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is moderately limited by flooding, frost action, and low strength. Their effect can be reduced by providing adequate road drainage ditches and by using more stable base material such as sand or gravel. The use of this soil for septic tank absorption fields is moder-

ately limited by flooding, wetness, and seepage. Measures should be taken to avoid contaminating nearby shallow wells. Drainage is needed in some areas.

This soil is in capability subclass 1Ie and woodland suitability subclass 2o.

**WhC2—Wheeling loam, 6 to 12 percent slopes, eroded.** This moderately sloping soil is deep and well drained. It is on side slopes on river terraces and is subject to rare flooding. The dominant size of individual areas is 10 to 15 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is brown, firm clay loam; the middle part is yellowish brown, friable sandy clay loam, and the lower part is yellowish brown, friable sandy loam. The underlying material, to a depth of 60 inches, is yellowish brown and brown fine sand and medium sand. In some places the solum is less than 40 inches thick. In some places this soil has a silt loam or sandy loam surface layer. In some places the profile is less than 15 percent sand.

Included with this soil in mapping are small areas where the slope is more than 12 percent.

This soil has high available water capacity and moderate permeability. Surface runoff is rapid. The organic-matter content is moderate. Reaction of the surface layer varies widely due to local liming practices. It is strongly or medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Many areas are in woodland. A few areas are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Erosion and surface water runoff need to be controlled. Crop rotation, minimum tillage, diversions, terraces, contour farming, grassed waterways, or grade stabilization structures help prevent excessive soil loss. The use of crop residues and cover crops also helps control erosion and improve and maintain the tilth and organic-matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. This use is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in native hardwoods. Plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by cutting, spraying, or girdling.

The use of this soil for dwellings is severely limited by rare flooding. Its use for small commercial buildings is severely limited by slope and rare flooding. Flooding may be reduced by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. Slope may be modified by grading or by cutting and filling. Special practices are needed to help prevent erosion and siltation during construction. The use of this soil for local streets and roads is moderately limited by slope, frost action, and low strength. Their effect can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is moderately limited by slope, seepage, and flooding. Measures should be taken to avoid contaminating nearby shallow wells. Drainage is needed in some areas.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

**Wm—Wheeling Variant silt loam.** This nearly level soil is deep and moderately well drained. It is in flat areas on river terraces and is subject to rare flooding. The dominant size of individual areas ranges from 5 to 15 acres.

In a typical profile the surface layer is brown silt loam about 11 inches thick. The subsoil is about 29 inches thick. It is yellowish brown, mottled, friable loam in the upper part; yellowish brown, mottled, firm clay loam in the middle part; and light grayish brown, mottled, firm clay loam in the lower part. The underlying material, to a depth of 60 inches, is light grayish brown, mottled, firm clay loam. In some places the solum is less than 40 inches thick. In some places textures of sandy loam or loamy sand are above a depth of 60 inches. In some places subsoil and underlying material are silty clay loam.

Included with this soil in mapping are small areas of Vincennes and Peoga soils in small depressions and drainageways. Also included are small areas of soils that have dominantly grayish colors in the topsoil except in one horizon.

This soil has high available water capacity and moderately slow permeability. Surface runoff is slow. The organic-matter content is moderate. Reaction of the surface layer varies widely due to local liming practices. It is strongly acid or medium acid in areas that have not been limed. The surface layer is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in hay and pasture or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is a limitation to its use for crops. Some areas will benefit from some type of artificial drainage such as tile drains, surface drains, and open ditches. The

use of crop residues helps to improve and maintain tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture, and a few areas are used for this purpose. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Proper stocking rates, timely deferment of grazing, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

The soil is well suited to trees, and a few areas are in native hardwoods. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings without basements and for commercial buildings is severely limited by rare flooding. Its use for dwellings with basements is severely limited by wetness and rare flooding. Flooding may be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for septic tank absorption fields is severely limited by wetness and moderately slow permeability. A properly designed drainage system is needed in conjunction with storm sewers to successfully lower the water table. Pumping may be necessary in areas where suitable outlets are not available. Commercial or public sewage systems may be necessary. The use of this soil for local streets and roads is severely limited by frost action and low strength. The effects of frost action and low strength may be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand and gravel.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

**Wz—Woodmere silt loam.** This soil is nearly level, deep, and well or moderately well drained. It is on high bottom lands. It is subject to occasional flooding. The dominant size of individual areas is 15 to 20 acres.

In a typical profile the surface layer is brown silt loam about 7 inches thick. The upper part of the subsoil is recently deposited brown silt loam about 16 inches thick. Below this, and extending to a depth of 76 inches, is the subsoil of an older buried soil. It is brown, firm silty clay. The underlying material, to a depth of 90 inches, is brown silty clay. In a few places this soil has less than 20 inches of neutral alluvium over the older acid material. In some places the upper part of the older material is slightly acid.

Included with this soil in mapping are small areas of Rahm and Nolin soils. Also included are a few narrow areas along the sides of drainageways where slopes are up to 6 percent.

This soil has high available water capacity and moderately slow permeability. Surface runoff is slow. The organic-matter content is moderate. The surface layer is

neutral. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn and soybeans are the most common crops. A few areas are used for woodland.

This soil is well suited to corn and soybeans. Most areas should be protected from flooding to insure timeliness of planting and to prevent crop loss. If this soil is protected from flooding, it is well suited to winter wheat. The use of crop residues, minimum tillage, and cover crops improves and helps maintain organic-matter content and soil tilth. Controlling Johnsongrass is a problem on this soil.

This soil is poorly suited to perennial grasses and legumes for hay and pasture unless it is protected from flooding. Annual warm-season forage crops may be used for pasture or green chop during the summer or early fall. This soil is well suited to grasses and legumes if it is protected from flooding. Grazing when the soil is wet will cause soil compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. A few areas are in native hardwoods that can tolerate wetness during the winter months. The hazard of plant competition is moderate, but seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

This soil generally is not suitable for dwellings and small commercial buildings because of occasional flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by flooding, frost action, and low strength. Frost action and low strength may be overcome by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is severely limited by moderately slow permeability, wetness, and flooding. Commercial or public sewage systems are needed.

This soil is in capability class I and woodland suitability subclass 1o.

**Zp—Zipp silty clay loam.** This soil is nearly level, deep, and very poorly drained. It is in depressions on low river terraces. It is occasionally flooded. The dominant size of individual areas is 50 to 100 acres.

In a typical profile the surface layer is dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 40 inches thick. It is gray, mottled, very firm silty clay. The underlying material, to a depth of 75 inches, is mottled, light brownish gray and yellowish brown silty clay. In some places the original surface is covered with 6 to 12 inches of silt loam overwash. In some places in

Point Township this soil is strongly acid or very strongly acid. Small areas of soil are as much as 35 to 40 percent clay, and small areas of soils have a darker colored surface layer.

Included with this soil in mapping are small areas of Vincennes soils.

This soil has high available water capacity and very slow permeability. Surface runoff is very slow. The organic-matter content is moderate. Reaction of the surface layer varies due to the local liming practices. It is neutral or slightly acid in most areas. The surface layer is firm and is easily tilled through a narrow range in moisture content. It has a tendency to be sticky and plastic when wet and hard and cloddy when dry.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. A few areas are in woodland, and a few are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Wetness is the main limitation to the use of this soil for crops. Artificial drainage is needed, and properly designed open ditches and surface drains will remove excess water. Tile drainage systems usually do not function satisfactorily because of the very slow permeability. Some areas are subject to occasional flooding. The use of crop residues and minimum tillage improves and helps maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep-rooted legumes because of poor drainage and a seasonal high water table. Artificial drainage is needed to achieve maximum yields. Some areas are subject to occasional flooding. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods that tolerate wetness. The limitation to the use of equipment is severe. Logging operations are confined to dry seasons of the year or periods when the ground is frozen. The hazards of seedling mortality, windthrow, and plant competition are severe. Replanting may be necessary. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings and small commercial buildings is severely limited by wetness, shrink-swell potential, and flooding. It is generally not suited for building sites because of flooding. A properly designed drainage system is needed in conjunction with storm drains to effectively lower the water table. Pumping often is needed because adequate outlets are not available for a drainage system. Structural damage resulting from the soil shrinking when dry and swelling when wet may be reduced by properly designing foundations, footings, and basement walls. Excavated areas should be backfilled

with sand or gravel and adequately drained. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. The use of this soil for local streets and roads is severely limited by wetness, flooding, and low strength. These limitations can be reduced by providing adequate road drainage ditches and by using more stable base material, such as sand or gravel. The use of this soil for septic tank absorption fields is severely limited by very slow permeability, flooding, and wetness. Commercial or public sewage systems are needed. Conditions are generally unfavorable for commercial or residential development. More favorable sites may be available on adjacent soils.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

**Zu—Zipp Variant sandy loam.** This soil is nearly level, deep, and very poorly drained. It is in flat areas on low river terraces and is occasionally flooded. The dominant size of individual areas is 20 to 50 acres.

In a typical profile the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsoil is about 33 inches thick. The upper part is mottled grayish brown and dark grayish brown, firm loam; the middle part is light brownish gray, mottled, very firm clay; and the lower part is gray, mottled, very firm clay. The underlying material, to a depth of 60 inches, is gray, mottled clay. In some small areas the surface layer is dark colored loam or sandy loam, and in other places it is loam and clay loam.

Included with this soil in mapping are small areas of Vincennes, Wheeling, and Weinbach soils.

This soil has high available water capacity and very slow permeability. Surface runoff is very slow. The organic-matter content is moderate. Reaction of the surface layer varies widely due to local liming practices. It is usually medium or strongly acid in areas that have not been limed. It is friable and is easily tilled through a fairly wide range in moisture content.

Most areas of this soil are cropland. Corn, soybeans, and winter wheat are the most common crops. Some areas are in woodland. A few areas are in hay and pasture.

This soil is suited to corn, soybeans, and small grain. Wetness is the main limitation to the use of this soil for crops. Artificial drainage is needed, and properly designed open ditches and surface drains will remove excess water. Tile drainage systems are not usually satisfactory because the soil is very slowly permeable. The use of crop residues and minimum tillage improves and helps maintain soil tilth and organic-matter content.

This soil is well suited to grasses and legumes for hay and pasture. It is better suited to grasses than to deep-rooted legumes because it is poorly drained and has a seasonal high water table. Artificial drainage is needed to achieve maximum yields. Overgrazing or grazing when

the soil is wet will cause surface compaction and poor tilth. Stocking at a proper rate, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few areas are in native hardwoods that tolerate wetness. The limitations to the use of equipment are severe. Logging operations are confined to dry seasons of the year or to periods when the ground is frozen. The hazards of seedling mortality, windthrow, and plant competition are severe. Replanting may be necessary. Seedlings survive and grow well if competing vegetation is controlled. The control of unwanted trees and shrubs may be accomplished by site preparation or by spraying, cutting, or girdling.

The use of this soil for dwellings, small commercial buildings, and local streets and roads is severely limited by wetness, flooding, shrink-swell potential, and low strength. It is generally not a suitable building site because of flooding. Flooding can be prevented by dikes and levees, but they are extremely expensive when constructed well enough to assure total protection. Foundations and footings should be properly designed to prevent structural damage caused by low strength and shrinking and swelling of the soil. Road drainage ditches should be provided, and a more stable base material, such as sand or gravel, should be used. A properly designed drainage system is needed to effectively lower the water table. Pumping is often needed because adequate outlets are not available for a drainage system.

The use of this soil for septic tank absorption fields is severely limited by wetness, flooding, and very slow permeability. Conditions are generally unfavorable for commercial or residential development. More favorable sites may be available on adjacent soils.

This soil is in capability subclass IIIw and woodland suitability subclass 3w.

## Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and

measured data on soil properties and performance are used as a basis for predicting soil behavior.

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

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

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

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

## Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 219,243 acres was used for crops and pasture in 1967, according to the Conservation Needs Inventory (3). Of this total, 140,689 was used for row

crops, mainly corn and soybeans, 20,129 was in close-growing crops, mainly wheat; 11,253 in rotational hay and pasture; 22,291 in permanent pasture; and 2,162 in hay; the rest was idle cropland and used for conservation purposes.

The potential of the soils in Posey County for increased production of food is fair. About 6,000 acres of potentially good cropland is currently used as pasture and about 20,000 acres as woodland. In addition to reserve productive capacity represented by this land, food production could be increased by extending the latest crop production technology to all cropland in the county. For example, double cropping by planting soybeans after wheat harvest offers good potential for increased production. This soil survey can greatly facilitate the application of such technology.

Acreage in crops and pasture has gradually decreased as more land was used for urban development. In 1967 there was about 6,493 acres of urban and built-up land in the county. This figure has been increasing at a rate of about 200 acres per year. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section 'Soil maps for detailed planning'.

*Soil erosion* is a major soil problem on about 46 percent of the cropland and pasture in Posey County. If the slope is more than 2 percent, erosion is a hazard.

Loss of the surface soil through erosion is doubly damaging in that it reduces productivity and adds to sedimentation of streams. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Preparing a good seedbed and tilling are difficult on eroded Alford, Iona, and Uniontown soils because the exposed subsoil is heavier textured and less friable than the original surface layer. Because many fertilizers applied to the soil tend to remain in the plow layer, they are carried away when the soil erodes, and a direct economic loss results. Loss of the surface layer is especially damaging on Hosmer soils because a fragipan limits the depth of the root zone. Erosion also reduces productivity on soils that tend to be droughty, such as Bloomfield soils. A secondary result of soil erosion is sediment entering streams. Control of erosion prevents clogging of drainage ditches and pollution of streams by sediment, herbicides, and pesticides and improves water quality for municipal use, for recreation, and for fish and wildlife.

Erosion can be controlled by providing surface cover, reducing runoff, and increasing infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil losses to amounts that will maintain the productive capacity of the soils. On livestock farms, where pasture and hay are required, the legume and grass forage crops in the cropping system reduce erosion on sloping land and provide nitrogen and improve tilth for the following crop.

In some areas of Posey County the slopes are so short and irregular that contour tillage or terracing is not practical. This is true of many areas of Uniontown and Wheeling soils. These soils need a cropping system that provides substantial vegetative cover unless minimum tillage is practical. These practices can be adapted to most soils in the survey area, but are more difficult to use successfully on eroded soils and on soils with a clayey surface layer. The no-tillage method can be used for corn, and soybeans are double cropped in wheat stubble on an increasing acreage. These are both effective methods of reducing erosion on sloping land and can be adapted to many soils in the survey area.

Diversions and parallel tile-outlet terraces are used to shorten the effective length of slope and are effective in reducing sheet, rill, and gully erosion. They are most practical on the deep, well drained Alford and Sylvan soils that are highly susceptible to erosion. Terracing reduces soil loss and the associated loss of fertilizer elements; reduces damage to crops and watercourses caused by sedimentation; reduces the need for grassed waterways which take productive land out of row crops; and makes it easier to farm on the contour which, in turn, reduces the use of fuel and the amount of pesticides entering watercourses. Many of the Alford and Sylvan soils are suitable for terraces. Terraces are less easily adapted to soils that have a fragipan, such as the Hosmer soils, and coarser textured soils, such as the Bloomfield soils.

Grassed waterways are needed in many areas of Posey County on sloping soils such as those of the Alford and Sylvan series. Grass waterways often require tile drainage to reduce seepiness and to maintain a good grass cover.

Grade stabilization structures are needed on many of the open ditches in the county to reduce erosion caused by surface water draining into the open ditch. Structures also are needed in open ditches that have too much grade, causing the water to move so rapidly that it erodes the sides and bottom of the channel.

Soil blowing can be a problem on the coarser textured soils, such as those of the Bloomfield, Landes, and Plainfield Variant series. It can displace much of the surface layer if winds are strong and the soil is dry and bare of vegetation or surface mulch. A vegetative cover, surface mulch, or a rough surface minimizes the effect of soil blowing. Soils that are plowed in fall are very susceptible to soil blowing the following spring.

*Soil drainage* is a major problem on about 30 percent of the cropland and pasture in Posey County. Many areas of the poorly and very poorly drained soils, such as the Birds, Evansville, Patton, Ragsdale, and Vincennes soils, have been drained satisfactorily for agricultural production. A few depressional areas however, cannot be drained economically because drainage ditches would have to be deep and extend great distances to a suitable outlet. This condition exists for many

areas of Petrolia and Zipp soils. Crops on somewhat poorly drained soils, such as the Henshaw, Reesville, and Wakeland soils, benefit from artificial drainage during most years.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drains and tile drainage is needed in most areas of very poorly drained soils used for intensive row cropping. Drains must be more closely spaced in soils with slow permeability than in soils that are more permeable. Because tile drains do not usually function satisfactorily in the fine textured soils, such as Zipp or Zipp Variant soils, open ditches and surface drains are necessary. This is also true of the soils that have a fragipan, such as the Ginat and Weinbach soils. Pumping may be needed in conjunction with drainage systems in areas where outlets are difficult to obtain.

Flooding is a hazard on the bottom land and a few low-lying terraces in Posey County (fig. 11). Some soils, such as those of the Genesee, Newark, Nolin, and Petrolia series, are flooded most years during winter and early in spring. This flooding does not usually occur during the cropping season and rarely causes crop losses. Floodwater ponded on Newark and Petrolia soils often delays planting, and in some years prevents it entirely. Because of flooding, winter wheat and pasture and hay crops are not usually grown on these bottom land soils. Although the soils along smaller streams, such as the Birds, Haymond, and Wakeland soils, are subject to local flooding, this is usually of short duration and does not severely restrict crop selection or tillage operations. Dikes and levees are needed to protect the soils on bottom land, but they are very costly to construct and maintain.

Droughtiness is a hazard in a few areas in Posey County. The coarser textured soils, such as the Bloomfield and Plainfield Variant soils, have low available water capacity. During periods of low rainfall, crops growing on these soils are subject to stress due to lack of moisture. Additions of organic matter and minimum tillage help conserve soil moisture and prevent crop loss.

*Soil fertility* is naturally moderate or low in many of the soils of the uplands and terraces. The soils of the bottom lands, such as those of the Genesee, Nolin, and Wakeland series, are naturally higher in plant nutrients than most upland and terrace soils. The bottom land soils are normally neutral, and the soils of the lakebed plains, such as the Evansville, Patton, and Ragsdale soils, are normally neutral or slightly acid.

The upland and terrace soils, such as the Alford, Elkinsville, and Wheeling soils, are usually strongly acid or medium acid. They usually require applications of ground limestone to raise the pH level for crops that grow best on nearly neutral soils. Available phosphorus and potash is naturally low in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soils tests, on the need of the crop, and on the



Figure 11.—Newark silty clay loam on bottom lands is flooded almost every winter and early spring, limiting its use to annual crops and woodland.

expected level of yields. The Cooperative Extension Service can help in determining the kinds and amount of fertilizer and lime to apply.

*Soil tilth* is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils used for crops in the survey area have a silt loam surface layer that is low or moderate in content of organic matter. Generally, the structure of these soils is moderate or weak, and intense rainfall causes the formation of some crust on the surface. The crust in some areas is hard when dry and impervious to water. Once a hard crust forms, infiltration is reduced and runoff is increased. The return of crop residues to the soil and regular additions of manure and other organ-

ic matter can improve soil structure and reduce crust formation.

Fall plowing is generally not a good practice on the light colored soils that have a silt loam surface layer, because a crust forms during the winter and spring. Many soils are nearly as dense and hard at planting time as they were before fall plowing. Also, most of the cropland consists of sloping soils that are subject to damaging erosion if plowed in the fall.

The Patton, Petrolia, and Zipp soils have a silty clay loam surface layer, and tilth is a problem because the soils often stay wet until late in spring. If plowed when wet, these soils tend to be very cloddy when dry, and good seedbeds are difficult to prepare. Fall plowing generally results in good tilth in the spring.

*Field crops* suited to the soils and climate of the survey area include many that are not now commonly grown. Corn and soybeans are the main row crops. Grain sorghum, sunflowers, navy beans, sugar beets, peanuts, and similar crops can be grown if economic conditions are favorable.

Wheat is the most common close-growing crop. Oats, rye, barley, buckwheat, and flax also can be grown, however, and grass seed could be produced from fescue, redbud, and bluegrass.

*Special crops* are of limited commercial importance in the survey area. Only a small acreage is used for vegetables and small fruits. Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. In the survey area these are the Alford, Bloomfield, and Princeton soils that have slopes of less than 6 percent. (Bloomfield soils need irrigation for optimum production.) Crops can generally be planted and harvested earlier on these soils than on other soils in the survey area.

Most of the well drained soils are suitable for orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor, however, are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

### Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations

and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 6.

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

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

### Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for trees or for engineering purposes.

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

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

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

The acreage of soils in each capability subclass is indicated in table 7. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils. The capability subclass is identified in the description of each map unit in the section "Soil maps for detailed planning."

### Woodland management and productivity

About 12 percent of Posey County is woodland. Much of it consists of sloping upland areas. The dominant species are trees that have high commercial value such

as tulip popular, sugar maple, ash, and several species of oak, including white, red, and Cherrybark. Black walnut, beech, and several species of hickory also occur. The trees on river terraces and lakebed plains are mainly pin oak, green ash, and sycamore. On the bottom lands, the dominant species are silver maple and cottonwood, and there are a few areas of baldcypress.

Almost all the soils in Posey County have good potential for timber production, and there are local markets for wood products. Only a few areas, however, are managed for the production of wood crops. Both the quantity and quality of the timber products in the survey area could increase greatly if all the woodland in the county were properly managed.

Table 8 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Mapping unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: *x*, *w*, *t*, *d*, *c*, *s*, *f*, and *r*.

In table 8 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

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

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

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

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

*Trees to plant* are those that are suitable for commercial wood production and that are suited to the soils.

## Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Table 9 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 9, based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting

and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from nurserymen.

## Engineering

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

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

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

can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

*Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.*

The information is presented mainly in tables. Table 10 shows, for each kind of soil, the degree and kind of limitations for building site development; table 11, for sanitary facilities; and table 13, for water management. Table 12 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

### Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 10. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

*Shallow excavations* are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings

do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

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

*Dwellings and small commercial buildings* referred to in table 10 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

*Local roads and streets* referred to in table 10 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

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

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

### Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 11 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

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

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

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

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

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

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to

minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

*Sanitary landfill* is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 11 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

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

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

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to

be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

### Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 12 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

*Roadfill* is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 16 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

*Sand* and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals,

reaction, and stratification are given in the soil series descriptions and in table 16.

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

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

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

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

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

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

### Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13 the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

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

*Embankments, dikes, and levees* require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength,

and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

*Aquifer-fed excavated ponds* are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 13 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

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

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

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

### Recreation

The two main recreation areas in Posey County are the Hovey Lake Fish and Wildlife Area in Point Township and the Harmonie State Recreation Area near New Harmony. The Hovey Lake area includes about 3,800 acres and has facilities for camping, fishing, and hunting. The Harmonie State Recreation Area includes about 3,400 acres and has facilities for camping, hiking, swimming, picnicking, and horseback riding. Golfing and canoeing areas are planned. The Wabash and Ohio Rivers are used extensively for boating, water skiing, and fishing, and several public access areas are available. In addition, the county has numerous small community parks, several riding stables, and two private golf courses.

The soils of the survey area are rated in table 14 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegeta-

tion, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 14 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 11, and interpretations for dwellings without basements and for local roads and streets, given in table 10.

*Camp areas* require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

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

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

*Paths and trails* for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the

annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

## Wildlife habitat

There is a wide variety of wildlife species in Posey County. Many of these species provide recreation, fur, and food for people of the area. These include such furbearers as beaver, muskrat, mink, racoon, opossum, and both the red and gray fox. Small game such as cottontail rabbit, bobwhite quail, woodcock, and both fox and gray squirrels are common. Whitetail deer are the only large game species present. Migratory ducks and geese pass through the county in the spring and fall and the wood duck is present throughout the year. Woodchucks are numerous, and the swamp rabbit and coyote, though rare, are increasing in numbers. In addition there are large numbers of nongame species and songbirds in the county.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 15, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

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

impossible to create, improve, or maintain on soils having such a rating.

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

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

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bluegrass, redtop, orchardgrass, crownvetch, sericea lespedeza, clover, and alfalfa.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, goldenrod, beggarweed, partridge pea, chickweed, and wild sunflower.

*Hardwood trees* and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, sweetgum, mulberry, black walnut, hawthorn, dogwood, pecan, hickory, and blackberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are honeysuckle, autumn-olive, and crabapple.

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

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

face stoniness. Examples of wetland plants are smartweed, cattail, arrowhead, rushes, sedges, and reeds.

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

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

*Openland habitat* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, killdeer, cottontail rabbit, woodchuck, and red fox.

*Woodland habitat* consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and whitetailed deer.

*Wetland habitat* consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfisher muskrat, mink, and beaver.

## Soil properties

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

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

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially

properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

## Engineering properties

Table 16 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 16 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

*Texture* is described in table 16 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

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

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

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil

is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 19. The estimated classification, without group index numbers, is given in table 16. Also in table 16 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

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

*Liquid limit* and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

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

## Physical and chemical properties

Table 17 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

*Permeability* is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water

movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

*Available water capacity* is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

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

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

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

*Wind erodibility groups* are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil

lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

- 4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

## Soil and water features

Table 18 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep

or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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

*Flooding* is the temporary covering of soil with water from overflowing streams and with runoff from adjacent slopes. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about flood-water levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such

information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

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

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

*Risk of corrosion* pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

## Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are in table 19.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil series and morphology." The soil samples were analyzed by the Joint Highway Research Project at Purdue University.

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American

Association of State Highway and Transportation Officials. The codes for shrinkage, Unified classification, and California bearing ratio are those assigned by the American Society for Testing and Materials.

The methods and codes are AASHTO classification (M-145-66); Unified classification (D-2487-66T); mechanical analysis (T88-57); liquid limit (T89-60); plasticity index (T90-56); moisture-density, method A (T99-57); shrinkage (D-427).

## Soil series and morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (5). Unless otherwise noted, colors described are for moist soil.

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

### Alford series

The Alford series consists of deep, well drained, moderately permeable soils on loess covered uplands. They formed in silty loess. Slopes range from 0 to 25 percent. These soils are outside the range defined for the Alford series in that the base saturation is lower. This difference does not greatly alter the use and management of the soils for most common purposes.

Alford soils are similar to the adjacent Hosmer, Iona, Sylvan, and Wellston soils and are also adjacent to Uniontown soils. Hosmer soils differ from Alford soils in that they have a fragipan. Iona and Sylvan soils have calcareous underlying materials, and Iona soils have grayish mottles in the lower part of the subsoil. Wellston soils have residuum of sandstone and shale in the lower part of their profile. Uniontown soils have a yellower subsoil than Alford soils, and are underlain with stratified calcareous material.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 1,420 feet east and 240 feet north of the southwest corner of sec. 29, T. 6 S., R. 12 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; mixed with some dark

brown (7.5YR 4/4) silt loam from the B1 horizon; medium acid; abrupt smooth boundary.

B1—7 to 10 inches; dark brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; many fine roots; few thin patchy reddish brown (5YR 4/3) clay films and few thin discontinuous pale brown (10YR 6/3) silt films on faces of peds; strongly acid; clear smooth boundary.

B21t—10 to 21 inches; dark brown (7.5YR 4/4) silty clay loam; moderate and strong medium subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—21 to 31 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) and very dark brown (10YR 2/2) clay films on faces of peds; strongly acid; clear smooth boundary.

B3—31 to 47 inches; brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds; few light brownish gray (10YR 6/2) silt streaks; strongly acid; gradual wavy boundary.

C—47 to 60 inches; brown (7.5YR 4/4) silt loam; massive; friable; few light brownish gray (10YR 6/2) silt streaks; medium acid.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is 6 to 10 inches thick and is slightly acid or medium acid. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam or silt loam. It is 16 to 30 inches thick and is medium acid to very strongly acid. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

### Armiesburg series

The Armiesburg series consists of deep, well drained, moderately permeable soils on bottom lands and low terraces. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Armiesburg soils are similar to the Onarga soils and are adjacent to the Genesee, Nolin, and Stonelick soils. Onarga soils are on river terraces and have an argillic horizon. They have a higher sand content than Armiesburg soils. Genesee, Nolin, and Stonelick soils are on bottom lands and do not have mollic epipedons.

Typical pedon of Armiesburg silt loam in a cultivated field 1,650 feet west and 40 feet south of the northeast corner of sec. 17, T. 6 S., R. 14 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine

granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—10 to 17 inches; very dark gray (10YR 3/1) silt loam; moderate, medium and fine subangular blocky structure; firm; many fine roots; neutral; gradual smooth boundary.

B1—17 to 22 inches; brown (10YR 4/3) silty clay loam; moderate medium and fine subangular blocky structure; firm; common fine roots; many thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; gradual smooth boundary.

B21—22 to 31 inches; brown (10YR 4/3) silty clay loam; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; firm; common fine roots; many thin continuous dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; gradual smooth boundary.

B22—31 to 41 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; firm; few fine roots; many thin continuous grayish brown (10YR 5/2) coatings on faces of peds; neutral; gradual smooth boundary.

B3—41 to 49 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; friable; few fine roots; many thin continuous grayish brown (10YR 5/2) coatings on faces of peds; neutral; gradual smooth boundary.

C—49 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate, medium subangular blocky; friable; common thin discontinuous grayish brown (10YR 5/2) coatings on faces of peds; neutral.

The solum is 30 to 50 inches thick. It is neutral or slightly acid.

The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is silt loam or, in some places, light silty clay loam and is 14 to 20 inches thick. The B2 horizon is brown (10YR 4/3 or 5/3) or dark yellowish brown (10YR 4/4). The C horizon has colors similar to the B2 horizon. Some stratified coarser material is below a depth of 60 inches.

### Armiesburg Variant

The Armiesburg Variant consists of deep, well drained, moderately permeable soils on alluvial fans and river terraces. They formed in alluvium. Slopes range from 0 to 2 percent.

This Armiesburg Variant is similar to Armiesburg and Landes soils and is adjacent to Elkinsville and Wheeling soils. Armiesburg soils are more than 18 percent clay and Landes soils are more than 15 percent sand in their control sections. Both these soils are on bottom lands.

Elkinsville and Wheeling soils do not have mollic epipedons. They are strongly acid and are more than 18 percent clay in their control sections. These soils are on river terraces.

Typical pedon of Armiesburg Variant silt loam in a cultivated field 2,600 feet north and 245 feet east of the southwest corner of sec. 6, T. 4 S., R. 13 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A12—9 to 19 inches; black (10YR 2/1) silt loam; dark gray (10YR 4/1) dry; weak fine subangular blocky parting to weak fine granular structure; friable; few fine roots, neutral; gradual smooth boundary.

B1—19 to 26 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous prominent very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; gradual smooth boundary.

B21—26 to 39 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; few fine roots; thin patchy prominent white (10YR 8/1) dry silt coats on faces of peds; neutral; gradual smooth boundary.

B22—39 to 50 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; few fine roots; neutral; gradual smooth boundary.

C—50 to 70 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; neutral.

The solum is 36 to 60 inches thick. It is slightly acid or neutral.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is 10 to 24 inches thick. The B horizon has hue of 10YR, value of 4 through 6, and chroma of 4 or more. It is silt loam or silt. Some pedons have mottles in the C horizon.

### Birds series

The Birds series consists of deep, poorly drained, moderately slowly permeable soils on bottom lands. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Birds soils are similar to Evansville and Petrolia soils and are commonly near Wakeland and Haymond soils. Evansville soils have a cambic horizon and are on lakebed plains. Petrolia soils have a higher clay content than Birds soils and are along the larger streams. Wakeland soils differ from Birds soils in that they have more brownish colors in the upper part of the underlying material and have a lower clay content. Haymond soils do not have grayish colors above a depth of 30 inches and they have a lower clay content and are on higher positions on the bottom lands than Birds soils.

Typical pedon of Birds silt loam in a cultivated field 1,320 feet north and 2,550 feet east of the southwest corner of sec. 14, T. 6 S., R. 12 W.

Ap—0 to 10 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—10 to 25 inches; gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine roots; neutral; gradual smooth boundary.

C2—25 to 50 inches; gray (10YR 5/1, 6/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse granular structure; friable; common very dark brown (10YR 2/1) iron and manganese oxide concretions; neutral; gradual wavy boundary.

C3—50 to 60 inches; gray (10YR 5/1) and yellowish brown (10YR 5/6) stratified silt loam and silty clay loam; massive; friable; neutral.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. The C horizon has hue of 10YR or 2.5YR, value of 5 or 6, and chroma of 1 or 2. Thin strata of loam and sandy loam are within the range for the series.

### Bloomfield series

The Bloomfield series consists of deep, somewhat excessively drained, moderately rapidly or rapidly permeable soils on uplands. They formed in wind-deposited sands. Slopes range from 2 to 35 percent.

Bloomfield soils are similar to the adjacent Princeton soils and are also similar to Plainfield Variant, Psamments, and Stonelick soils. Princeton soils have a continuous argillic horizon and are more than 18 percent clay in the control section. Plainfield Variant soils do not have an argillic horizon and are on river terraces. Psamments and Stonelick soils are calcareous, have coarser sands than Bloomfield soils, and are on bottom lands.

Typical pedon of Bloomfield loamy fine sand, 6 to 12 percent slopes, in a cultivated field 360 feet south and 125 feet east of the northwest corner of sec. 11, T. 7 S., R. 14 W.

Ap—0 to 9 inches; brown (10YR 4/3) loamy fine sand, light yellowish brown (10YR 6/4) dry; weak very fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A21—9 to 15 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak very fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A22—15 to 22 inches; brown (7.5YR 4/4) and yellowish brown (10YR 5/6) fine sand; single grained; loose;

few fine roots; slightly acid; gradual smooth boundary.

A23—22 to 36 inches; yellowish brown (10YR 5/6) fine sand; single grained; loose; few fine roots; slightly acid; gradual wavy boundary.

A&B—36 to 53 inches; yellowish brown (10YR 5/6) fine sand (A); single grained; loose; with lamellae and bands of brown (7.5YR 4/4) fine sandy loam and loamy sand (B); weak fine subangular blocky structure in thicker bands; friable; wavy and discontinuous 1/4 to 3/4 inch thick lamellae in upper part and bands 1 inch to 3 inches thick in lower part; total thickness of bands less than 5 inches; slightly acid; gradual wavy boundary.

B&A—53 to 80 inches; brown (7.5YR 4/4) fine sandy loam bands (B); weak fine subangular blocky structure; 4 to 8 inches thick totaling 16 inches inter-bands of yellowish brown (10YR 5/6) fine sand (A) 2 to 4 inches thick; single grained; loose; slightly acid.

The solum is 54 to 80 inches thick. Depth to calcareous material is between 6 and 9 feet. Depth to lamellae ranges from 30 to 45 inches. Combined thickness of the lamellae above a depth of 40 inches is less than 3 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. On uncultivated sites the A1 horizon is dark grayish brown (10YR 4/2). Texture is fine sand, loamy fine sand, or loamy sand. Reaction is neutral or slightly acid. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4, and has the same texture range as the A1 horizon. It is neutral or slightly acid. The sandier portion of the A&B horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is fine sand or loamy fine sand. Many lamellae and bands in the A&B horizon are discontinuous and wavy. Most are 1/4 inch to 2 inches thick in the upper part of the solum and increase to 10 inches in the lower part of the B&A horizon. Lamellae have hue of 5YR, 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. They are commonly fine sandy loam, ranging to loamy sand or sandy loam. The A&B horizon and B&A horizon are slightly acid or medium acid.

### Elkinsville series

The Elkinsville series consists of deep, well drained, moderately permeable soils on river terraces. They formed in silty alluvium. Slopes range from 0 to 6 percent.

Elkinsville soils are similar to the adjacent Wheeling soils and are also adjacent to Uniontown and Nolin soils. Wheeling soils have higher sand content. Uniontown and Nolin soils are less acid than Elkinsville soils. Uniontown soils are on lakebed terraces, and Nolin soils are on bottom lands.

Typical pedon of Elkinsville silt loam, 0 to 2 percent slopes, in a cultivated field 2,050 feet north and 1,730 feet east of the southwest corner of sec. 31, T. 4 S., R. 13 W.

- Ap—0 to 9 inches; brown (10YR 4/3) silt loam; pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.
- A2—9 to 16 inches; brown (10YR 5/3) silt loam; weak thin platy structure; few fine roots; thin discontinuous distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; gradual smooth boundary.
- B1t—16 to 22 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; few fine roots; thin patchy faint yellowish brown (10YR 5/8) clay films on faces of peds; thin patchy faint light brownish gray (10YR 6/2) silt coats on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.
- B21t—22 to 33 inches; yellowish brown (10YR 5/6) silt loam; moderate medium and fine subangular blocky structure; firm; thin discontinuous distinct brown (7.5YR 4/4) clay films on faces of peds; thin patchy faint light brownish gray (10YR 6/2) silt coats on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.
- B22t—33 to 49 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; thin continuous distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; thin patchy faint light brownish gray (10YR 6/2) silt coats on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; very strongly acid; gradual smooth boundary.
- B3t—49 to 65 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous distinct brown (7.5YR 4/4) clay films on faces of peds; thin patchy faint light brownish gray (10YR 6/2) on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; very strongly acid.
- C—65 to 72 inches; yellowish brown (10YR 5/4) silt loam; massive; firm; thin patchy light brownish gray (10YR 6/2) silt coatings in voids and in root channels; strongly acid.

The solum is 42 to 72 inches thick.

The Ap horizon is brown (10YR 5/3), dark yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2), or dark brown (10YR 4/3). It is 7 to 10 inches thick and is neutral to medium acid. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is 5 to 9

inches thick and is medium acid or strongly acid. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 6. It is silt loam or silty clay loam in the upper part and silt loam, silty clay loam, loam, clay loam, or sandy clay loam in the lower part. It is strongly acid or very strongly acid. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is silt loam, silty clay loam, loam, sandy loam, or fine sand. It is medium acid to very strongly acid.

### Evansville series

The Evansville series consists of deep, poorly drained, moderately permeable soils on lake plains and terraces. They formed in silty sediments. Slopes range from 0 to 2 percent.

Evansville soils are similar to the Birds, Petrolia, and Vincennes soils and are adjacent to Henshaw, Patton, and Uniontown soils. Birds soils lack cambic horizons. Petrolia soils have a silty clay loam surface layer. Birds and Petrolia soils are on bottom lands. Vincennes soils have a higher sand content, are more acid than Evansville soils, and are on river terraces. Henshaw soils are browner in the upper part of the subsoil. Uniontown soils do not have grayish colors in the upper part of the subsoil. Uniontown and Henshaw soils are on slightly higher positions. Patton soils have mollic epipedons and are on slightly lower positions and in depressions.

Typical pedon of Evansville silt loam in a cultivated field 1,870 feet north and 100 feet west of the southeast corner of sec. 1, T. 7 S., R. 13 W.

- Ap—0 to 9 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
- B1g—9 to 20 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine faint light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few thin patchy dark gray (10YR 4/1) silt films on faces of peds; neutral; clear smooth boundary.
- B2g—20 to 35 inches; olive gray (5Y 4/2) silty clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; common thin discontinuous dark gray (5Y 4/1) silt films on faces of peds; neutral; clear smooth boundary.
- Cg—35 to 60 inches; light olive brown (2.5Y 5/6) silty clay loam; common medium distinct olive gray (5Y 5/2) mottles; massive; firm; few fine roots; mildly alkaline.

The solum is 30 to 50 inches thick.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. It is silt loam or light silty clay loam.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5, and chroma of 2 and has common to many mottles in shades of brown. It is silt loam or silty clay loam. The C horizon ranges from neutral to moderately alkaline.

### Genesee series

The Genesee series consists of deep, well drained, moderately permeable soils on bottom lands. They formed in loamy alluvium. Slopes range from 0 to 2 percent.

Genesee soils are similar to and are commonly near Nolin and Stonelick soils. Nolin soils have less sand and Stonelick soils have more sand in their profiles than Genesee soils. All the soils are in similar positions on the landscape.

Typical pedon of Genesee loam in a cultivated field 410 feet east and 205 feet south of the center of sec. 9, T. 5 S., R. 14 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry, weak very fine granular structure; friable; many fine roots; mildly alkaline; abrupt smooth boundary.

C1—9 to 16 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure parting to weak very fine granular; friable; common fine roots; common thin continuous dark grayish brown (10YR 4/2) coatings on faces of peds and in root channels; mildly alkaline; gradual smooth boundary.

C2—16 to 29 inches; brown (10YR 5/3) loam; weak fine subangular blocky structure; friable; common fine roots; slight effervescence; moderately alkaline; gradual smooth boundary.

C3—29 to 43 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; friable; few fine roots; few thin discontinuous dark grayish brown (10YR 4/2) coatings on faces of peds; slight effervescence; moderately alkaline; clear smooth boundary.

C4—43 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; firm; few fine black (10YR 2/1) iron and manganese oxide concretions; mildly alkaline.

Typically fine stratification is within a depth of 20 inches.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3, 4/3). Typically it is loam or silt loam, but sandy loam and silty clay loam are within the range of textures characteristic of the soils. It is neutral or mildly alkaline. The C horizon to a depth of 40 inches has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is typically loam or silt loam, but textures of sandy loam and fine sandy loam are common. It is neutral to moderately alkaline. The C horizon below a depth of 40 inches consists of strata of brown or yellowish brown loam, silt loam, sandy loam, loamy sand, or sand, often

becoming coarser with depth. It is mildly alkaline or moderately alkaline, and many pedons contain free carbonates that have slight or strong effervescence.

### Ginat series

The Ginat series consists of deep, poorly drained, very slowly permeable soils that have a fragipan. They formed in acid alluvium on river terraces. Slopes range from 0 to 2 percent.

Ginat soils are similar to Peoga and Vincennes soils and are adjacent to Elkinsville, Weinbach, and Wheeling soils. Peoga soils do not have a fragipan. Vincennes and Wheeling soils have more sand and do not have a fragipan. Elkinsville and Wheeling soils do not have grayish colors in their profiles. Weinbach soils have at least one horizon in the subsoil that is dominantly brown. Peoga and Vincennes soils are in similar positions on the landscape, but Ginat, Elkinsville, Weinbach, and Wheeling soils are on slightly higher positions.

Typical pedon of Ginat silt loam in a cultivated field 1,066 feet south and 1,148 feet east of the northwest corner of sec. 25, T. 7 S., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; few fine roots; many fine black (10YR 2/1) iron and manganese oxide concretions; neutral; abrupt smooth boundary.

A2—8 to 12 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct light olive brown (2.5Y 5/6) mottles; weak medium platy structure; friable; few fine roots; many thick continuous light gray (10YR 7/1) dry silt coatings on faces of peds; neutral; clear smooth boundary.

B21tg—12 to 18 inches; light brownish gray (10YR 6/2) silt loam; many fine distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; common thin continuous grayish brown (10YR 5/2) clay films on faces of peds; many thin discontinuous light gray (10YR 7/1) dry silt coatings on faces of peds; many fine black (10YR 2/1) iron and manganese oxide concretions; very strongly acid; gradual smooth boundary.

B22tg—18 to 25 inches; light brownish gray (10YR 6/2) silt loam; many fine distinct yellowish brown (10YR 5/8) and few fine distinct yellowish brown (10YR 5/8) and few fine distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; common thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few fine mica flakes; many fine black (10YR 2/1) iron and manganese oxide concretions; very strongly acid; gradual smooth boundary.

Bx1g—25 to 33 inches; light brownish gray (10YR 6/2) silt loam; many fine distinct olive brown (2.5Y 4/4) mottles; moderate very coarse prismatic structure;

very firm; few fine roots in vertical cracks; brittle; common thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few fine mica flakes; few thin patchy white (10YR 8/1) dry silt coatings on faces of peds and in vertical cracks; many fine black (10YR 2/1) iron and manganese oxide concretions; very strongly acid; gradual smooth boundary.

Bx2g—33 to 48 inches; light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) silt loam; many medium faint grayish brown (10YR 5/2) mottles; moderate very coarse prismatic structure; very firm; brittle; few thin patchy grayish brown (10YR 5/2) clay films on faces of peds; few fine mica flakes; many fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

C—48 to 60 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; few fine mica flakes; many fine black (10YR 2/1) iron and manganese oxide concretions; medium acid.

Solum thickness is 40 to 70 inches. Depth to the fragipan is commonly 20 to 26 inches and ranges from 18 to 30 inches. The solum, except for surface layers affected by liming, is strongly acid or very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. In areas where it has not been mixed with the Ap horizon, an A2 horizon is present. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2 and has common to many mottles. It is silt loam or silty clay loam. The Bx horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 6 and has common to many mottles. It commonly is silt loam or silty clay loam, but in some pedons it is clay loam or loam. The C horizon is silt loam, silty clay loam, fine sand, or is stratified with these textures.

### Haymond series

The Haymond series consists of deep, well drained, moderately permeable soils on bottom lands and alluvial fans. They formed in silty alluvium from loess covered uplands. Slopes range from 0 to 2 percent.

Haymond soils are similar to Genesee, Nolin, and Elkinsville soils and are commonly near Wakeland and Birds soils. Genesee soils have higher sand content than Haymond soils. Nolin and Elkinsville soils have higher clay content than Haymond soils and Elkinsville soils are more acid. Birds and Wakeland soils have grayish colors in the horizons below the surface layer and are in slightly lower positions on the landscape.

Typical pedon of Haymond silt loam in a cultivated field 820 feet east and 410 feet north of the center of sec. 20, T. 5 S., R. 12 W.

Ap—0 to 9 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—9 to 33 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; common brown (10YR 5/3) worm casts; neutral; gradual smooth boundary.

C2—33 to 47 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light grayish brown (10YR 6/2) and few fine prominent strong brown (7.5YR 5/8) mottles; massive; friable; few fine roots; common brown (10YR 5/3) worm casts; neutral; gradual smooth boundary.

C3—47 to 60 inches; light brownish gray (10YR 6/2) silt loam; common fine prominent strong brown (7.5YR 5/8) mottles; massive; friable; neutral.

The soil ranges from medium acid to neutral.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3, 5/3). The C horizon to a depth of 40 inches has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons are mottled below a depth of 30 inches. The 10 to 40 inch control section averages between 12 to 18 percent clay and less than 15 percent fine sand or coarser.

### Henshaw series

The Henshaw series consists of deep, somewhat poorly drained, moderately slowly permeable soils on terraces. They formed in silty sediments. Slopes range from 0 to 2 percent. These soils are outside the range defined for the Henshaw series in that there are no carbonates at depths above 60 inches. This difference does not affect the use and management of those soils.

Henshaw soils are similar to Iona and Reesville soils and are adjacent to Evansville, Patton, and Uniontown soils. Iona and Uniontown soils do not have grayish mottles in the upper 10 inches of the argillic horizon. Iona soils are on uplands, and Uniontown soils are on higher positions on the landscape than Henshaw soils. Reesville soils have more grayish colors in the upper part of the subsoil than Henshaw soils. Evansville and Patton soils have dominantly grayish colors in the subsoil. Patton soils have mollic epipedons. Evansville, Patton, and Reesville soils are on lower positions on the landscape.

Typical pedon of Henshaw silt loam, 0 to 2 percent slopes, in a cultivated field 1,400 feet west and 100 feet south of the center of sec. 7, T. 7 S., R. 12 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 13 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; common thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of peds and in voids of old root channels; strongly acid; clear smooth boundary.

B22t—13 to 25 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common thin discontinuous grayish brown (2.5Y 5/2) clay films and silt films on faces of peds; common fine and medium very dark brown (10YR 2/2) iron and manganese oxide concretions; strongly acid; clear smooth boundary.

B23t—25 to 38 inches; light olive brown (2.5Y 5/6) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common thin continuous light brownish gray (2.5Y 6/2) clay films on faces of peds; common fine dark brown (10YR 2/2) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

B3t—38 to 44 inches; olive brown (2.5Y 5/4) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; weak coarse prismatic structure; firm; few thin patchy grayish brown (2.5Y 5/2) clay films on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide concretions; slightly acid; gradual smooth boundary.

C—44 to 60 inches; light olive brown (2.5Y 5/4) and light brownish gray (2.5Y 6/2) stratified silty clay loam and silt loam; massive; firm; few very dark brown (10YR 2/2) iron and manganese oxide concretions; mildly alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3, and is 6 to 11 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 4 to 6 with few to many low chroma mottles. The B3 horizon has colors similar to the B2t horizon with common or many distinct mottles. The C horizon has the same range in color as the B horizon. Texture is commonly silt loam or silty clay loam. It ranges from neutral to moderately alkaline.

### Hosmer series

The Hosmer series consists of deep, well drained, very slowly permeable soils that have a fragipan. They formed in silty loess on uplands. Slopes range from 2 to 18 percent.

Hosmer soils are similar to and are commonly near Alford, Iona, and Wellston soils. These soils differ from Hosmer soils in that they do not have a fragipan. Iona

soils have grayish mottles below the upper 10 inches of the argillic horizon. Wellston soils have residuum from sandstone and shale in the lower part of the profile and are on side slopes.

Typical pedon of Hosmer silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 660 feet north and 80 feet west of the center of sec. 14, T. 5 S., R. 12 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak very fine granular structure; friable; many fine roots; mixed with some yellowish brown (10YR 5/6) material from below; neutral; abrupt smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; many fine roots; strongly acid; gradual wavy boundary.

B21t—13 to 20 inches; brown (7.5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; firm; common fine roots; discontinuous thin faint brown (7.5YR 4/4) clay films on faces of peds and in root channels; common thin discontinuous white (10YR 8/1) dry silt coatings on faces of peds; strongly acid; gradual wavy boundary.

B22t—20 to 29 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; discontinuous thin distinct brown (7.5YR 4/4) clay films on faces of peds and in root channels; common thin discontinuous white (10YR 8/1) dry silt coatings on faces of peds; strongly acid; gradual wavy boundary.

B&A—29 to 33 inches; yellowish brown (10YR 5/6) silt loam; (B part) moderate coarse prismatic parting to moderate medium subangular blocky structure; firm; few fine roots between peds; thin to thick (less than 1 mm to as much as 2 inches thick) coatings and fillings of light brownish gray (10YR 6/2) silt (A part) as cappings on faces of prisms; and fillings between prisms; friable; many yellowish red (5YR 4/6) stains; clear irregular boundary.

Bx1—33 to 42 inches; yellowish brown (10YR 5/6) silt loam; strong coarse prismatic structure; very firm, brittle; few fine roots in vertical cracks between peds; few very fine discontinuous vertical impeded vesicular pores; thin brown (7.5YR 4/4) clay films on vertical faces of peds; many thin continuous light grayish brown (10YR 6/2) silt coating on faces of prisms; strongly acid; diffuse irregular boundary.

Bx2—42 to 80 inches; yellowish brown (10YR 5/6) silt loam; strong very coarse prismatic structure; very firm, brittle; few very fine discontinuous vertical impeded vesicular pores; thin brown (7.5YR 4/4) clay films on vertical faces of peds; many thin continuous light grayish brown (10YR 6/2) silt coating on faces of prisms and vertical crack fillings; strongly acid.

The solum is 48 to 84 inches thick. The thickness of the loess is more than 4 and usually less than 8 feet.

Depth to the fragipan ranges from 25 to 36 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon, when present, has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. The B2 horizon above the fragipan is silt loam or silty clay loam. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The range in color of the Bx horizon is similar to the B2 horizon. Texture is silt loam or silty clay loam. The B horizon is strongly acid or very strongly acid.

### Iona series

The Iona series consists of deep, moderately well drained, moderately slowly permeable soils on ridgetops in the uplands. They formed in loess. Slopes range from 0 to 6 percent.

Iona soils are similar to Uniontown soils and are commonly near Alford, Hosmer, and Sylvan soils. Uniontown soils have stratified silts and clays in the underlying material and are on lakebed terraces. Alford, Hosmer, and Sylvan soils do not have grayish mottles in the upper 30 inches.

Typical pedon of Iona silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 410 feet south and 45 feet east of the northwest corner of sec. 26, T. 4 S., R. 13 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very fine granular structure; friable; many fine roots; some yellowish brown (10YR 5/6) mixing; medium acid; abrupt smooth boundary.

B1—8 to 12 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; firm; common fine roots; common thin discontinuous white (10YR 8/1) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

B21t—12 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; many thick continuous brown (7.5YR 4/4) clay films on faces of peds and in root channels; few thin patchy white (10YR 8/1) dry silt coatings on faces of peds; strongly acid; clear smooth boundary.

B22t—22 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; many thick continuous brown (7.5YR 4/4) clay films on faces of peds and in root channels; common thin discontinuous white (10YR 8/1) dry silt coatings on faces of peds; few black (10YR 2/1) and dark yellowish brown (10YR 4/4) stains; medium acid; gradual smooth boundary.

B23t—31 to 39 inches; yellowish brown (10YR 5/6) silty clay loam; many fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common thin discontinuous brown (7.5YR 4/4) clay films on faces of peds and in root channels; few thin patchy white (10YR 8/1) dry silt coatings on faces of peds; few black (10YR 2/1) and dark yellowish brown (10YR 4/4) stains; neutral; gradual smooth boundary.

C—39 to 60 inches; mottled brownish yellow (10YR 6/6) and light brownish gray (10YR 6/2) silt loam; massive; friable; few fine roots; few black (10YR 2/1) and dark yellowish brown (10YR 4/4) stains; slight effervescence in lower part; moderately alkaline.

The solum is 36 to 50 inches thick. Depth to carbonates generally coincides with solum thickness but is 60 inches or more in some areas.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3, 5/3). The B horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. Texture ranges from silt loam to silty clay loam. Reaction in the upper part of the B horizon is medium acid or strongly acid. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 8.

### Junius series

The Junius series consists of deep, poorly drained, rapidly permeable soils on flats and depressions on river terraces. They formed in sandy alluvium. Slopes range from 0 to 2 percent. These soils are outside the limits defined for the Junius series in that the solum contains less fine sand and the underlying material is stratified loam, sandy loam, and loamy sand rather than sand. This difference does not alter the use and management of the soils for most common purposes.

Junius soils are similar to Psammets soils and are adjacent to Lyles and Plainfield Variant soils. Psammets soils do not have grayish colors, consists of coarser sands, and are on bottom lands. Lyles soils have mollic epipedons and a slightly higher clay content than Junius soils. Plainfield Variant soils do not have grayish colors in the subsoil and are in higher areas than Junius soils.

Typical pedon of Junius loamy sand in a cultivated field 860 feet south and 50 feet west of the northeast corner of sec. 36, T. 3 S., R. 13 W.

Ap—0 to 8 inches; brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak very fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—8 to 11 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) loamy sand; few fine faint light brownish gray (10YR 6/2) mottles; weak very fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B21g—11 to 22 inches; light brownish gray (10YR 6/2) loamy sand; common fine prominent yellowish brown (10YR 5/8) mottles; weak fine granular structure; very friable; common fine roots; neutral; gradual smooth boundary.

B22g—22 to 34 inches; light brownish gray (10YR 6/2) loamy sand; many coarse and medium prominent strong brown (7.5YR 5/8) mottles; weak very fine granular structure; very friable; few fine roots; neutral; gradual smooth boundary.

C1—34 to 53 inches; light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4) loamy sand; massive; very friable; neutral; clear smooth boundary.

C2—53 to 65 inches; light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) stratified loam and sandy loam; massive; friable; neutral.

The solum is 24 to 36 inches thick. It is neutral or slightly acid. There are no carbonates within a depth of 60 inches.

The A horizon ranges from 6 to 12 inches in thickness. The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), brown (10YR 4/3, 5/3) or very dark grayish brown (10YR 3/2). It is light brownish gray (10YR 6/2) dry. The A horizon is loamy fine sand, loamy sand, or fine sand. The B horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 or less and is distinctly or prominently mottled. The B horizon is loamy fine sand, loamy sand, or fine sand and medium sand. The C horizon has colors similar to those in the B horizon. Below a depth of 40 inches it is stratified with textures of loamy sand, sandy loam, and loam.

### Landes series

The Landes series consists of deep, well drained, moderately rapidly permeable soils on bottom lands. They formed in loamy and sandy alluvial sediments. Slopes range from 0 to 2 percent.

Landes soils are similar to Onarga, Psammments, and Stonelick soils and are commonly near Genesee, Newark, Nolin, Psammments, and Stonelick soils. Onarga soils have argillic horizons, are more acid than Landes soils, and are on river terraces. Psammments differ from Landes soils in that they have coarser textures and are closer to the river. Stonelick soils lack a mollic epipedon and are calcareous. All other associated or similar soils lack a mollic surface layer and have more than 18 percent clay in the control section. Newark soils have grayish colors in the horizons below the surface layer and are in lower or depressional areas on bottom lands.

Typical pedon of Landes sandy loam in a cultivated field 1,070 feet west and 450 feet south of the center of sec. 11, T. 4 S., R. 14 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; weak very fine granular

structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 19 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak very fine granular; very friable; many fine roots; neutral; gradual smooth boundary.

B21—19 to 26 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; very friable; many fine roots; patchy faint thin dark grayish brown (10YR 4/2) organic coats on faces of peds; neutral; gradual smooth boundary.

B22—26 to 36 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; common fine roots; neutral; gradual smooth boundary.

C1—36 to 47 inches; yellowish brown (10YR 5/6) loamy sand; weak fine subangular blocky structure; loose; neutral; gradual smooth boundary.

C2—47 to 65 inches; yellowish brown (10YR 5/6) sand; single grained; loose; neutral.

The solum ranges from 20 to 40 inches in thickness. Fine sandy loam, sandy loam, or loamy fine sand typically extends to depths of 24 to 36 inches and ranges from 20 to 40 inches.

The A horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), or very dark brown (10YR 2/2). It is neutral or mildly alkaline. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is generally sandy loam, fine sandy loam, or loam, but some pedons have strata of sand, loamy fine sand, or silt loam. It ranges from neutral or mildly alkaline. The C horizon has colors similar to the B horizon and is sand or loamy sand. It is neutral or mildly alkaline. Some pedons have free carbonates in the C horizon.

### Lyles series

The Lyles series consists of deep, very poorly drained, moderately permeable soils on river terraces. They formed in loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Lyles soils are similar to Patton and Rensselaer soils and are adjacent to Plainfield Variant, Junius, and Rensselaer soils. Patton and Rensselaer soils have a higher clay content than Lyles soils. Patton soils are less than 15 percent sand, and Rensselaer soils have argillic horizons. Patton soils are on lakebed plains. Plainfield Variant and Junius soils do not have a mollic epipedon and have less clay content. In addition, Plainfield Variant soils do not have grayish colors in the subsoil.

Typical pedon of Lyles sandy loam in a cultivated field 205 feet east and 80 feet north of the center sec. 35, T. 3 S., R. 13 W.

- Ap—0 to 10 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; moderate medium granular structure; many fine roots; neutral; abrupt smooth boundary.
- A12—10 to 20 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; weak medium prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; neutral; clear irregular boundary.
- B21g—20 to 27 inches; dark gray (10YR 4/1) sandy loam; common fine faint olive brown (2.5Y 4/4) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; neutral; gradual irregular boundary.
- B22g—27 to 36 inches; dark gray (10YR 4/1) loam with pockets of sandy loam; common fine distinct olive brown (10YR 4/4) and many coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; few coarse strong brown (7.5YR 4/4) accumulations; neutral; gradual irregular boundary.
- B23g—36 to 44 inches; gray (10YR 5/1) and strong brown (7.5YR 5/8) sandy loam; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; neutral; gradual irregular boundary.
- B3g—44 to 55 inches; dark gray (10YR 4/1) and gray (10YR 5/1) stratified sandy loam and loam; many coarse prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; neutral; gradual irregular boundary.
- C1g—55 to 60 inches; light gray (10YR 7/2) sand; single grained; loose; neutral.

The solum is 40 to 60 inches thick. It is neutral or slightly acid.

The A horizon ranges from 10 to 24 inches in thickness. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is commonly sandy loam and less commonly loam, silt loam, or clay loam. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Mottles are common or few and faint or distinct. The Bg horizon is sandy loam or loam. The C horizon is sand or is stratified with thin layers of silt loam or clay loam. It is neutral to moderately alkaline.

### Newark series

The Newark series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Newark soils are commonly near Nolin, Petrolia, Rahm, and Woodmere soils and are similar to Wakeland soils. Nolin soils do not have grayish colors in their

profiles and are on higher positions than Newark soils. Petrolia soils have dominantly grayish colors throughout the subsoil and are on lower positions. Rahm and Woodmere soils have finer textured, strongly acid material in the lower part of the subsoil and are on higher positions than Newark soils. Wakeland soils have a lower clay content and are along smaller streams.

Typical pedon of Newark silty clay loam in a cultivated field 250 feet south and 150 feet west of the northeast corner of sec. 29, T. 7 S., R. 12 W.

- Ap—0 to 7 inches; brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
- B1—7 to 15 inches; brown (10YR 4/3) silty clay loam; few medium faint dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; firm; few fine roots; few mica flakes; neutral; gradual smooth boundary.
- B21g—15 to 22 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium distinct brown (10YR 4/3) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; few mica flakes; neutral; gradual smooth boundary.
- B22g—22 to 35 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct brown (10YR 4/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak very coarse subangular blocky structure; firm; few fine roots; few mica flakes; neutral; gradual smooth boundary.
- Cg—35 to 60 inches; light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) silty clay loam; massive; firm; few fine roots; neutral.

The solum is 20 to 40 inches thick.

The Ap horizon ranges from brown (7.5YR 4/4) through dark grayish brown (2.5YR 4/2). It ranges from loam to silty clay loam. The B21 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottles. It is silt loam or silty clay loam and is medium acid to neutral. The B22g horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. It is silt loam or light silty clay loam and is neutral or mildly alkaline. The C horizon is similar to the B22g horizon in color and texture.

### Nolin series

The Nolin series consists of deep, well drained, moderately permeable soils on bottom lands. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Nolin soils are similar to Armiesburg, Genesee, and Haymond soils and are near Armiesburg, Genesee, Newark, and Petrolia soils. Armiesburg soils have a mollic epipedon. Genesee soils have more than 15 per-

cent sand in the control section. Haymond soils have less than 18 percent clay in the control section and are along smaller streams than Nolin soils. Newark and Petrolia soils have grayish colors in the subsoil. They are in the lower or depressional areas on bottom lands.

Typical pedon of Nolin silt loam, in a cultivated field, 2,304 feet north and 164 feet west of the southeast corner of sec. 29, T. 6 S., R. 14 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

B21—10 to 28 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; firm; common fine roots; common thin continuous dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; gradual smooth boundary.

B22—28 to 48 inches; brown (10YR 4/3) silt loam; few fine faint light brownish gray (10YR 6/2) mottles in lower part; weak fine subangular blocky structure; firm; common fine roots; many thin continuous dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; gradual smooth boundary.

C1—48 to 55 inches; brown (10YR 4/3) silt loam high in very fine sand; massive; very friable; few fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C2—55 to 70 inches; stratified brown (10YR 5/3) loam and light yellowish brown (10YR 6/4) fine sand; single grained; very friable and loose; few fine roots; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. Thickness of alluvial deposits ranges from 40 inches to many feet. The solum is usually neutral, but some pedons are slightly acid. In the 10- to 40-inch control section, the content of clay is between 18 and 30 percent.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or silty clay loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. A few pedons have mottles with chroma of 2 below a depth of 24 inches. The B horizon is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is silt loam, loam, fine sandy loam, sandy loam, sand, fine sand, or is stratified with these textures. Some pedons have free carbonates.

### Onarga series

The Onarga series consists of deep, well drained, moderately rapidly permeable soils on terraces along the Wabash River. They formed in loamy and sandy sediments. Slopes range from 0 to 2 percent.

Onarga soils are similar to Armiesburg and Landes soils and are commonly near Elkinsville and Wheeling

soils. Both Armiesburg and Landes soils are less acid, lack argillic horizons and are on bottom lands. In addition, Armiesburg soils have less sand than Onarga soils. Elkinsville and Wheeling soils do not have a mollic epipedon. They have more clay and are on slightly higher positions on terraces than Onarga soils.

Typical pedon of Onarga fine sandy loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field 1,025 feet east and 180 feet north of the southwest corner of sec. 34, T. 6 S., R. 14 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine roots; medium acid; clear smooth boundary.

A12—9 to 15 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many fine roots; medium acid; gradual smooth boundary.

B21—15 to 20 inches; very dark grayish brown (10YR 3/2) and brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky structure; friable; common fine roots; strongly acid; gradual smooth boundary.

B22t—20 to 30 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable; few fine roots; few thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; strongly acid; gradual smooth boundary.

B3—30 to 44 inches; brown (7.5YR 5/4) fine sandy loam; weak fine subangular blocky structure parting to weak fine granular; very friable; few fine roots; strongly acid; gradual smooth boundary.

C—44 to 60 inches; yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) loamy fine sand; single grained; very friable; few fine roots; medium acid.

The solum is 36 to 50 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, chroma of 1 or 2. It is sandy loam or loam. Some pedons have an A3 horizon that is browner than the A1 or A2 horizon when crushed. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 4. It is typically fine sandy loam or loam with subhorizons of sandy clay loam. The C horizon ranges from slightly acid to strongly acid. It is typically fine sandy loam, loamy fine sand, or sand.

### Patton series

The Patton series consists of deep, poorly drained, moderately permeable soils on terraces and lake plains. They formed in silty sediments. Slopes range from 0 to 2 percent.

Patton soils are similar to Evansville, Ragsdale, and Rensselaer soils and are adjacent to Evansville, Henshaw, and Uniontown soils. Evansville soils do not have a mollic epipedon. Ragsdale soils have a silt loam surface layer and an argillic horizon. Rensselaer soils are on river terraces and have higher sand content than Patton soils. In addition, Rensselaer soils have an argillic horizon. Henshaw and Uniontown soils do not have a mollic epipedon. They have an argillic horizon and are on higher positions on the landscape than Patton soils.

Typical pedon of Patton silty clay loam in a cultivated field 2,060 feet west and 110 feet north of the southeast corner of sec. 13, T. 7 S., R. 13 W.

- Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.
- A12—10 to 16 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.
- B1g—16 to 21 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; few thin very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; gradual smooth boundary.
- B2g—21 to 28 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; neutral; gradual smooth boundary.
- B3g—28 to 38 inches; grayish brown (10YR 5/2) silty clay loam; light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; neutral; gradual smooth boundary.
- Cg—38 to 60 inches; light brownish gray (10YR 6/2) silt loam; many fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; few very dark grayish brown (10YR 3/2) krotovinas; neutral.

The solum is 24 to 42 inches thick. It ranges from slightly acid to mildly alkaline. The A horizon is black (10YR 2/1) very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It commonly is silty clay loam, but in some places is silt loam. The B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It has common or many mottles with chroma of 3 or more. The C horizon has color similar to the B horizon and is silty clay loam or silt loam.

## Pekin series

The Pekin series consists of deep, moderately well drained, very slowly permeable soils that have a fragipan. They formed in acid alluvium on river terraces. Slopes range from 0 to 6 percent. These soils are outside the range defined for the Pekin soils in that the lower part of the solum and underlying material contain less sand. This difference does not greatly alter the use and management of the soils for most common purposes.

Pekin soils are similar to Hosmer soils and are commonly near Elkinsville, Ginat, Weinbach, and Wheeling soils. Hosmer soils formed in loess, do not have grayish mottles above 30 inches, and are on uplands. Elkinsville and Wheeling soils do not have a fragipan. Ginat and Weinbach soils have grayish colors throughout the subsoil and are on lower positions on the landscape.

Typical pedon of Pekin silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 1,980 feet west and 120 feet north of the southeast corner of sec. 16, T. 8 S., R. 14 W.

- Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak very fine granular structure; friable; many fine roots; mixing of some strong brown (7.5YR 5/6) material; neutral; abrupt smooth boundary.
- B1—8 to 14 inches; yellowish brown (10YR 5/6) silt loam; weak subangular blocky structure; friable; few fine roots; very strongly acid; gradual smooth boundary.
- B21t—14 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.
- B22t—19 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint light gray (10YR 7/2) and common fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; few fine roots; few thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; common thin discontinuous very pale brown (10YR 7/3) silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; very strongly acid; gradual smooth boundary.
- B23t—24 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; many fine distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate fine subangular blocky; firm; few fine roots; common thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; many thin continuous pale brown (10YR 6/3) silt coatings on faces of peds; common fine and medium brown (7.5YR 4/4) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

Bx1—30 to 46 inches; yellowish brown (10YR 5/6) silty clay loam; many fine distinct brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to weak coarse subangular blocky; very firm, brittle; few fine roots in vertical cracks; common thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; many thick continuous pale brown (10YR 6/3) silt coatings on faces of peds; common fine and medium brown (7.5YR 4/4) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

Bx2—46 to 58 inches; yellowish brown (10YR 5/6) silty clay loam; many fine distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; very firm, brittle; common thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; common fine and medium brown (7.5YR 4/4) iron and manganese oxide concretions; strongly acid.

C—58 to 80 inches; dark yellowish brown (10YR 4/4) silt loam; common fine distinct grayish brown (10YR 5/2) mottles; massive; firm; many fine black (10YR 2/1) iron and manganese oxide stains; slightly acid.

The solum is 40 to 60 inches thick. Depth to the fragipan ranges from 24 to 32 inches.

The Ap horizon is dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) or brown (10YR 5/3, 4/3)(7.5YR 4/2) and ranges from slightly acid to strongly acid. The B1 and B2 horizons have hue of 10YR, value of 5 or 6, and chroma of 3 to 6. Mottles with chroma of 2 or less are in the upper 10 inches of the argillic horizon. It is strongly acid or very strongly acid. Concretions are in the lower part of the B2 horizon. The Bx horizon has hue of 10YR, value of 5 or 6, and chroma of 2 and is silt loam or silty clay loam. It has common to many mottles with chroma of 2 or less. Structure is coarse or very coarse prismatic. Silt and clay coatings are on surfaces of peds and in voids. The Bx horizon is strongly acid or very strongly acid. Concretions are common to many in the fragipan. The C horizon is silt loam, loam, fine sandy loam, or fine sand, and is often stratified. It ranges from medium acid to neutral.

### Peoga series

The Peoga series consists of deep, poorly drained, slowly permeable soils on river terraces. They formed in silty acid alluvium. Slopes range from 0 to 2 percent.

Peoga soils are similar to and commonly near Ginat, Vincennes, and Weinbach soils. Ginat soils have a fragipan. Vincennes soils are more than 18 percent sand. Weinbach soils have a fragipan and have one horizon in the upper part of the subsoil that has dominant chroma of 3 or more.

Typical pedon of Peoga silt loam in a cultivated field 1,066 feet west and 50 feet south of the center of sec. 8, T. 7 S., R. 14 W.

Ap—0 to 9 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; few fine faint light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable; many fine roots; few fine strong brown (7.5YR 5/8) iron and manganese oxide stains; neutral; abrupt smooth boundary.

A2—9 to 18 inches; light gray (10YR 7/2) silt loam; common fine distinct strong brown (7.5YR 5/8) and brownish yellow (10YR 6/8) mottles; weak thin platy structure parting to weak very fine granular; friable; many fine roots; many fine black (10YR 2/1) iron and manganese oxide concretions, and strong brown (7.5YR 5/8) iron and manganese oxide stains; strongly acid; gradual irregular boundary.

B21tg—18 to 22 inches; light gray (10YR 7/2) silty clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous distinct light brownish gray (10YR 6/2) clay films on faces of peds and in root channels; few thin patchy white (10YR 8/1) dry silt coatings on faces of peds; many fine black (10YR 2/1) iron and manganese oxide concretions and strong brown (7.5YR 5/8) iron and manganese oxide stains; strongly acid; gradual smooth boundary.

B22tg—22 to 32 inches; light gray (10YR 7/2) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous distinct grayish brown (10YR 5/2) clay films on faces of peds and in root channels; many fine black (10YR 2/1) iron and manganese oxide concretions and strong brown (7.5YR 5/8) iron and manganese oxide stains; strongly acid; gradual smooth boundary.

B23tg—32 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium and coarse distinct strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin patchy faint grayish brown (10YR 5/2) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

Cg—50 to 65 inches; light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) silt loam; massive; friable; few fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid.

The solum is 48 to 72 inches thick.

The Ap horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. The A2 horizon, if present, has hue of 10YR, value of 5 to 7, and chroma of 1 or 2 and is distinctly mottled. It is medium acid or strongly acid

unless limed. The B2 horizon has hue of 10YR, 2.5Y or 5Y, value of 5 to 7, and chroma of 1 or 2 and is distinctly mottled. It is very strongly acid or strongly acid. In many places the C horizon is stratified. Textures include silty clay loam and silt loam.

### **Petrolia series**

The Petrolia series consists of deep, poorly drained, moderately slowly permeable soils on bottom lands. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Petrolia soils are similar to Birds, Evansville, and Vincennes soils and are adjacent to Newark and Nolin soils. Birds soils have a lower clay content than Petrolia soils and are along smaller streams. Evansville soils formed in lakebed sediments and have a silt loam surface layer. Vincennes soils have a higher sand content and are more acid than Petrolia soils. They are on river terraces. Newark soils have at least one horizon in the subsoil that has dominantly brownish colors. Nolin soils do not have grayish colors in the upper part of the subsoil. Newark and Nolin soils are on higher positions on the bottom lands than Petrolia soils.

Typical pedon of Petrolia silty clay loam in a cultivated field 1,648 feet east and 30 feet south of the northwest corner of sec. 17, T. 6 S., R. 14 W.

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; firm; many fine roots; neutral; clear smooth boundary.

C1g—12 to 22 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; firm; few fine roots; neutral; gradual smooth boundary.

C2g—22 to 54 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) and few fine prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak medium and fine subangular blocky; firm; few fine roots; thin (1 inch) layer of loam at a depth of 30 inches; neutral; gradual smooth boundary.

C3g—54 to 70 inches; gray (5Y 5/1) silty clay loam; many medium distinct olive brown (2.5Y 4/4) and few fine prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; neutral.

The control section is typically slightly acid or neutral, but is medium acid within the range of the series.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4, 5, or 6; and chroma of 1 or 2. Thin strata of silt loam or sandy loam are included.

### **Plainfield Variant**

The Plainfield Variant consists of deep, excessively drained, rapidly permeable soils in flat areas and on dunes on river terraces. They formed in sandy alluvium. Slopes range from 0 to 6 percent.

Plainfield Variant soils are similar to Bloomfield and Stonelick soils and are near Elkinsville and Wheeling soils. Bloomfield soils are on uplands and have an argillic horizon in thin bands. Stonelick soils are on bottom lands and are calcareous. Elkinsville and Wheeling soils have less sand and more clay in their control sections and are more acid than Plainfield Variant soils.

Typical pedon of Plainfield Variant loamy fine sand, 0 to 6 percent slopes, in a cultivated field 1,148 feet south and 450 feet east of the center of sec. 28, T. 6 S., R. 14 W.

Ap—0 to 12 inches; brown (10YR 4/3) and very dark grayish brown (10YR 3/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

B2—12 to 22 inches; dark yellowish brown (10YR 4/4) sand; weak very fine granular structure parting to single grained; very friable; many fine roots; neutral; gradual smooth boundary.

B3—22 to 30 inches; yellowish brown (10YR 5/6) sand; weak very fine granular structure parting to single grained; very friable; few fine roots; neutral; gradual smooth boundary.

C—30 to 65 inches; brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) fine sand and sand; single grained; loose; few fine roots; neutral.

The solum is 18 to 34 inches thick.

The Ap horizon is very dark grayish brown (10YR 3/2), brown (10YR 4/3), or dark grayish brown (10YR 4/2). If the moist color is very dark grayish brown (10YR 3/2), the dry color is light grayish brown (10YR 6/2). The Ap horizon is sand, loamy sand, or loamy fine sand. The B horizon has hue of 10YR or 7.5YR, value of 4 or more, and chroma of 3 to 6. It is neutral or slightly acid. The B horizon is dominantly medium sand and contains varying amounts of fine and coarse sand. The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 6. It is slightly acid or neutral.

### **Princeton series**

The Princeton series consists of deep, well drained, moderately permeable soils on uplands. They formed in loamy and sandy wind deposits. Slopes range from 2 to 12 percent.

Princeton soils are similar to and commonly near Alford, Bloomfield, and Sylvan soils. Alford and Sylvan

soils are less than 15 percent sand. Bloomfield soils are less than 18 percent clay.

Typical pedon of Princeton loam, 6 to 12 percent slopes, eroded, 1,570 feet west and 640 feet north of the southeast corner of sec. 1, T. 4 S., R. 13 W.

- Ap—0 to 7 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak very fine granular structure; friable; many fine roots; mixing of some yellowish brown (10YR 5/4) material from below; neutral; abrupt smooth boundary.
- B1t—7 to 12 inches; brown (7.5YR 5/4) loam; weak fine subangular blocky structure; firm; common fine roots; thin patchy distinct brown (7.5YR 4/4) clay films on faces of peds and in root channels; slightly acid; gradual smooth boundary.
- B21t—12 to 26 inches; brown (7.5YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous distinct brown (7.5YR 4/4) clay films on faces of peds and in root channels; slightly acid; gradual smooth boundary.
- B22t—26 to 40 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; common fine roots; thin discontinuous distinct brown (7.5YR 4/4) clay films on faces of peds and in root channels; medium acid; gradual smooth boundary.
- B23t—40 to 50 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure parting to weak very fine granular; very friable; thin discontinuous distinct brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual smooth boundary.
- B3—50 to 60 inches; very pale brown (10YR 7/3) fine sand with lamellae and bands of brown (7.5YR 4/4) loamy fine sand; single grained; loose; few patchy faint brown (7.5YR 4/4) clay bridges between sand grains; discontinuous bands 1/16 to 3/4 inch thick; medium acid.
- C—60 to 80 inches; brown (7.5YR 4/4) and yellowish brown (10YR 5/6) stratified loamy fine sand and fine sand; single grained; loose; slightly acid.

The solum is 40 to 60 inches thick.

The Ap or A1 horizon is dark grayish brown (10YR 4/2), brown (10YR 4/3, 5/3), or dark yellowish brown (10YR 4/4). It is fine sandy loam, sandy loam, or loam. The A2 or B1 horizon, or both, are present in some pedons. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 4 to 6. It is typically clay loam, but subhorizons in some pedons are sandy loam, sandy clay loam, or loam. It is commonly medium acid or strongly acid, but thin horizons in some pedons are slightly acid or very strongly acid. Between depths of 40 and 60 inches the B and C horizons are commonly banded loamy fine sand and fine sand. Below a depth of 60 inches the C horizon is commonly stratified loamy fine

sand, fine sand, and fine sandy loam. It is slightly acid to moderately alkaline.

## Ragsdale series

The Ragsdale series consists of deep, very poorly drained, slowly permeable soils on terraces. They formed in loess. Slopes range from 0 to 2 percent.

Ragsdale soils are similar to Patton and Rennselaer soils and commonly near Henshaw, Patton, and Reesville soils. Patton soils have a silty clay loam surface layer and they do not have an argillic horizon. Rennselaer soils are on river terraces and have a higher sand content than Ragsdale soils. Henshaw and Reesville soils do not have a mollic epipedon. They have one or more horizons in the subsoil that are dominantly brownish in color. They are on slightly higher positions on the landscape than Ragsdale soils.

Typical pedon of Ragsdale silt loam in a cultivated field 1,290 feet south and 40 feet east of the northwest corner of sec. 29, T. 4 S., R. 12 W.

- Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak very fine granular structure; friable; many fine roots; neutral; clear smooth boundary.
- A12—8 to 19 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; neutral; clear smooth boundary.
- B21tg—19 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; common thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds and in root channels; few large very dark gray (10YR 3/1) krotovinas; neutral; gradual smooth boundary.
- B22tg—31 to 43 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm; few fine roots; many thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds and in root channels; common large very dark gray (10YR 3/1) krotovinas; neutral; gradual smooth boundary.
- Cg—43 to 65 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) silt loam; massive; friable; neutral.

The solum is 30 to 52 inches thick.

The Ap horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is silt loam or silty clay loam, is 10 to 20 inches thick, and is slightly acid or neutral. The B2t horizon has hue of 10YR or 2.5Y, value

of 4 to 6, and chroma of 1 or 2. It has few to many mottles. It is slightly acid or neutral. The C horizon is mottled with colors of both high and low chroma. It is silty clay loam or silt loam and is neutral to moderately alkaline. In some pedons it contains free carbonates.

### Rahm series

The Rahm series consists of deep, somewhat poorly drained, slowly permeable soils on bottom lands. They formed in recent alluvium over older acid alluvium. Slopes range from 0 to 2 percent.

Rahm soils are similar to Wakeland and Woodmere soils and commonly near Nolin, Newark, Petrolia, and Woodmere soils. Wakeland, Nolin, Newark, and Petrolia soils are neutral throughout. In addition, Wakeland soils have less clay than Rahm soils, and Nolin soils do not have grayish colors in the upper part of the subsoil. Petrolia soils have dominantly grayish colors in all horizons below the surface layer. Woodmere soils do not have grayish colors in the upper material and are on slightly higher positions than Rahm soils.

Typical pedon of Rahm silt loam, in a cultivated field 60 feet south and 85 feet east of the northwest corner of sec. 29, T. 7 S., R. 12 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Cg—8 to 26 inches; grayish brown (10YR 5/2) silt loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; common fine roots; neutral; abrupt wavy boundary.

IIB21tb—26 to 42 inches; light brownish gray (10YR 6/2) silty clay; many coarse prominent brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; continuous distinct thin light brownish gray (10YR 6/2) clay films on faces of peds and in root channels; few fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

IIB22tb—42 to 72 inches; light brownish gray (10YR 6/2) and brown (7.5YR 4/4) silty clay; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; continuous distinct thin light brownish gray (10YR 6/2) clay films on faces of peds; many fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid.

IIC—72 to 80 inches; brown (7.5YR 4/4) silty clay; common fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; few fine black (10YR 2/1) iron and manganese oxide stains; strongly acid.

The upper alluvial material is neutral or slightly acid and the buried material ranges from medium acid to very strongly acid. The upper alluvial material is 20 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 4 and 5, and chroma of 2 to 4. It is silt loam or silty clay loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 5, and chroma of 1 to 4. It has common or many distinct mottles. The IIB horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is mottled. It is silty clay loam or silty clay. The IIC horizon has colors and textures similar to the IIB horizon. It is medium acid or strongly acid.

### Reesville series

The Reesville series consists of deep, somewhat poorly drained, moderately slowly permeable soils on broad flat areas on uplands and on terraces. They formed in loess. Slopes range from 0 to 2 percent. These soils are outside the range of the Reesville series in that they formed in loess more than 60 inches thick. This difference does not affect use and management for most common purposes.

Reesville soils are similar to Iona, Henshaw, and Uniontown soils and are commonly near Alford, Iona, Ragsdale, and Uniontown soils. Alford soils lack grayish colors in the upper 30 inches and are on higher positions on uplands than Reesville soils. Iona and Uniontown soils do not have grayish colors in the upper 10 inches of the argillic horizon. Henshaw soils do not have dominant chroma of 2 or less in the upper 30 inches. Ragsdale soils have a mollic epipedon, have dominantly grayish colors in the subsoil, and are in lower areas on the landscape than Reesville soils.

Typical pedon of Reesville silt loam, 0 to 2 percent slopes in a cultivated field 820 feet west and 50 feet north of the southwest corner of sec. 29, T. 4 S., R. 12 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak very fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—8 to 13 inches; light brownish gray (10YR 6/2) silt loam; common fine faint yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; many fine roots; many thick continuous white (10YR 8/2) dry silt coatings on faces of peds; slightly acid; gradual smooth boundary.

B21t—13 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (2.5Y 6/2) and many medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; many thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds and in root channels; few thin

discontinuous white (10YR 8/2) dry silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; slightly acid; gradual smooth boundary.

- B22t—20 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light grayish brown (10YR 6/2) and many medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds and in root channels; few fine black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual smooth boundary.
- B3—31 to 36 inches; yellowish brown (10YR 5/6, 5/8) silty clay loam; common fine distinct light brownish gray (2.5Y 6/2) and few fine distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine roots; few fine black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual smooth boundary.
- C—36 to 63 inches; light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) silt loam; massive; firm; few fine roots; few fine black (10YR 2/1) iron and manganese oxide concretions; slight effervescence; moderately alkaline.

The solum is 30 to 60 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). Pedons that have never been plowed have a thin A1 horizon, 2 to 5 inches thick, that is very dark gray (10YR 3/1). The A2 horizon is 4 to 10 inches thick in such pedons, and 0 to 6 inches thick in pedons with an Ap horizon. The A2 horizon is mottled with dominant chroma of 2, 3, or 4. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Mottles that have chroma of 2 are in all subhorizons. Faces of peds in the B horizon have dominant chroma of 2 or less. The C horizon has colors similar to the B horizon.

### Rensselaer series

The Rensselaer series consists of deep, very poorly drained, slowly permeable soils on river terraces. They formed in loamy alluvium. Slopes range from 0 to 2 percent.

Rensselaer soils are similar to Lyles, Patton, and Ragsdale soils and near Elkinsville, Lyles, and Wheeling soils. Lyles and Patton soils do not have argillic horizons. In addition, Patton and Ragsdale soils are less than 15 percent sand. Elkinsville and Wheeling soils do not have grayish colors in their subsoils and are more acid than Rensselaer soils. They are also on higher positions on the landscape.

Typical pedon of Rensselaer clay loam, clay loam substratum, in a cultivated field 480 feet west and 1,525 feet

north of the southeast corner of sec. 30, T. 4 S., R. 13 W.

- Ap—0 to 6 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak very fine granular; firm; few fine roots; neutral; abrupt smooth boundary.
- A12—6 to 19 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; firm; few fine roots; neutral; gradual smooth boundary.
- B21tg—19 to 26 inches; dark gray (10YR 4/1) clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual smooth boundary.
- B22tg—26 to 36 inches; gray (10YR 5/1) clay loam; many fine distinct light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; firm; few fine roots; common thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual smooth boundary.
- B23tg—36 to 49 inches; gray (10YR 5/1) clay loam; many medium distinct light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; firm; many thin continuous gray (10YR 5/1) clay films on faces of peds; neutral; gradual smooth boundary.
- Cg—49 to 60 inches; light gray (10YR 6/1) and strong brown (7.5YR 5/8) clay loam; massive; firm; neutral.

The solum is 28 to 60 inches thick. It contains 0 to 5 percent coarse fragments.

The A horizon is 10 to 20 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam, silt loam, loam, or clay loam. It is slightly acid or neutral. The B2 horizon has dominant hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It has few to many mottles. It is commonly silty clay loam or clay loam, but individual horizons are loam, sandy clay loam, or sandy loam. It is neutral or mildly alkaline. The C horizon is stratified below a depth of 60 inches in many pedons. Textures include clay loam, silt loam, fine sand, and loam. Reaction is neutral or mildly alkaline.

### Stonelick series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils on bottom lands. They formed in loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Bloomfield soils and are commonly near Genesee and Nolin soils. Bloomfield soils are on uplands and have more than 15 inches of loamy fine sand or coarser material in the control sec-

tion. Genesee and Nolin soils are more than 18 percent clay. In addition, Nolin soils are less than 15 percent sand.

Typical pedon of Stonelick fine sandy loam in a cultivated field 1,660 feet north and 440 feet west of the southeast corner of sec. 36, T. 5 S., R. 15 W.

Ap—0 to 10 inches; brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; common worm casts; strong effervescence; moderately alkaline; abrupt smooth boundary.

C1—10 to 18 inches; brown (10YR 5/3) loam; weak fine granular structure; friable; few fine roots; common worm casts; slight effervescence; mildly alkaline; clear wavy boundary.

C2—18 to 35 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous faint brown (10YR 4/3) coatings on faces of peds; common worm casts; slight effervescence; moderately alkaline; clear wavy boundary.

C3—35 to 43 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; loose; strong effervescence; moderately alkaline; abrupt wavy boundary.

C4—43 to 70 inches; very pale brown (10YR 7/3) sand; single grained; loose; strong effervescence; moderately alkaline.

The Ap horizon ranges from dark grayish brown (10YR 4/2) and dark brown (10YR 3/3) to yellowish brown (10YR 5/4). In areas that have not been cultivated, thin A1 horizons are very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). Ap and A1 horizons are sandy loam, fine sandy loam, silt loam, loam, or loamy fine sand. The C horizon has hue of 10YR or 7.5YR; value of 4 to 6, and chroma of 2 to 4. Some ped coatings have a value of 3. The C horizon is stratified. Textures include loam, sandy loam, silt loam, fine sandy loam, sand, or loamy sand. However, loamy sand has a total thickness of 15 inches or less in the control section.

### Sylvan series

The Sylvan series consists of deep, well drained, moderately permeable soils on uplands. They formed in loess. Slopes range from 2 to 40 percent.

Sylvan soils are similar to Uniontown soils and are also similar to and commonly near Alford, Hosmer, Iona, and Wellston soils. Uniontown soils have a yellower subsoil that includes more clay than Sylvan soils. They are on lakebed terraces and often have strata of silt and silty clay loam in the underlying material. Alford, Hosmer, and Wellston soils do not have free carbonates above 60 inches. In addition, Hosmer soils have a fragipan, and Wellston soils have residuum of sandstone and shale

above 60 inches. Iona soils have grayish mottles below the upper 10 inches of the argillic horizon.

Typical pedon of Sylvan silt loam, 18 to 40 percent slopes; in woodland 2,310 feet north and 1,568 feet east of the southwest corner of sec. 26, T. 5 S., R. 14 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak very fine subangular blocky structure parting to moderate fine granular; friable; common fine and medium roots; many brown (10YR 5/3) worm casts; neutral; abrupt smooth boundary.

A2—4 to 9 inches; brown (10YR 5/3) silt loam; weak very fine subangular blocky structure parting to weak fine granular; friable; few fine roots; some darker mixing from above; neutral; clear smooth boundary.

B21t—9 to 15 inches; brown (7.5YR 5/4) silt loam; weak fine and medium subangular blocky structure; friable; few fine roots; common thin discontinuous yellowish brown (10YR 5/6) clay films on faces of peds and root channels; slightly acid; gradual smooth boundary.

B22—15 to 25 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds and in root channels; slightly acid; clear smooth boundary.

C—25 to 60 inches; light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) silt; massive; friable; few fine roots; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In areas that have been cultivated, the Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3, 5/3). A B1 horizon is in some profiles. It is silt loam or silty clay loam. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 5. It is silty clay loam or silt loam and ranges from medium acid to neutral in reaction. The B3 horizon, when present, ranges from neutral to moderately alkaline. The C horizon is silt loam or silt, contains free carbonates, and is moderately alkaline.

### Uniontown series

The Uniontown series consists of deep, well drained and moderately well drained, moderately permeable soils on terraces. They formed in calcareous alluvium from loess. Slopes range from 0 to 12 percent. These soils are outside the range defined for the Uniontown series in that the soil does not have the stratification and the increase in sand content with increasing depth. This difference does not greatly alter the use and management of the soils for most common purposes.

The Uniontown soils are similar to Alford, Henshaw, Iona, and Sylvan soils. Alford soils are more acid than Uniontown soils and have profiles more than 40 inches thick. Iona soils have mottles with chroma of 2 or less below the top 10 inches of the argillic horizon and do not have stratification in the underlying material. Sylvan soils have less clay in the subsoil, have a browner subsoil than Uniontown soils, and do not have stratification in the underlying material. Alford, Iona, and Sylvan soils are on uplands. Henshaw soils have low-chroma mottles in the upper part of the argillic horizon and are on lower, more nearly flat areas than Uniontown soils.

Typical pedon of Uniontown silt loam, 2 to 6 percent slopes, eroded, in a cultivated field 2,600 feet east and 40 feet south of the northwest corner of sec. 24, T. 5 S., R. 13 W.

- Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very fine granular structure; friable; many fine roots; mixed with some yellowish brown (10YR 5/6) material; medium acid; abrupt smooth boundary.
- B1—8 to 14 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; common thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; slightly acid; gradual smooth boundary.
- B21t—14 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium and fine subangular blocky structure; firm; common fine roots; common thick continuous yellowish brown (10YR 5/4) clay films on faces of peds; few thin discontinuous white (10YR 8/2) dry silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions slightly acid; gradual smooth boundary.
- B22t—22 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many thick continuous yellowish brown (10YR 5/4) clay films on faces of peds and in root channels; common fine black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual smooth boundary.
- B3—30 to 37 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct strong brown (7.5YR 5/8) and few fine distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; gradual smooth boundary.
- C—37 to 65 inches; mottled yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) silt loam; massive; friable; few fine roots; common fine black (10YR 2/1) iron and manganese oxide concretions; few calcium carbonate concretions below 60 inches; slight effervescence; moderately alkaline.

The solum is 30 to 40 inches thick.

The Ap horizon ranges from brown (10YR 4/3, 5/3) to dark grayish brown (10YR 4/2). The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. It is typically silt loam or silty clay loam. The B horizon is medium acid or slightly acid in the upper part and slightly acid to mildly alkaline in the lower part. The lower part has few to common, distinct mottles. The C horizon is mottled with hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 8. It is silt loam or silty clay loam and is often stratified with silt loam, silt, and silty clay loam. It is neutral to moderately alkaline. Free carbonates are in most pedons, and carbonate concretions are few to common.

### Vincennes series

The Vincennes series consists of deep, poorly drained, slowly permeable soils on river terraces. They formed in loamy alluvium. Slopes range from 0 to 2 percent.

Vincennes soils are similar to Evansville and Petrolia soils and are commonly near Elkinsville, Ginat, Weinbach, and Wheeling soils. Evansville soils are on lakebed plains, and Petrolia soils are on bottom lands. Both of these soils are less acid than Vincennes soils and are less than 15 percent sand in the control section. Elkinsville and Wheeling soils are on slightly higher positions and lack grayish colors in the subsoil. Ginat and Weinbach soils have a fragipan and are less than 15 percent sand in the control section.

Typical pedon of Vincennes loam in a cultivated field 420 feet east and 180 feet south of the northwest corner of sec. 22, T. 7 S., R. 14 W.

- Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.
- B1g—10 to 19 inches; light brownish gray (10YR 6/2) loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine roots; very strongly acid; gradual smooth boundary.
- B21g—19 to 30 inches; light brownish gray (10YR 6/2) clay loam; many fine distinct yellowish brown (10YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm; few fine roots; strongly acid; gradual smooth boundary.
- B22g—30 to 43 inches; light brownish gray (10YR 6/2) clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and fine subangular blocky; firm; few fine roots; strongly acid; gradual smooth boundary.
- Cg—43 to 60 inches; light brownish gray (10YR 6/2) stratified sandy loam, loam, and clay loam; many fine distinct yellowish brown (10YR 5/6) and few

fine prominent yellowish red (5YR 4/8) mottles; massive; friable; strongly acid.

The solum is 42 to 60 inches thick.

The Ap horizon is dark gray (10YR 4/1), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2). It is loam, silt loam, clay loam, or silty clay loam and is medium acid or strongly acid unless limed. The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 through 6, and chroma of 1 or 2. It has common or many distinct mottles. It is dominantly clay loam, but individual horizons may be loam, sandy clay loam, or silty clay loam. The C horizon has colors similar to the B2g horizon. It is stratified loam, clay loam, sandy loam, and silt loam, but some areas are underlain with sand, silty clay, or clay.

### Wakeland series

The Wakeland series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. They formed in silty alluvium from loess-covered uplands. Slopes range from 0 to 2 percent.

Wakeland soils are similar to Newark and Rahm soils and are adjacent to Birds and Haymond soils. Newark and Rahm soils have a higher clay content than Wakeland soils. In addition, Rahm soils have finer textured, strongly acid layers in the lower part of the subsoil. Birds soils have higher clay content than Wakeland soils and are in slightly lower depressional areas. They have dominantly grayish colors in all horizons below the surface layer. Haymond soils do not have grayish colors in all horizons above 30 inches and they are on slightly higher areas than Wakeland soils.

Typical pedon of Wakeland silt loam in a cultivated field 690 feet east and 1,200 feet north of the southwest corner of sec. 21, T. 6 S., R. 12 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1g—8 to 19 inches; grayish brown (10YR 5/2) silt loam; common fine faint brown (10YR 5/3) mottles; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

C2g—19 to 36 inches; grayish brown (10YR 5/2) silt loam; common fine faint light brownish gray (10YR 6/4) mottles; weak medium granular structure; friable; few fine roots; yellowish brown (10YR 5/4) iron and manganese oxide stains; slightly acid; clear wavy boundary.

C3—36 to 60 inches; gray (10YR 6/1) silt loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; massive; firm; few fine roots; neutral.

The soil ranges from neutral to medium acid. The control section between depths of 10 to 40 inches averages between 12 and 18 percent clay and less than 15 percent fine and coarser sand.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. Mottles are few or common.

### Weinbach series

The Weinbach series consists of deep, somewhat poorly drained, very slowly permeable soils that have a fragipan. They formed in acid alluvium on river terraces. Slopes range from 0 to 2 percent.

Weinbach soils are similar to Ginat and Pekin soils and are commonly near Elkinsville, Ginat, Pekin, and Wheeling soils. Elkinsville and Wheeling soils do not have a fragipan and do not have grayish colors in the subsoil. Ginat soils have dominantly grayish colors in all horizons below the surface layer and are on lower positions on the landscape than Weinbach soils. Pekin soils have brownish colors in the upper 10 inches of the argillic horizon and are on higher positions on the landscape.

Typical pedon of Weinbach silt loam, 0 to 2 percent slopes, in an idle area 328 feet west and 75 feet north of the southeast corner of sec. 6, T. 8 S., R. 14 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.

A2—8 to 12 inches; pale brown (10YR 6/3) silt loam; few fine faint light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; many fine and medium roots; few fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual smooth boundary.

B1—12 to 20 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; many fine and medium roots; few fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear wavy boundary.

Bx1—20 to 35 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure; very firm; brittle; few coarse roots; many thick continuous light gray (10YR 6/1) clay films on faces of peds; many thick continuous light brownish gray (10YR 6/2) silt coatings on faces of peds and in vertical cracks; few fine black (10YR 2/1) iron and manganese oxide concretions; few fine mica flakes; strongly acid; gradual wavy boundary.

**Bx2**—35 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; strong very coarse prismatic structure; very firm; brittle; many thick continuous yellowish brown (10YR 5/4) clay films on faces of peds; few thin discontinuous light gray (10YR 6/1) silt coatings on faces of peds and in vertical cracks; few fine black (10YR 2/1) iron and manganese oxide concretions; few fine mica flakes; strongly acid; gradual smooth boundary.

**C**—45 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine faint light gray (10YR 6/1) and few fine distinct strong brown (7.5YR 5/8) mottles; massive; very firm; few thin patchy light gray (10YR 6/1) silt coatings in voids; few fine mica flakes; medium acid.

The solum is 42 to 60 inches thick. Depth to the fragipan ranges from 20 to 30 inches. The solum is strongly acid or very strongly acid below the Ap horizon.

The Ap horizon is brown (10YR 5/3), grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2). The A2 horizon commonly has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The B horizon above the fragipan has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It has common or many mottles. It is silt loam or silty clay loam. The Bx horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It has common to many mottles. It is silt loam or silty clay loam. The C horizon is silty clay loam, silt loam, and fine sand or stratified layers of these textures.

### Wellston series

The Wellston series consists of deep, well drained, moderately permeable soils on uplands. They formed in loess over residuum of sandstone or shale. Slopes range from 12 to 35 percent.

Wellston soils are similar to and commonly near Alford, Hosmer, and Sylvan soils. All associated soils are deeper than 60 inches to residual material. In addition, Hosmer soils have a fragipan, and Sylvan soils are calcareous above 40 inches.

Typical pedon of Wellston silt loam, 25 to 35 percent slopes, in hardwood timber, 1,420 feet west and 1,000 feet south of the center of sec. 12, T. 5 S., R. 12 W.

**A1**—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; light brownish gray; (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; strongly acid; clear smooth boundary.

**A2**—4 to 12 inches; pale brown (10YR 6/3) silt loam; weak thin platy structure; friable; many fine and medium roots; few medium distinct strong brown (7.5YR 5/6) iron and manganese oxide stains on faces of peds; very strongly acid; gradual smooth boundary.

**B1t**—12 to 18 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine and medium roots; many thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common thin discontinuous very pale brown (10YR 7/3) dry silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

**B21t**—18 to 28 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular and angular blocky structure; firm; common fine and medium roots; many thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common thin discontinuous very pale brown (10YR 7/3) dry silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

**B22t**—28 to 34 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; few fine and medium roots; many thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common thin discontinuous very pale brown (10YR 7/3) dry silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; very strongly acid; gradual smooth boundary.

**IIB23t**—34 to 43 inches; brown (10YR 4/4) silt loam; moderate fine subangular and angular blocky structure; friable; few fine roots; few thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; few thin discontinuous very pale brown (10YR 7/3) dry silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; high in sand content; very strongly acid; clear smooth boundary.

**IIB3**—43 to 48 inches; pale brown (10YR 6/3) and strong brown (7.5YR 5/6) loam; weak fine subangular blocky structure; friable; few fine roots; few very coarse sandstone fragments; very strongly acid; gradual smooth boundary.

**IIC**—48 to 60 inches; pale brown (10YR 6/3) and strong brown (7.5YR 5/6) gravelly sandy loam; weak thin platy structure; firm; very strongly acid.

The solum is 32 to 50 inches thick. Depth to bedrock ranges from 40 to 72 inches.

The A1 horizon is dark grayish brown (10YR 4/2), brown (10YR 5/3), or dark brown (10YR 4/3). The A2 horizon is pale brown (10YR 6/3), brown (10YR 5/3), or yellowish brown (10YR 5/4). The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam and is 18 to 36 inches thick. The IIC horizon is a gravelly or channery, or very gravelly or very channery analog of silt loam, loam, clay loam, sandy clay loam, or sandy loam.

### Wheeling series

The Wheeling series consists of deep, well drained, moderately permeable soils on river terraces. They

formed in loamy alluvium. Slopes range from 0 to 12 percent.

Wheeling soils are similar to Elkinsville and Pekin soils and are commonly near Elkinsville, Ginat, Pekin, and Weinbach soils. Elkinsville soils have less than 15 percent sand in the control section. Ginat, Pekin, and Weinbach soils have a fragipan, and are less than 15 percent sand coarser than very fine sand.

Typical pedon of Wheeling loam, 0 to 2 percent slopes in a cultivated field 1,270 feet east and 760 feet north of the center of sec. 29, T. 7 S., R. 14 W.

Ap—0 to 10 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to weak very fine granular; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—10 to 18 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common fine roots; common thin continuous brown (7.5YR 4/4) clay films on faces of peds; few thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; medium acid; gradual smooth boundary.

B22t—18 to 33 inches; strong brown (7.5YR 5/6) clay loam; moderate medium and fine subangular blocky structure; firm; few fine roots; common thin continuous reddish brown (5YR 4/4) clay films on faces of peds; few thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; few fine mica flakes; strongly acid; gradual smooth boundary.

B23t—33 to 50 inches; strong brown (7.5YR 5/6) sandy clay loam; weak fine and medium subangular blocky structure; friable; few fine roots; few thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; common thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; few fine mica flakes; strongly acid; clear smooth boundary.

B3—50 to 56 inches; yellowish brown (10YR 5/6) sandy clay loam; few distinct faint pale brown (10YR 6/3) and common fine distinct brown (7.5YR 4/4) mottles; weak fine and medium subangular blocky structure; friable; few fine black (10YR 2/1) iron and manganese oxide concretions; few fine mica flakes; strongly acid; clear smooth boundary.

C—56 to 65 inches; brown (7.5YR 5/4) sandy loam; massive; very friable; few fine mica flakes; strongly acid.

The solum is 40 to 60 inches thick. It ranges from strongly acid to medium acid throughout except that the surface layer is less acid where limed.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (7.5YR 4/3, 5/3) or (10YR 4/3, 5/3). It is loam, fine sandy loam, or silt loam. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, sandy clay loam, clay loam, or silty clay loam. The B3 horizon has colors similar to the B2t horizon. It ranges from fine sandy loam to sandy clay loam. The C horizon ranges from fine sand to sandy loam or is stratified with these textures.

### Wheeling Variant

The Wheeling Variant consists of deep, moderately well drained, moderately slowly permeable soils on river terraces. They formed in loamy alluvium. Slopes range from 0 to 2 percent.

Wheeling Variant soils are adjacent to Elkinsville, Vincennes, and Wheeling soils and are similar to Wheeling soils. Elkinsville and Wheeling soils have dominantly brownish colors throughout their profiles, and Elkinsville soils are less than 15 percent sand. Vincennes soils have dominantly grayish colors in all horizons below the surface layer. They are in depressions and low areas, and Elkinsville and Wheeling soils are in slightly higher areas.

Typical pedon of Wheeling Variant silt loam in a cultivated field 120 feet west and 20 feet north of the center of sec. 13, T. 4 S., R. 14 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very fine granular structure; friable; few fine roots; medium acid; clear smooth boundary.

A12—8 to 11 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; few black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear smooth boundary.

B1—11 to 17 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; few fine roots; medium acid; gradual smooth boundary.

B21t—17 to 25 inches; yellowish brown (10YR 5/6) clay loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; patchy thin distinct yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

B22tg—25 to 34 inches; yellowish brown (10YR 5/6) clay loam, many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; patchy thin distinct yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

B3g—34 to 40 inches; light grayish brown (10YR 6/2) clay loam; many medium distinct yellowish brown

(10YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; few dark yellowish brown (10YR 4/4) iron and manganese oxide concretions and stains; few pebbles (2 to 5 mm); strongly acid; gradual smooth boundary.

Cg—40 to 60 inches; light grayish brown (10YR 6/2) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; few dark yellowish brown (10YR 4/4) iron and manganese oxide concretions and stains; strongly acid.

Solum thickness ranges from 40 to 60 inches. It is generally strongly acid throughout, except the surface layer is less acid in areas that have been limed.

The Ap horizon ranges from 8 to 12 inches in thickness. It has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam and, less commonly, sandy loam. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 8. It has common or many mottles with chroma of 2 or less. It is typically clay loam or loam. The B3 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or less. It has many mottles. It ranges in texture from clay loam to sandy loam. The C horizon is commonly stratified with textures ranging from clay loam to sand, but stratification is often not evident above 60 inches.

### Woodmere series

The Woodmere series consists of deep, well drained and moderately well drained, moderately slowly permeable soils on high bottom lands. They formed in silty neutral alluvium over finer textured acid alluvium. Slopes range from 0 to 2 percent.

Woodmere soils are similar and adjacent to Newark, Nolin, and Rahm soils. Newark and Nolin soils do not have a buried solum within a depth of 40 inches, are neutral throughout, and have less clay in the 10 to 40 inch control section. They are on lower positions than Woodmere soils. Rahm soils have grayish colors that are higher in the profile, and they are on lower positions.

Typical pedon of Woodmere silt loam in a cultivated field 1,150 feet south and 290 feet west of the northeast corner of sec. 30, T. 7 S., R. 12 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

B2—7 to 23 inches; brown (10YR 4/3) silt loam; weak fine prismatic structure parting to weak medium subangular blocky; friable; few fine roots; discontinuous thin faint dark grayish brown (10YR 4/2) coatings on faces of peds; few brown (10YR 4/3) worm casts; neutral; clear wavy boundary.

IIB1b—23 to 34 inches; brown (7.5YR 4/4) silty clay; weak medium prismatic structure parting to moder-

ate medium angular and subangular blocky; firm; few fine roots; discontinuous distinct brown (10YR 5/3) clay films on faces of peds and in root channels; discontinuous distinct thin dark grayish brown (10YR 4/2) coatings on faces of peds; medium acid; gradual smooth boundary.

IIB2b—34 to 76 inches; brown (7.5YR 4/4) silty clay; weak medium prismatic structure parting to moderate medium angular and subangular blocky; firm; continuous prominent medium brown (10YR 5/3) clay films on faces of peds and in voids; strongly acid; gradual smooth boundary.

IIC—76 to 90 inches; brown (7.5YR 4/4) silty clay; massive; firm; strongly acid.

The solum is 50 to 80 inches thick. The upper alluvial material is neutral or slightly acid, and the buried material is medium acid to very strongly acid. Thickness of the overlying material ranges from 20 to 36 inches.

The Ap horizon ranges from dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) and is 7 to 11 inches thick. It is silt loam or silty clay loam. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. The IIB horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is silty clay loam or silty clay. Some pedons have distinct mottles below a depth of 30 inches. The IIC horizon has colors and textures similar to the IIB horizon.

### Zipp series

The Zipp series consists of deep, very poorly drained, very slowly permeable soils in depressions and slack-water areas on river terraces. They formed in fine textured sediments. Slopes range from 0 to 2 percent.

Zipp soils are similar to Evansville, Patton, Petrolia, and Zipp Variant soils and commonly near Ginat, Vincennes, and Zipp Variant soils. Evansville, Patton, Petrolia, Ginat, and Vincennes soils are less than 35 percent clay in the control section. In addition, Patton soils have a mollic epipedon, Ginat soils have a fragipan, and Vincennes soils are more than 15 percent sand. Zipp Variant soils have a coarser textured surface layer and are more acid than Zipp soils.

Typical pedon of Zipp silty clay loam in a cultivated field 1,690 feet south and 50 feet east of the northwest corner of sec. 34, T. 3 S., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate medium angular and subangular blocky structure; firm; few fine roots; slightly acid; abrupt smooth boundary.

B21g—8 to 15 inches; gray (10YR 5/1) silty clay; many fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular and subangular blocky; very firm;

few fine roots; few coarse sand grains; neutral; gradual smooth boundary.

B22g—15 to 48 inches; gray (10YR 5/1) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular and subangular blocky; very firm; few thin patchy gray (10YR 5/1) clay films on faces of peds; few coarse sand grains; neutral; gradual smooth boundary.

Cg—48 to 75 inches; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) silty clay; few medium faint gray (10YR 5/1) mottles; massive; very firm; few fine black (10YR 2/1) iron and manganese oxide concretions; few coarse sand grains; neutral.

The solum is 28 to 48 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2), dark gray (10YR 4/1), or very dark grayish brown (10YR 3/2) with a dry value of 6. It is silty clay loam or silty clay. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1. It has common or many distinct mottles. The Bg horizon is silty clay loam, silty clay, or clay. The C horizon is clay or silty clay.

### Zipp Variant

The Zipp Variant consists of deep, very poorly drained, very slowly permeable soils on river terraces. They formed in loamy and clayey slack-water sediments. Slopes range from 0 to 2 percent.

Zipp Variant soils are similar and adjacent to Vincennes and Zipp soils and are commonly near Elkinsville and Wheeling soils. Vincennes soils have less than 35 percent clay in the control section and are on slightly higher positions than Zipp Variant soils. Zipp soils have fine textured surface layers and are neutral. They are in lower depressional areas. Elkinsville and Wheeling soils have brownish colors throughout their profiles, have lower clay content, and are on slightly higher areas than Zipp Variant soils.

Typical pedon of Zipp Variant sandy loam in a cultivated field 1,980 feet east and 54 feet south of the northwest corner of sec. 16, T. 7 S., R. 14 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many fine roots; neutral; abrupt smooth boundary.

B1g—10 to 13 inches; grayish brown (2.5Y 5/2) and dark grayish brown (10YR 4/2) loam; few fine prominent red (2.5YR 4/8) mottles; moderate fine subangular blocky structure; very firm; many fine roots; few fine faint brown (7.5YR 4/4) iron and manganese oxide stains; strongly acid; gradual smooth boundary.

B21g—13 to 21 inches; light brownish gray (2.5YR 6/2) clay; many medium prominent red (2.5YR 4/8) mottles; weak coarse prismatic structure parting to weak fine subangular blocky; very firm; few fine roots; very strongly acid; gradual smooth boundary.

B22g—21 to 32 inches; gray (10YR 5/1) clay; common fine prominent red (2.5YR 4/8) and common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; very firm; few fine roots; very strongly acid; gradual smooth boundary.

B23g—32 to 43 inches; gray (10YR 5/1) clay; common medium distinct strong brown (7.5YR 5/6) and common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; very firm; very strongly acid; gradual smooth boundary.

Cg—43 to 60 inches; gray (10YR 5/1) clay; few fine distinct yellowish brown (10YR 5/6) mottles; massive; very firm; thin strata of sandy clay loam; strongly acid.

The solum is 30 to 50 inches thick.

The Ap horizon ranges from 6 to 12 inches in thickness. It is dark grayish brown (10YR 4/2), dark gray (10YR 4/1), grayish brown (10YR 5/2), or brown (10YR 4/3). It is sandy loam, loam, clay loam, and, less commonly, sandy clay loam. It is medium acid or strongly acid unless limed. The B1g horizon has hue of 2.5Y or 10YR, value of 5 to 7, and chroma of 1 or 2. It is loam, clay loam, or sandy clay loam, and is 3 to 10 inches thick. The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2. It has common or many, distinct or prominent mottles. It is very strongly acid or strongly acid. The C horizon has matrix colors similar to the B2g horizon and is mottled. It is typically clay and is often stratified with textures ranging from loam to sand or the gravelly analogs of these textures. The C horizon ranges from very strongly acid to slightly acid.

### Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (6).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 20, the soils of the survey area are classified according to the system.

Categories of the system are discussed in the following paragraphs.

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

**SUBORDER.** Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalfs (*ud*, meaning humid, plus *alfs*, from Alfisols).

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

**SUBGROUP.** Each great group may be divided into three subgroups: the central (*typic*) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Hapludalfs.

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

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

## Formation of the soils

In this section the major factors of soil formation and their degree of importance in the formation of the soils in the county are discussed.

### Factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

### Parent material

Parent material is the unconsolidated mass from which soil is formed. The parent materials of most of the soils in Posey County are glacial in origin. These materials were reworked and redeposited by subsequent action of wind and water. The properties of these materials may vary greatly within small areas, depending on how they were deposited. Parent material determines the limits of chemical and mineralogical composition of the soil. The dominant parent materials in Posey County were deposited as loess, wind-blown sands, outwash deposits, lacustrine deposits, and alluvium.

Loess is silty material that was blown from nearby bottom lands and lakebeds and deposited on adjacent uplands by strong northwesterly winds. This material covers almost all of the uplands in Posey County, to a depth of more than 30 feet on the west side of the county and to about 8 feet on the east side. Loess is calcareous and friable. Its texture is silty. Some exam-

ples of soils formed from loess are those of the Alford and Sylvan series. These soils are typically medium textured and have well developed structure.

Windblown sand consists of coarse textured material carried from bottom lands by wind and deposited as dunes on the uplands adjacent to the Wabash River Valley. These deposits range from a few feet to more than 15 feet in thickness. The material is slightly acid or neutral and is very friable or loose. Texture is loamy sand or fine sand. An example of soil formed in windblown sand is soil of the Bloomfield series.

Outwash materials are deposited by running water from melting glaciers. The size of the particles that make up outwash material varies according to the speed of the stream of water that carried them. When the water slows down, the coarser particles are deposited. Finer particles, such as very fine sand, silt, and clay, can be carried by slowly moving water. Outwash deposits generally consists of layers of particles of similar size, such as sandy loam, sand, and gravel, in which coarse particles are dominant. The Wheeling soils, for example, formed in deposits of outwash material.

Lacustrine materials are deposited in still, or ponded, glacial melt water. Because the coarser fragments drop out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remain to settle out in still water. Lacustrine deposits are silty or clayey in texture. In Posey County soils that formed in lacustrine deposits are typically medium textured or moderately fine textured. The Evansville series is an example of soils formed in lacustrine materials.

Alluvium material is deposited by floodwater in recent times. This material ranges in texture, depending on the speed of the water and the source of the material from which it was carried. The alluvium from areas that are dominantly loess tends to be silty, while alluvium from glacial till is more variable. Examples of alluvial soils are those of the Wakeland and Genesee series.

### **Plant and animal life**

Plants have been the principal organism influencing the soils in Posey County; however, bacteria, fungi, earthworms, and the activities of man have also been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on the soil. The remains of these plants accumulate on the surface, decay, and eventually become organic matter. Roots of the plants provide channels for downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The native vegetation in Posey County was mainly deciduous forests. Differences in natural soil drainage

and minor changes in parent material have affected the composition of the forest.

In general the well drained upland and terrace soils, such as the Alford, Sylvan, and Elkinsville soils, were mainly covered with sugar maple, beech, oak, and hickory. The wet soils were covered mainly with soft maple, ash, sycamore, and cottonwood trees. The dominant vegetation in some wet depressional areas was marsh grasses and reeds, which contributed substantially to the accumulation of organic matter. The Patton and Ragsdale series were developed under wet conditions and contain relatively more organic matter than other soils in the county. The soils of Posey County, which developed under dominantly forest vegetation, generally have less accumulated organic matter than soils in other parts of the county that developed under dominantly marsh vegetation.

### **Climate**

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil. It determines the amount of water available for weathering of minerals and the transporting of soil materials. Climate, through its influence on temperatures in the soil, determines the rate of chemical reaction that occurs in the soil.

The climate in Posey County is hot and humid. This is presumably similar to that which existed when the soils were being formed. The soils in Posey County differ from soils formed in a dry, warm climate or from those that formed in a hot, moist climate. Climate is fairly uniform throughout the county, although its effect is modified locally by the Wabash and Ohio Rivers. Therefore the differences in the soils of Posey County result only to a minor extent from differences in climate. For more detailed information on the climate of this county, see the section "General nature of county".

### **Relief**

Relief, or topography, has a marked influence on the soils of Posey County, through its influence on natural drainage, erosion, plant cover, and soil temperature. In Posey County slopes range from 0 to 45 percent. Natural drainage ranges from somewhat excessive on some ridgetops to very poorly drained in some depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage, in turn, through its affect on aeration of the soil, determines the color of the soil. Runoff of water ranges from very rapid on the steeper slopes to very slow or even temporarily ponded in low areas. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. In soils that are well aerated, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized, and in poorly aerated soils the color is a dull gray and mottled. The Bloomfield

series is an example of a somewhat excessively drained, well aerated soil, and the Ragsdale series is an example of a poorly aerated, very poorly drained soil.

Intermediate between the very poorly drained and somewhat excessively drained soils, are the poorly drained, somewhat poorly drained, moderately well drained, and well drained soils.

### Time

Time, usually a long time, is required by the agents of soil formation to form distinct horizons in the soil from parent material. The differences in length of time that the parent materials have been in place are commonly reflected in the degree of development of the soil profile. Some soils develop rapidly, others slowly.

The soils in Posey County range from young to mature. The loess deposits from which many of the soils in Posey County formed have been exposed to soil-forming factors for a long enough time to allow distinct horizons to develop within the soil profile. Some soils, however, forming in recent alluvial sediments have not been in place long enough for distinct horizons to develop.

The Haymond series is an example of a young soil formed in recently deposited alluvial material. Soil development has proceeded only to the point that a surface layer has formed. The material below the surface layer has no distinct subhorizons, and its physical and chemical properties are almost the same as when it was deposited. The Alford series is an example of a mature soil. It has been subject to the soil forming processes for a sufficient time to alter the original parent material. The profile consists of definite layers, or horizons, each of which has slightly different chemical and physical properties from the horizons above and below it. Parent material in its original form is not evident within the upper 4 feet.

### Processes of soil formation

Several processes have been involved in the formation of the soils of this county. These processes are the accumulation of organic matter; the solution, transfer, and removal of carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils of this county. The organic-matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, for example, Lyles or Patton soils, have a thick black surface layer.

Carbonates and bases have been leached from the upper horizons of nearly all the soils of this county. Most of the carbonates and some of the bases have been

leached from the A and B horizons of the well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because of high water tables or because water moves slowly through such soils. Leaching is generally believed to precede the translocation of silicate clay minerals.

Clay particles accumulate in pores and other voids in soil material and form films on the surfaces along which water moves. In soils of the Iona series, for example, translocated silicate clays have accumulated in the B2t horizon in the form of clay films. Leaching of bases and translocation of silicate clays are among the more important processes of horizon differentiation in the soils of Posey County.

The reduction and transfer of iron, or gleying, has occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils of this county. In the naturally wet soils, this process has been significant in horizon differentiation. The gray color of the subsoil indicates the redistribution of iron oxides. The reduction is commonly accompanied by some transfer of the iron, either from upper horizons to lower horizons or completely out of the profile. Mottles in the horizon indicate segregation of iron.

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## Glossary

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	<i>Inches</i>
Very low.....	0 to 3
Low.....	3 to 6
Moderate.....	6 to 9
High.....	More than 9

**Base saturation.** The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bottom land.** The normal flood plain of a stream, subject to frequent flooding.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

**Climax vegetation.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

**Coarse fragments.** Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

**Coarse textured (light textured) soil.** Sand or loamy sand.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

**Corrosive.** High risk of corrosion to uncoated steel or deterioration of concrete.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Cutbanks cave.** Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

**Depth to rock.** Bedrock at a depth that adversely affects the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage

outlets. Seven classes of natural soil drainage are recognized:

**Excessively drained.**—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

**Somewhat excessively drained.**—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

**Well drained.**—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

**Moderately well drained.**—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

**Somewhat poorly drained.**—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

**Poorly drained.**—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

**Very poorly drained.**—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Erosion.** The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

**Erosion (geologic).** Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

**Erosion (accelerated).** Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

**Excess fines.** Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

**Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fast intake.** The rapid movement of water into the soil.

**Favorable.** Favorable soil features for the specified use.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured (heavy textured) soil.** Sandy clay, silty clay, and clay.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flooding.** The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average

of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Foot slope.** The inclined surface at the base of a hill.

**Forage.** Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

**Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

**Frost action.** Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Glacial outwash** (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

**Gleyed soil.** A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

**Green manure** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water** (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated

by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Habitat.** The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

*A horizon.*—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

*A<sub>2</sub> horizon.*—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

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

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

*R layer.*—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They

have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Lacustrine deposit (geology).** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**Light textured soil.** Sand and loamy sand.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by wind.

**Low strength.** Inadequate strength for supporting loads.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Moderately coarse textured (moderately light textured) soil.** Sandy loam and fine sandy loam.

**Moderately fine textured (moderately heavy textured) soil.** Clay loam, sandy clay loam, and silty clay loam.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Munsell notation.** A designation of color by degrees of the three single variables—hue, value, and chroma.

For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3.

**Nutrient, plant.** Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

**Outwash, glacial.** Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

**Outwash plain.** A land form of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

**Parent material.** The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly.** The slow movement of water through the soil adversely affecting the specified use.

**Permeability.** The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

**Phase, soil.** A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

**pH value.** (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

**Piping.** Moving water of subsurface tunnels or pipelike cavities in the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from a semisolid to a plastic state.

**Poorly graded.** Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Poor outlets.** Surface or subsurface drainage outlets difficult or expensive to install.

**Productivity (soil).** The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Reaction, soil.** The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	<i>pH</i>
Extremely acid.....	Below 4.5
Very strongly acid.....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Medium acid.....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral.....	6.6 to 7.3
Mildly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4
Strongly alkaline.....	8.5 to 9.0
Very strongly alkaline.....	9.1 and higher

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

**Rooting depth.** Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-size particles.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedi-

mentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Series, soil.** A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

**Slow refill.** The slow filling of ponds, resulting from restricted permeability in the soil.

**Soil.** A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the

underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

**Stratified.** Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

**Surface soil.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural

classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt*, *silt loam*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer.** Otherwise suitable soil material too thin for the specified use.

**Tilth, soil.** The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

**Toe slope.** The outermost inclined surface at the base of a hill; part of a foot slope.

**Topsoil** (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

**Underlying material.** The C horizon. Soil material below the solum.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Unstable fill.** Risk of caving or sloughing in banks of fill material.

**Variant, soil.** A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

**Water table.** The upper limit of the soil or underlying rock material that is wholly saturated with water. *Water table, apparent.* A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

*Water table, perched.* A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

## **TABLES**

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature <sup>1</sup>						Precipitation <sup>1</sup>				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days <sup>2</sup>	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
				of	of			of	of		
Units	In	In	In	In	In	In	In	In			
January----	40.6	22.5	31.6	69	-6	34	3.17	1.60	4.45	6	3.4
February----	44.5	25.5	35.0	72	0	58	3.17	1.62	4.42	6	3.0
March-----	53.4	33.4	43.4	81	13	207	4.67	2.57	6.37	8	2.5
April-----	67.0	45.3	56.2	87	27	486	4.30	2.49	5.77	8	.5
May-----	76.8	54.1	65.5	93	35	791	4.71	2.51	6.50	7	.0
June-----	85.7	62.9	74.4	99	47	1,032	3.74	2.05	5.11	6	.0
July-----	89.2	66.4	77.8	99	51	1,172	3.90	2.04	5.41	6	.0
August-----	88.1	64.0	76.0	99	49	1,116	3.16	1.57	4.45	5	.0
September--	82.5	57.1	69.9	97	39	897	2.80	1.20	4.10	4	.0
October----	71.5	45.0	58.3	91	27	567	2.46	.71	3.86	4	.0
November---	56.0	34.7	45.4	81	14	190	3.57	1.69	5.10	6	.9
December---	44.2	26.6	35.4	69	2	92	3.53	1.71	5.01	7	2.0
Year-----	66.6	44.8	55.7	101	-6	6,642	43.18	35.99	50.04	73	12.3

<sup>1</sup>Recorded in the period 1951-74 at Mount Vernon, Ind.

<sup>2</sup>A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature <sup>1</sup>		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 2	April 12	April 23
2 years in 10 later than--	March 28	April 8	April 19
5 years in 10 later than--	March 19	April 1	April 9
First freezing temperature in fall:			
1 year in 10 earlier than--	November 1	October 20	October 12
2 years in 10 earlier than--	November 5	October 24	October 16
5 years in 10 earlier than--	November 14	October 30	October 25

<sup>1</sup>Recorded in the period 1951-74 at Mount Vernon, Ind.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season <sup>1</sup>		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	219	196	179
8 years in 10	226	201	186
5 years in 10	240	212	198
2 years in 10	253	222	210
1 year in 10	260	228	217

<sup>1</sup>Recorded in the period 1951-74 at Mount Vernon, Ind.

TABLE 4.--POTENTIALS AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP FOR SPECIFIED USES

Map unit	Percent of county	Cultivated crops	Specialty crops	Woodland	Urban uses	Intensive recreation areas	Extensive recreation areas
1. Alford-Sylvan-Iona-	46	Fair: slope.	Good-----	Good-----	Fair: slope.	Good-----	Good.
2. Alford-Hosmer-Iona-	2	Fair: slope.	Good-----	Good-----	Fair: slope, slow percolation.	Good-----	Good.
3. Evansville-Patton-Henshaw-----	6	Good-----	Poor: wetness.	Good-----	Poor: wetness.	Poor: wetness.	Good.
4. Ragsdale-Reesville-	4	Good-----	Poor: wetness.	Good-----	Poor: wetness.	Poor: wetness.	Good.
5. Elkinsville-Wheeling-Vincennes	8	Good-----	Fair: frost damage.	Good-----	Fair: rare flooding.	Fair: rare flooding.	Good.
6. Weinbach-Ginat-Elkinsville-----	11	Good-----	Poor: wetness.	Good-----	Poor: wetness.	Poor: wetness.	Good.
7. Nolin-Newark-Petrolia-----	15	Good-----	Poor: flooding.	Good-----	Poor: flooding.	Poor: flooding.	Good.
8. Wakeland-----	6	Good-----	Poor: flooding.	Good-----	Poor: flooding, wetness.	Poor: flooding, wetness.	Good.
9. Bloomfield-Princeton-----	2	Fair: slope, droughtiness.	Good-----	Good-----	Fair: slope.	Good-----	Good.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AlA	Alford silt loam, 0 to 2 percent slopes-----	606	0.2
AlB2	Alford silt loam, 2 to 6 percent slopes, eroded-----	22,731	8.6
AlB3	Alford silt loam, 2 to 6 percent slopes, severely eroded-----	2,904	1.1
AlC2	Alford silt loam, 6 to 12 percent slopes, eroded-----	1,623	0.6
AlC3	Alford silt loam, 6 to 12 percent slopes, severely eroded-----	17,755	6.7
AlD	Alford silt loam, 12 to 18 percent slopes-----	970	0.4
AlD3	Alford silt loam, 12 to 18 percent slopes, severely eroded-----	7,119	2.7
AlE	Alford silt loam, 18 to 25 percent slopes-----	2,513	0.9
Ar	Armiesburg silt loam-----	892	0.3
As	Armiesburg Variant silt loam-----	532	0.2
Bd	Birds silt loam-----	2,044	0.8
B1B	Bloomfield loamy fine sand, 2 to 6 percent slopes-----	854	0.3
B1C	Bloomfield loamy fine sand, 6 to 12 percent slopes-----	698	0.3
B1D	Bloomfield loamy fine sand, 12 to 18 percent slopes-----	465	0.2
B1F	Bloomfield loamy fine sand, 18 to 35 percent slopes-----	1,219	0.5
EkA	Elkinsville silt loam, 0 to 2 percent slopes-----	6,985	2.6
EkB2	Elkinsville silt loam, 2 to 6 percent slopes, eroded-----	1,993	0.8
Ev	Evansville silt loam-----	14,781	5.6
Ge	Genesee loam-----	2,071	0.8
Gn	Ginat silt loam-----	5,840	2.2
Ha	Haymond silt loam-----	1,695	0.6
HeA	Henshaw silt loam, 0 to 2 percent slopes-----	9,273	3.5
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded-----	1,503	0.6
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded-----	981	0.4
HoD3	Hosmer silt loam, 12 to 18 percent slopes, severely eroded-----	810	0.3
IoA	Iona silt loam, 0 to 2 percent slopes-----	1,548	0.6
IoB2	Iona silt loam, 2 to 6 percent slopes, eroded-----	13,563	5.1
IoB3	Iona silt loam, 2 to 6 percent slopes, severely eroded-----	3,549	1.3
Ju	Junius loamy sand-----	316	0.1
Ld	Landes sandy loam-----	1,307	0.5
Ly	Lyles sandy loam-----	819	0.3
Nk	Newark silty clay loam-----	7,426	2.8
No	Nolin silt loam-----	15,969	6.0
OnA	Onarga fine sandy loam, 0 to 2 percent slopes, rarely flooded-----	919	0.3
Pa	Patton silty clay loam-----	5,844	2.2
PeA	Pekin silt loam, 0 to 2 percent slopes-----	469	0.2
PeB2	Pekin silt loam, 2 to 6 percent slopes, eroded-----	408	0.2
Pg	Peoga silt loam-----	756	0.3
Ph	Petrolia silty clay loam-----	6,209	2.3
PnB	Plainfield Variant loamy fine sand, 0 to 6 percent slopes-----	918	0.3
PrB2	Princeton loam, 2 to 6 percent slopes, eroded-----	788	0.3
PrC2	Princeton loam, 6 to 12 percent slopes, eroded-----	473	0.2
Ps	Psamments-----	485	0.2
Ra	Ragsdale silt loam-----	3,866	1.5
Rh	Rahm silt loam-----	921	0.3
R1A	Reesville silt loam, 0 to 2 percent slopes-----	4,365	1.6
Rn	Rensselaer clay loam, clay loam substratum-----	695	0.3
St	Stonelick fine sandy loam-----	2,122	0.8
SyB3	Sylvan silt loam, 2 to 6 percent slopes, severely eroded-----	470	0.2
SyC3	Sylvan silt loam, 6 to 12 percent slopes, severely eroded-----	7,245	2.7
SyD3	Sylvan silt loam, 12 to 18 percent slopes, severely eroded-----	3,793	1.4
SyF	Sylvan silt loam, 18 to 40 percent slopes-----	5,506	2.1
UnA	Uniontown silt loam, 0 to 2 percent slopes-----	2,477	0.9
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded-----	4,464	1.7
UnB3	Uniontown silt loam, 2 to 6 percent slopes, severely eroded-----	2,282	0.9
UnC3	Uniontown silt loam, 6 to 12 percent slopes, severely eroded-----	3,315	1.3
Vn	Vincennes loam-----	4,803	1.8
Wa	Wakeland silt loam-----	23,191	8.8
WbA	Weinbach silt loam, 0 to 2 percent slopes-----	6,371	2.4
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded-----	1,133	0.4
WeE	Wellston silt loam, 18 to 25 percent slopes-----	3,003	1.1
WeF	Wellston silt loam, 25 to 35 percent slopes-----	753	0.3
WhA	Wheeling loam, 0 to 2 percent slopes-----	3,159	1.2
WhB	Wheeling loam, 2 to 6 percent slopes-----	2,589	1.0
WhC2	Wheeling loam, 6 to 12 percent slopes, eroded-----	572	0.2
Wm	Wheeling Variant silt loam-----	1,383	0.5
Wz	Woodmere silt loam-----	500	0.2
Zp	Zipp silty clay loam-----	1,919	0.7
Zu	Zipp Variant sandy loam-----	1,292	0.5
	Water-----	2,148	0.8
	Total-----	264,960	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield figure indicates that the soil is not suited to the crop or crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
A1A----- Alford	125	44	50	4.1	8.2
A1B2----- Alford	120	42	48	4.0	8.0
A1B3----- Alford	115	40	46	3.8	7.6
A1C2----- Alford	110	38	44	3.6	7.2
A1C3----- Alford	105	37	42	3.4	6.8
A1D----- Alford	95	33	38	3.1	6.2
A1D3----- Alford	---	---	---	3.0	6.0
A1E----- Alford	---	---	---	2.8	5.6
Ar----- Armiesburg	115	39	45	3.0	8.8
As----- Armiesburg Variant	140	47	54	4.4	8.8
Bd----- Birds	115	39	45	4.3	8.6
B1B----- Bloomfield	68	27	34	2.7	5.4
B1C----- Bloomfield	63	25	32	2.6	5.2
B1D----- Bloomfield	---	---	28	2.4	4.8
B1F----- Bloomfield	---	---	---	---	---
EkA----- Elkinsville	120	42	48	4.0	8.0
EkB2----- Elkinsville	115	40	46	3.8	7.6
Ev----- Evansville	145	51	58	4.8	9.6
Ge----- Genesee	115	40	---	3.5	8.0
Gn----- Ginat	100	37	42	3.8	7.6
Ha----- Haymond	120	42	42	3.7	8.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
HeA----- Henshaw	130	45	48	4.0	8.0
HoB2----- Hosmer	105	37	47	3.4	6.8
HoC3----- Hosmer	75	26	34	2.5	5.0
HoD3----- Hosmer	---	---	---	2.0	4.0
IoA----- Iona	125	44	50	4.1	8.2
IoB2----- Iona	120	42	48	3.8	7.6
IoB3----- Iona	110	38	44	3.6	6.2
Ju----- Junius	90	35	40	3.5	7.0
Ld----- Landes	100	37	42	3.3	6.6
Ly----- Lyles	125	44	50	4.6	9.2
Nk----- Newark	90	40	---	4.5	9.0
No----- Nolin	125	45	---	4.5	9.0
OnA----- Onarga	90	32	40	3.0	6.0
Pa----- Patton	145	45	50	4.5	9.0
PeA----- Pekin	105	37	47	3.4	6.8
PeB2----- Pekin	95	33	43	3.1	6.2
Pg----- Peoga	100	37	42	4.1	8.2
Ph----- Petrolia	90	32	---	3.1	6.2
PnB----- Plainfield Variant	65	29	34	2.0	5.8
PrB2, PrC2----- Princeton	90	32	42	3.1	6.2
Ps----- Psamments	---	---	---	---	---
Ra----- Ragsdale	155	54	62	5.1	10.2
Rh----- Rahm	100	37	---	4.4	8.8

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
RI A----- Reesville	135	45	48	4.5	9.0
Rn----- Rensselaer	150	53	55	5.0	10.0
St----- Stonelick	80	25	---	3.5	7.0
SyB3----- Sylvan	115	40	46	3.4	6.8
SyC3----- Sylvan	105	37	42	3.2	6.4
SyD3----- Sylvan	---	---	---	3.0	6.0
SyF----- Sylvan	---	---	---	---	---
UnA----- Uniontown	115	40	46	3.8	7.6
UnB2, UnB3----- Uniontown	110	40	46	3.6	7.2
UnC3----- Uniontown	95	35	40	3.4	6.8
Vn----- Vincennes	110	38	44	4.3	8.6
Wa----- Wakeland	115	40	40	4.4	8.8
WbA----- Weinbach	110	38	50	3.6	7.2
WeD3----- Wellston	80	28	36	3.5	7.0
WeE----- Wellston	---	---	---	2.8	5.6
WeF----- Wellston	---	---	---	2.6	5.2
WhA----- Wheeling	125	40	45	4.1	8.2
WhB----- Wheeling	125	40	45	4.0	8.0
WhC2----- Wheeling	115	35	40	3.6	7.2
Wm----- Wheeling Variant	125	40	45	4.3	8.5
Wz----- Woodmere	105	37	41	3.5	8.2
Zp----- Zipp	95	35	40	3.4	6.8
Zu----- Zipp Variant	90	32	40	3.6	7.2

\* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
I	31,776	---	---	---
II	139,259	46,046	88,865	4,348
III	33,794	14,564	18,376	854
IV	31,649	30,731	---	918
V	---	---	---	---
VI	24,630	24,630	---	---
VII	1,704	1,219	---	485
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	
A1A, A1B2, A1B3, A1C2, A1C3, A1D, A1D3----- Alford	1o	Slight	Slight	Slight	Slight	White oak----- Yellow-poplar----- Sweetgum-----	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black locust.
A1E----- Alford	1r	Moderate	Moderate	Slight	Slight	White oak----- Yellow-poplar----- Sweetgum-----	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black locust.
Ar----- Armiesburg	1o	Slight	Slight	Slight	Slight	Yellow-poplar----- White oak----- Black walnut-----	100 90 70	Eastern white pine, black walnut, yellow-poplar, black locust.
As----- Armiesburg Variant	1o	Slight	Slight	Slight	Slight	Yellow-poplar----- White oak----- Black walnut-----	100 90 70	Eastern white pine, yellow-poplar, black walnut.
Bd----- Birds	2w	Slight	Severe	Moderate	Slight	Eastern cottonwood-- Pin oak----- Sweetgum----- Cherrybark oak----- American sycamore---	100 90 --- --- ---	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
B1B, B1C, B1D----- Bloomfield	3s	Slight	Slight	Moderate	Slight	Black oak----- White oak----- Scarlet oak-----	70 --- ---	Eastern white pine, Scotch pine, red pine, eastern redcedar, jack pine.
B1F----- Bloomfield	3s	Moderate	Moderate	Moderate	Slight	Black oak----- White oak----- Scarlet oak-----	70 --- ---	Eastern white pine, Scotch pine, red pine, eastern redcedar, jack pine.
EKA, EkB2----- Elkinsville	1o	Slight	Slight	Slight	Slight	White oak----- Yellow-poplar----- Sweetgum-----	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
Ev----- Evansville	2w	Slight	Severe	Moderate	Moderate	Pin oak----- White oak----- Sweetgum-----	90 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Ge----- Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar-----	100	Eastern white pine, black walnut, yellow-poplar, black locust.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	
Gn----- Ginat	2w	Slight	Severe	Moderate	Moderate	Pin oak----- White oak----- Sweetgum-----	95 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Ha----- Haymond	1o	Slight	Slight	Slight	Slight	Yellow-poplar----- White oak----- Black walnut-----	100 90 70	Eastern white pine, black walnut, yellow-poplar, black locust.
HeA----- Henshaw	1o	Slight	Slight	Slight	Slight	Pin oak----- Yellow-poplar----- Sweetgum-----	95 95 95	White ash, sweetgum, eastern cottonwood, yellow-poplar.
HoB2, HoC3----- Hosmer	2o	Slight	Slight	Slight	Slight	White oak----- Yellow-poplar----- Virginia pine----- Sugar maple-----	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
HoD3----- Hosmer	2r	Moderate	Moderate	Slight	Slight	White oak----- Yellow-poplar----- Virginia pine----- Sugar maple-----	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
IoA, IoB2, IoB3----- Iona	1o	Slight	Slight	Slight	Slight	White oak----- Yellow-poplar----- Sweetgum-----	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
Ju----- Junius	3w	Slight	Moderate	Moderate	Moderate	Red maple----- Eastern white pine-- White ash-----	70 65 55	Eastern white pine, northern white-cedar, white spruce.
Ld----- Landes	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- Yellow-poplar----- American sycamore--- Sweetgum----- Green ash-----	105 95 --- --- ---	Eastern cottonwood, yellow-poplar, American sycamore, sweetgum, green ash, black walnut, eastern white pine, sugar maple.
Ly----- Lyles	2w	Slight	Severe	Severe	Severe	Pin oak----- White oak----- Sweetgum----- Northern red oak----	85 76 90 ---	Eastern white pine, baldcypress, Norway spruce, white ash, sweetgum.
Nk----- Newark	1o	Slight	Slight	Slight	Slight	Pin oak----- Eastern cottonwood-- Northern red oak---- Yellow-poplar----- Sweetgum-----	99 94 85 95 88	Eastern cottonwood, sweetgum, post oak, loblolly pine, red maple, American sycamore, eastern white pine, yellow-poplar.
No----- Nolin	1o	Slight	Slight	Slight	Slight	Sweetgum----- Yellow-poplar-----	96 ---	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	
OnA----- Onarga	---	---	---	---	---	---	---	Eastern white pine, Scotch pine, eastern redcedar, red pine.
Pa----- Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak----- White oak----- Sweetgum----- Northern red oak----	88 75 87 75	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
PeA, PeB2----- Pekin	3o	Slight	Slight	Slight	Slight	White oak----- Yellow-poplar----- Virginia pine----- Sugar maple-----	70 85 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
Pg----- Peoga	2w	Slight	Severe	Severe	Moderate	Pin oak----- White oak----- Sweetgum----- Cherrybark oak-----	90 75 90 ---	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Ph----- Petrolia	2w	Slight	Moderate	Moderate	Slight	Eastern cottonwood-- Pin oak----- Sweetgum----- Cherrybark oak----- American sycamore---	100 90 --- --- ---	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
PnB----- Plainfield Variant	3s	Slight	Slight	Moderate	Slight	Eastern white pine-- Northern red oak---- White oak----- Yellow-poplar-----	60 --- --- ---	Black walnut, northern red oak, white oak, yellow-poplar, red pine, eastern white pine.
PrB2, PrC2----- Princeton	1o	Slight	Slight	Slight	Slight	White oak----- Yellow-poplar----- Sweetgum-----	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black locust.
Ra----- Ragsdale	2w	Slight	Severe	Severe	Severe	Pin oak----- White oak----- Sweetgum-----	90 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Rh----- Rahm	1o	Slight	Slight	Slight	Slight	Yellow-poplar-----	100	Eastern white pine, black walnut, yellow-poplar, black locust.
RLA----- Reesville	3o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar----- Sugar maple-----	75 85 90	Eastern white pine, white ash, red maple.
Rn----- Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak----- White oak----- Sweetgum----- Northern red oak----	85 75 90 75	Eastern white pine, baldcypress, Norway maple, red maple, white ash, sweetgum.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	
St----- Stonelick	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, black walnut, yellow-poplar.
SyB3, SyC3----- Sylvan	2o	Slight	Slight	Slight	Slight	Yellow-poplar----- White oak----- Northern red oak----- Black walnut-----	90 80 80 ---	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
SyD3, SyF----- Sylvan	2r	Moderate	Moderate	Moderate	Slight	Yellow-poplar----- White oak----- Northern red oak----- Black walnut-----	90 80 80 ---	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
UnA, UnB2, UnB3, UnC3----- Uniontown	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar----- Sweetgum----- Virginia pine-----	81 91 90 80	Yellow-poplar, eastern white pine, black walnut, shortleaf pine, Virginia pine.
Vn----- Vincennes	2w	Slight	Severe	Severe	Moderate	Pin oak----- White oak----- Sweetgum-----	86 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Wa----- Wakeland	2o	Slight	Slight	Slight	Slight	Pin oak----- Sweetgum----- Yellow-poplar----- Virginia pine-----	90 85 90 90	Eastern white pine, baldcypress, American sycamore, red maple, white ash.
WbA----- Weinbach	2o	Slight	Slight	Slight	Moderate	White oak----- Pin oak----- Yellow-poplar----- Sweetgum-----	75 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
WeD3, WeE, WeF----- Wellston	2r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar----- Virginia pine-----	81 97 76	Eastern white pine, black walnut, yellow-poplar.
WhA, WhB, WhC2----- Wheeling	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar-----	80 90	Eastern white pine, yellow-poplar, black walnut.
Wm----- Wheeling Variant	2w	Slight	Slight	Slight	Slight	Pin oak----- Sweetgum----- White oak-----	90 85 80	Eastern white pine, white ash, sweetgum, red maple, American sycamore.
Wz----- Woodmere	1o	Slight	Slight	Slight	Slight	Yellow-poplar-----	100	Eastern white pine, black walnut, yellow-poplar, black locust.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	
Zp----- Zipp	2w	Slight	Severe	Severe	Severe	Pin oak----- White oak----- Sweetgum-----	85 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Zu----- Zipp Variant	3w	Slight	Severe	Severe	Severe	Pin oak----- White oak----- Sweetgum-----	85 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
A1A, A1B2, A1B3, A1C2, A1C3, A1D, A1D3, A1E----- Alford	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Ar----- Armiesburg	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
As. Armiesburg Variant					
Bd----- Birds	Gray dogwood, dwarf purple willow.	Silky dogwood, forsythia, Amur honeysuckle, redosier dogwood.	Amur maple, northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
B1B, B1C, B1D, B1F----- Bloomfield	American hazel-----	Amur maple, silky dogwood, tamarisk, late lilac.	Austrian pine, autumn-olive.	Douglas-fir, red pine.	Norway spruce, eastern white pine.
EkA, EkB2----- Elkinsville	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
Ev----- Evansville	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Ge----- Genesee	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Gn----- Ginat	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white- cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Ha----- Haymond	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Eastern white pine, Norway spruce, honeylocust.	---
HeA----- Henshaw	---	Blackhaw, arrowwood, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	---	Norway spruce, white spruce.	Eastern white pine.
HoB2, HoC3, HoD3-- Hosmer	Cuttleaf stag sumac	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of- sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
IoA, IoB2, IoB3-- Iona	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Ju. Junius					
Ld----- Landes	Silky dogwood, mockorange.	Amur maple, autumn-olive, American cranberrybush, blackhaw, late lilac, Amur honeysuckle.	White spruce-----	Red pine-----	Eastern white pine, Norway spruce.
Ly. Lyles					
Nk----- Newark	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white- cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
No. Nolin					

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
OnA----- Onarga	Mockorange-----	European burning-bush, blackhaw, late lilac, Amur honeysuckle, shadblow, serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Eastern white pine, Norway spruce, honeylocust.	---
Pa----- Patton	---	Silky dogwood, redosier dogwood.	Amur maple, northern white-cedar, tall purple willow, medium purple willow.	---	American sycamore, Lombardy poplar, eastern cottonwood.
PeA, PeB2----- Pekin	Cutleaf stag sumac	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
Pg----- Peoga	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Ph----- Petrolia	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
PnB----- Plainfield Variant	---	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, jack pine, Austrian pine.	---
PrB2, PrC2----- Princeton	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Ps. Psamments					
Ra----- Ragsdale	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Rh----- Rahm	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
R1A----- Reesville	Cutleaf stag sumac	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
Rn----- Rensselaer	Gray dogwood, dwarf purple willow.	Redosier dogwood, Amur honeysuckle, silky dogwood.	Northern white-cedar, medium purple willow, tall purple willow.	---	Lombardy poplar.
St----- Stonelick	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
SyB3, SyC3, SyD3, SyF----- Sylvan	---	Silky dogwood, gray dogwood, Amur honeysuckle.	Autumn-olive, Amur maple, Russian-olive.	Red pine, white spruce, Douglas-fir.	Eastern white pine, Norway spruce.
UnA, UnB2, UnB3, UnC3----- Uniontown	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
Vn----- Vincennes	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Wa----- Wakeland	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
WbA----- Weinbach	Cutleaf stag sumac	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
WeD3, WeE, WeF-- Wellston	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
WhA, WhB, WhC2. Wheeling					
Wm----- Wheeling Variant	Mockorange-----	European burningbush, late lilac, shadblow serviceberry, Amur honeysuckle, blackhaw, autumn-olive, American cranberrybush.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
Wz----- Woodmere	Mockorange-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Zp----- Zipp	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Zu----- Zipp Variant	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AlA----- Alford	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.	Slight.
AlB2, AlB3----- Alford	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: frost action, low strength.	Slight.
AlC2, AlC3----- Alford	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
AlD, AlD3, AlE---- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope, low strength.	Severe: slope.
Ar----- Armiesburg	Severe: floods.	Severe: floods, low strength.	Severe: floods, low strength.	Severe: floods, low strength.	Severe: floods, frost action, low strength.	Severe: floods.
As----- Armiesburg Variant	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.	Slight.
Bd----- Birds	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action, floods.	Severe: floods, wetness.
BlB----- Bloomfield	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: too sandy.
BlC----- Bloomfield	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight-----	Moderate: too sandy.
BlD----- Bloomfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: too sandy, slope.
BlF----- Bloomfield	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EkA, EkB2----- Elkinsville	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action, low strength.	Slight.
Ev----- Evansville	Severe: wetness.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, frost action, low strength.	Severe: wetness.
Ge----- Genesee	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Gn----- Ginat	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, low strength.	Severe: wetness.
Ha----- Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HeA----- Henshaw	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
HoB2----- Hosmer	Slight-----	Slight-----	Moderate: wetness.	Moderate: slope.	Severe: frost action.	Slight.
HoC3----- Hosmer	Moderate: slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
HoD3----- Hosmer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope.	Severe: slope.
IoA----- Iona	Moderate: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
IoB2, IoB3----- Iona	Moderate: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: slope, wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
Ju----- Junius	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too sandy.
Ld----- Landes	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Ly----- Lyles	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, floods.	Severe: wetness, floods.
Nk----- Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
No----- Nolin	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
OnA----- Onarga	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, floods.	Slight.
Pa----- Patton	Severe: wetness.	Severe: wetness, low strength, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, frost action, low strength.	Severe: wetness.
PeA, PeB2----- Pekin	Moderate: wetness, floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action.	Slight.
Pg----- Peoga	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, low strength.	Severe: wetness.
Ph----- Petrolia	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action.	Severe: wetness, floods.
PnB----- Plainfield Variant	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: too sandy.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PrB2----- Princeton	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action, low strength.	Slight.
PrC2----- Princeton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, low strength, slope.	Moderate: slope.
Ps. Psammets						
Ra----- Ragsdale	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods.
Rh----- Rahm	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: frost action, shrink-swell, low strength.	Moderate: wetness.
RIA----- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
Rn----- Rensselaer	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action.	Severe: wetness.
St----- Stonelick	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
SyB3----- Sylvan	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.	Slight.
SyC3----- Sylvan	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: frost action, low strength.	Slight.
SyD3, SyF----- Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action, low strength.	Severe: slope.
UnA----- Uniontown	Moderate: wetness.	Moderate: low strength.	Moderate: low strength, wetness.	Moderate: low strength.	Severe: frost action.	Slight.
UnB2, UnB3----- Uniontown	Moderate: wetness.	Moderate: low strength.	Moderate: low strength, wetness.	Moderate: slope, low strength.	Severe: frost action.	Slight.
UnC3----- Uniontown	Moderate: slope, wetness.	Moderate: slope, low strength.	Moderate: slope, low strength, wetness.	Severe: slope.	Severe: frost action.	Moderate: slope.
Vn----- Vincennes	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, low strength.	Severe: wetness.
Wa----- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WbA----- Weinbach	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: frost action, wetness.	Slight.
WeD3, WeE, WeF---- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
WhA, WhB----- Wheeling	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action, low strength.	Slight.
WhC2----- Wheeling	Moderate: slope, floods, wetness.	Severe: floods.	Severe: floods.	Severe: slope, floods.	Moderate: slope, floods, frost action.	Moderate: slope.
Wm----- Wheeling Variant	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action, low strength.	Slight.
Wz----- Woodmere	Severe: floods.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, frost action, low strength.	Moderate: floods.
Zp----- Zipp	Severe: wetness, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, floods, low strength.	Severe: floods, wetness.
Zu----- Zipp Variant	Severe: wetness, floods.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: wetness, low strength, floods.	Severe: wetness.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AlA----- Alford	Slight-----	Moderate: seepage.	Slight-----	Slight-----	Good.
AlB2, AlB3----- Alford	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
AlC2, AlC3----- Alford	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.	Fair: slope.
AlD, AlD3----- Alford	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
AlE----- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ar----- Armiesburg	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
As----- Armiesburg Variant	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
Bd----- Birds	Severe: wetness, floods, percs slowly.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
BlB----- Bloomfield	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy, seepage.
BlC----- Bloomfield	Slight-----	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: too sandy, seepage.
BlD----- Bloomfield	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: too sandy, seepage.
BlF----- Bloomfield	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
EkA, EkB2----- Elkinsville	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
Ev----- Evansville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ge----- Genesee	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Gn----- Ginat	Severe: wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ha----- Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
HeA----- Henshaw	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HoB2----- Hosmer	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Slight-----	Fair: wetness.
HoC3----- Hosmer	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope.	Fair: slope, wetness.
HoD3----- Hosmer	Severe: percs slowly, slope, wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Poor: slope.
IoA----- Iona	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: too clayey.
IoB2, IoB3----- Iona	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: too clayey.
Ju----- Junius	Severe: wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
Ld----- Landes	Severe: floods.	Severe: seepage, floods.	Severe: seepage, floods, too sandy.	Severe: seepage, floods.	Poor. seepage, too sandy.
Ly----- Lyles	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Poor: wetness.
Nk----- Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
No----- Nolin	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
OnA----- Onarga	Moderate: floods.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Good.
Pa----- Patton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
PeA, PeB2----- Pekin	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Fair: wetness, too clayey.
Pg----- Peoga	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ph----- Petrolia	Severe: wetness, floods, percs slowly.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
PnB----- Plainfield Variant	Slight-----	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
PrB2----- Princeton	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
PrC2----- Princeton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ps. Psamments					
Ra----- Ragsdale	Severe: wetness, percs slowly, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Rh----- Rahm	Severe: wetness, floods, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RLA----- Reesville	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Rn----- Rensselaer	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
St----- Stonelick	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Fair: too sandy.
SyB3----- Sylvan	Slight-----	Moderate: slope, seepage.	Slight-----	Slight-----	Good.
SyC3----- Sylvan	Moderate: slope.	Severe: slope.	Slight-----	Slight-----	Good.
SyD3----- Sylvan	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
SyF----- Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UnA----- Uniontown	Severe: percs slowly, wetness.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Good.
UnB2, UnB3----- Uniontown	Severe: percs slowly, wetness.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Good.
UnC3----- Uniontown	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Fair: slope.
Vn----- Vincennes	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Wa----- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
WbA----- Weinbach	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
WeD3, WeE----- Wellston	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
WeF----- Wellston	Severe: depth to rock, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WhA, WhB----- Wheeling	Moderate: wetness, floods, seepage.	Severe: floods, seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness, floods.	Good.
WhC2----- Wheeling	Moderate: slope, wetness, floods.	Severe: slope, floods, seepage.	Severe: seepage, wetness.	Moderate: slope, wetness, floods.	Fair: slope.
Wm----- Wheeling Variant	Severe: wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
Wz----- Woodmere	Severe: floods, percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, wetness.	Fair: too clayey, wetness.
Zp----- Zipp	Severe: wetness, percs slowly, floods.	Slight-----	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Poor: too clayey, wetness.
Zu----- Zipp Variant	Severe: wetness, percs slowly, floods.	Slight-----	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Poor: too clayey, wetness.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
A1A, A1B2, A1B3----- Alford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
A1C2, A1C3----- Alford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
A1D, A1D3----- Alford	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
A1E----- Alford	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Ar----- Armiesburg	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
As----- Armiesburg Variant	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Bd----- Birds	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
B1B, B1C, B1D----- Bloomfield	Good-----	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
B1F----- Bloomfield	Fair: slope.	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy, slope.
EkA, EkB2----- Elkinsville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ev----- Evansville	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ge----- Genesee	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Gn----- Ginat	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ha----- Haymond	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
HeA----- Henshaw	Fair: low strength, wetness.	Poor: excess fines.	Poor: excess fines.	Fair: thin layer.
HoB2----- Hosmer	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
HoC3----- Hosmer	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
HoD3----- Hosmer	Fair: low strength, slope, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
IoA, IoB2, IoB3----- Iona	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ju----- Junius	Fair: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Ld----- Landes	Fair: low strength.	Fair: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ly----- Lyles	Poor: wetness.	Good-----	Unsuited: excess fines.	Poor: wetness.
Nk----- Newark	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
No----- Nolin	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
OnA----- Onarga	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Pa----- Patton	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
PeA, PeB2----- Pekin	Fair: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Pg----- Peoga	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ph----- Petrolia	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
PnB----- Plainfield Variant	Good-----	Good-----	Unsuited: excess fines.	Fair: too sandy.
PrB2----- Princeton	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
PrC2----- Princeton	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
Ps. Psamments				
Ra----- Ragsdale	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Rh----- Rahm	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
R1A----- Reesville	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Rn----- Rensselaer	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
St----- Stonelick	Fair: low strength.	Fair: excess fines.	Unsuited: excess fines.	Fair: thin layer.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SyB3, SyC3----- Sylvan	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
SyD3----- Sylvan	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
SyF----- Sylvan	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
UnA, UnB2, UnB3----- Uniontown	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
UnC3----- Uniontown	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Vn----- Vincennes	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Wa----- Wakeland	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
WbA----- Weinbach	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
WeD3, WeE----- Wellston	Fair: low strength, slope, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
WeF----- Wellston	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
WhA, WhB, WhC2----- Wheeling	Fair: frost action.	Unsuited: excess fines.	Fair: excess fines.	Good.
Wm----- Wheeling Variant	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Wz----- Woodmere	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Zp----- Zipp	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
Zu----- Zipp Variant	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AlA----- Alford	Seepage-----	Favorable-----	No water-----	Not needed-----	Not needed-----	Erodes easily.
AlB2, AlB3----- Alford	Seepage-----	Favorable-----	No water-----	Not needed-----	Favorable-----	Erodes easily.
AlC2, AlC3----- Alford	Slope, seepage.	Favorable-----	No water-----	Not needed-----	Favorable-----	Slope, erodes easily.
AlD, AlD3, AlE----- Alford	Slope, seepage.	Favorable-----	No water-----	Not needed-----	Slope-----	Slope, erodes easily.
Ar----- Armiesburg	Seepage-----	Hard to pack-----	No water-----	Not needed-----	Not needed-----	Favorable.
As----- Armiesburg Variant	Seepage-----	Piping-----	No water-----	Not needed-----	Not needed-----	Favorable.
Bd----- Birds	Favorable-----	Wetness-----	Slow refill-----	Floods, frost action.	Not needed-----	Wetness, erodes easily.
B1B, B1C, B1D, B1F----- Bloomfield	Seepage-----	Piping-----	No water-----	Not needed-----	Too sandy, soil blowing.	Droughty.
EKA, EkB2----- Elkinsville	Seepage-----	Piping-----	No water-----	Not needed-----	Favorable-----	Erodes easily.
Ev----- Evansville	Seepage-----	Wetness, hard to pack.	Slow refill-----	Frost action-----	Not needed-----	Wetness, erodes easily.
Ge----- Genesee	Seepage-----	Piping-----	No water-----	Not needed-----	Not needed-----	Erodes easily.
Gn----- Ginat	Favorable-----	Wetness-----	Slow refill-----	Percs slowly, frost action.	Not needed-----	Wetness, rooting depth, erodes easily.
Ha----- Haymond	Seepage-----	Piping-----	No water-----	Not needed-----	Not needed-----	Erodes easily.
HeA----- Henshaw	Favorable-----	Wetness-----	Slow refill-----	Favorable-----	Erodes easily, wetness.	Wetness, erodes easily.
HoB2----- Hosmer	Favorable-----	Piping-----	Deep to water, slow refill.	Not needed-----	Rooting depth, erodes easily.	Erodes easily, rooting depth.
HoC3----- Hosmer	Slope-----	Piping-----	Deep to water, slow refill.	Not needed-----	Rooting depth, erodes easily.	Slope, erodes easily, rooting depth.
HoD3----- Hosmer	Slope-----	Piping-----	Deep to water, slow refill.	Not needed-----	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
IoA, IoB2, IoB3----- Iona	Favorable-----	Wetness-----	Deep to water, slow refill.	Frost action-----	Wetness-----	Erodes easily.
Ju----- Junius	Seepage-----	Seepage, piping.	Favorable-----	Favorable-----	Wetness, piping.	Wetness, droughty.
Ld----- Landes	Seepage-----	Seepage, piping.	No water-----	Not needed-----	Not needed-----	Favorable.
Ly----- Lyles	Seepage-----	Seepage, wetness.	Favorable-----	Floods, frost action.	Not needed-----	Wetness.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Nk----- Newark	Seepage-----	Wetness, piping.	Slow refill----	Floods, frost action.	Not needed-----	Wetness, erodes easily.
No----- Nolin	Seepage-----	Piping, low strength.	Deep to water	Not needed-----	Not needed-----	Erodes easily.
OnA----- Onarga	Seepage-----	Favorable-----	No water-----	Not needed-----	Not needed-----	Favorable.
Pa----- Patton	Seepage-----	Wetness-----	Slow refill----	Frost action----	Not needed-----	Wetness.
PeA, PeB2----- Pekin	Favorable-----	Wetness-----	Deep to water, slow refill.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
Pg----- Peoga	Favorable-----	Wetness-----	Slow refill----	Percs slowly, frost action.	Not needed-----	Wetness, percs slowly, erodes easily.
Ph----- Petrolia	Favorable-----	Wetness-----	Slow refill----	Wetness, floods, percs slowly.	Not needed-----	Wetness.
PnB----- Plainfield Variant	Seepage-----	Seepage, piping.	No water-----	Not needed-----	Too sandy, soil blowing.	Droughty.
PrB2----- Princeton	Seepage-----	Favorable-----	No water-----	Not needed-----	Favorable-----	Favorable.
PrC2----- Princeton	Slope, seepage.	Favorable-----	No water-----	Not needed-----	Favorable-----	Slope.
Ps. Psamments						
Ra----- Ragsdale	Favorable-----	Wetness-----	Slow refill----	Percs slowly, frost action, floods.	Not needed-----	Wetness, percs slowly.
Rh----- Rahm	Favorable-----	Hard to pack, wetness.	Slow refill----	Percs slowly, frost action.	Not needed-----	Wetness, percs slowly, erodes easily.
RIA----- Reesville	Seepage-----	Wetness-----	Slow refill----	Frost action----	Not needed-----	Wetness, erodes easily.
Rn----- Rensselaer	Favorable-----	Wetness-----	Slow refill----	Percs slowly, frost action.	Not needed-----	Wetness, percs slowly.
St----- Stonelick	Seepage-----	Seepage-----	No water-----	Not needed-----	Not needed-----	Droughty.
SyB3----- Sylvan	Seepage-----	Favorable-----	No water-----	Not needed-----	Erodes easily	Erodes easily.
SyC3----- Sylvan	Seepage, slope.	Favorable-----	No water-----	Not needed-----	Erodes easily	Erodes easily.
SyD3, SyF----- Sylvan	Seepage, slope.	Favorable-----	No water-----	Not needed-----	Slope, erodes easily.	Slope, erodes easily.
UnA, UnB2, UnB3, UnC3----- Uniontown	Seepage-----	Favorable-----	Deep to water, slow refill.	Slope-----	Favorable-----	Erodes easily, slope.
Vn----- Vincennes	Seepage-----	Wetness-----	Slow refill----	Percs slowly, frost action.	Not needed-----	Wetness, erodes easily.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Wa----- Wakeland	Seepage-----	Piping, wetness.	Deep to water, slow refill.	Frost action, floods.	Not needed----	Wetness, erodes easily.
WbA----- Weinbach	Favorable-----	Wetness-----	Slow refill----	Percs slowly, frost action.	Not needed----	Wetness, erodes easily, rooting depth.
WeD3, WeE, WeF----- Wellston	Slope, seepage, depth to rock.	Thin layer-----	No water-----	Not needed----	Slope-----	Erodes easily, slope.
WhA, WhB, WhC2----- Wheeling	Seepage, slope.	Seepage, piping.	No water-----	Not needed----	Slope-----	Slope, erodes easily.
Wm----- Wheeling Variant	Favorable-----	Wetness-----	Deep to water, slow refill.	Frost action----	Not needed----	Erodes easily.
Wz----- Woodmere	Favorable-----	Hard to pack----	Deep to water, slow refill.	Not needed----	Not needed----	Erodes easily.
Zp----- Zipp	Favorable-----	Wetness, hard to pack.	Slow refill----	Percs slowly, floods.	Not needed----	Wetness, percs slowly.
Zu----- Zipp Variant	Favorable-----	Wetness, hard to pack.	Slow refill----	Percs slowly, frost action, floods.	Not needed----	Wetness, percs slowly.

TABLE 14.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
A1A----- Alford	Slight-----	Slight-----	Slight-----	Slight.
A1B2, A1B3----- Alford	Slight-----	Slight-----	Moderate: slope.	Slight.
A1C2, A1C3----- Alford	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
A1D, A1D3----- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
A1E----- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ar----- Armiesburg	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
As----- Armiesburg Variant	Severe: floods.	Slight-----	Slight-----	Slight.
Bd----- Birds	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
B1B----- Bloomfield	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
B1C----- Bloomfield	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.
B1D----- Bloomfield	Moderate: too sandy, slope.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
B1F----- Bloomfield	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.
EkA----- Elkinsville	Severe: floods.	Slight-----	Slight-----	Slight.
EkB2----- Elkinsville	Severe: floods.	Slight-----	Moderate: slope.	Slight.
Ev----- Evansville	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ge----- Genesee	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Gn----- Ginat	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.
Ha----- Haymond	Severe: floods.	Slight-----	Moderate: floods.	Slight.
HeA----- Henshaw	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
HoB2----- Hosmer	Severe: percs slowly.	Slight-----	Severe: percs slowly.	Slight.
HoC3----- Hosmer	Severe: percs slowly.	Moderate: slope.	Severe: percs slowly, slope.	Slight.
HoD3----- Hosmer	Severe: slope, percs slowly.	Severe: slope.	Severe: percs slowly, slope.	Moderate: slope.
IoA----- Iona	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, percs slowly.	Slight.
IoB2, IoB3----- Iona	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Slight.
Ju----- Junius	Severe: wetness, too sandy.	Moderate: wetness, too sandy.	Severe: wetness, too sandy.	Moderate: wetness, too sandy.
Ld----- Landes	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Ly----- Lyles	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
Nk----- Newark	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness.
No----- Nolin	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
OnA----- Onarga	Slight-----	Slight-----	Slight-----	Slight.
Pa----- Patton	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
PeA, PeB2----- Pekin	Severe: percs slowly, floods.	Moderate: wetness.	Severe: percs slowly.	Slight.
Pg----- Peoga	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ph----- Petrolia	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.
PnB----- Plainfield Variant	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
PrB2----- Princeton	Slight-----	Slight-----	Moderate: slope.	Slight.
PrC2----- Princeton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Ps. Psamments				

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ra----- Ragsdale	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
Rh----- Rahm	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
R1A----- Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Rn----- Rensselaer	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
St----- Stonelick	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
SyB3----- Sylvan	Slight-----	Slight-----	Moderate: slope.	Slight.
SyC3----- Sylvan	Slight-----	Slight-----	Severe: slope.	Slight.
SyD3----- Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
SyF----- Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UnA----- Uniontown	Slight-----	Slight-----	Slight-----	Slight.
UnB2, UnB3----- Uniontown	Slight-----	Slight-----	Moderate: slope.	Slight.
UnC3----- Uniontown	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Vn----- Vincennes	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wa----- Wakeland	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.
WbA----- Weinbach	Severe: floods, percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
WeD3, WeE----- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
WeF----- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WhA----- Wheeling	Severe: floods.	Slight-----	Slight-----	Slight.
WhB----- Wheeling	Severe: floods.	Slight-----	Moderate: slope.	Slight.
WhC2----- Wheeling	Severe: floods.	Moderate: slope.	Severe: slope.	Slight.
Wm----- Wheeling Variant	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight.
Wz----- Woodmere	Severe: floods.	Slight-----	Moderate: floods, percs slowly.	Slight.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Zp----- Zipp	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
Zu----- Zipp Variant	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

TABLE 15.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AlA, AlB2, AlB3---- Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AlC2, AlC3----- Alford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AlD, AlD3----- Alford	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
AlE----- Alford	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Ar----- Armiesburg	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
As----- Armiesburg Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Bd----- Birds	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
B1B, B1C, B1D, B1F- Bloomfield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
EkA, EkB2----- Elkinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ev----- Evansville	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ge----- Genesee	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
Gn----- Ginat	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ha----- Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HeA----- Henshaw	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HoB2----- Hosmer	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HoC3----- Hosmer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HoD3----- Hosmer	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
IoA----- Iona	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
IoB2, IoB3----- Iona	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ju----- Junius	Poor	Fair	Fair	Poor	Poor	Fair	Poor	Fair	Poor	Poor.
Ld----- Landes	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ly----- Lyles	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Nk----- Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
No----- Nolin	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
OnA----- Onarga	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Pa----- Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
PeA----- Pekin	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
PeB2----- Pekin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pg----- Peoga	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ph----- Petrolia	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
PnB----- Plainfield Variant	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
PrB2----- Princeton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PrC2----- Princeton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ps. Psamments										
Ra----- Ragsdale	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
Rh----- Rahm	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
R1A----- Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Rn----- Rensselaer	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
St----- Stonelick	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
SyB3, SyC3----- Sylvan	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SyD3----- Sylvan	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SyF----- Sylvan	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UnA----- Uniontown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
UnB2, UnB3----- Uniontown	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UnC3----- Uniontown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Vn----- Vincennes	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wa----- Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
WbA----- Weinbach	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WeD3, WeE----- Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WeF----- Wellston	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WhA----- Wheeling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhB----- Wheeling	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhC2----- Wheeling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wm----- Wheeling Variant	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Wz----- Woodmere	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Zp----- Zipp	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Zu----- Zipp Variant	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
A1A, A1B2, A1B3, A1C2, A1C3, A1D, A1D3, A1E Alford	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	7-47	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	47-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Ar----- Armiesburg	0-17	Silt loam-----	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	17-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
As----- Armiesburg Variant	0-19	Silt loam-----	ML, CL-ML, CL	A-4	0	100	100	90-100	85-95	27-36	4-10
	19-70	Silt loam-----	ML, CL-ML, CL	A-4	0	100	100	90-100	85-95	27-36	4-10
Bd----- Birds	0-10	Silt loam-----	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
	10-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
B1B, B1C, B1D, B1F- Bloomfield	0-15	Loamy fine sand	SM, SP, SP-SM	A-2-4, A-3, A-4	0	100	100	70-90	4-40	---	NP
	15-36	Fine sand, fine sandy loam, loamy sand.	SM, SP, SP-SM	A-2-4, A-4, A-3	0	100	100	65-80	4-40	<20	NP-3
	36-80	Fine sand, fine sandy loam.	SP, SM, SP-SM	A-2-4, A-3	0	100	100	65-80	4-30	---	NP
EkA, EkB2----- Elkinsville	0-16	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
	16-65	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	85-100	65-90	30-40	8-18
	65-72	Silty clay loam, silt.	CL	A-4, A-6	0	100	100	80-100	50-90	30-40	8-18
Ev----- Evansville	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-35	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	35-60	Stratified silt loam to silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Ge----- Genesee	0-9	Loam-----	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	9-60	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
Gn----- Ginat	0-12	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-30	5-15
	12-25	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-90	25-35	10-15
	25-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-95	30-45	15-25
	48-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	20-30
Ha----- Haymond	0-9	Silt loam-----	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	9-33	Silt loam-----	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	33-60	Silt loam-----	ML	A-4	0	95-100	90-100	80-100	65-90	27-36	4-10

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
In											
HeA----- Henshaw	0-8	Silt loam-----	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	20-35	3-10
	8-44	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	95-100	95-100	95-100	85-100	30-40	8-18
	44-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
HoB2----- Hosmer	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	8-29	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	29-80	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
HoC3, HoD3----- Hosmer	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	8-20	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	20-80	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
IoA, IoB2, IoB3----- Iona	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	8-39	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	39-60	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-35	5-15
Ju----- Junius	0-11	Loamy sand-----	SM	A-2, A-4	0	100	95-100	65-85	20-50	---	NP
	11-65	Stratified fine sand to loam.	SM	A-2, A-4	0	95-100	90-100	65-85	15-40	---	NP
Ld----- Landes	0-36	Sandy loam-----	SM, ML	A-4	0	100	95-100	85-95	35-55	25-40	NP-10
	36-65	Stratified fine sand to silt loam.	SM, ML, SC, SP	A-2, A-4, A-3	0	100	95-100	60-95	3-70	<30	NP-10
Ly----- Lyles	0-20	Sandy loam-----	SC, SM-SC	A-4, A-2-4	0	95-100	90-100	60-70	30-40	20-30	4-10
	20-55	Sandy loam, loam.	SM, SC, SM-SC	A-2-4	0	90-100	90-100	55-70	20-35	15-30	NP-8
	55-60	Loamy sand, sand	SM, SP, SP-SM	A-3, A-1-B, A-2-4	0	90-100	85-100	18-60	3-20	---	NP
Nk----- Newark	0-7	Silty clay loam	CL	A-6	0	95-100	90-100	85-100	80-95	30-40	11-20
	7-35	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	25-42	5-20
	35-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	25-42	5-20
No----- Nolin	0-10	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-55	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	75-100	25-40	5-18
	55-70	Stratified loam to fine sand.	SM, SC, ML, CL	A-2, A-4	0	100	95-100	60-90	25-70	<25	NP-10
OnA----- Onarga	0-15	Fine sandy loam	SC, SM	A-2, A-4, A-6	0	100	100	75-95	25-50	5-28	NP-12
	15-44	Fine sandy loam, loam, sandy clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0	95-100	95-100	75-95	36-60	19-32	5-14
	44-60	Stratified sand to sandy loam.	SM	A-2, A-4	0	85-100	80-100	70-95	12-50	<20	NP-6

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth In	USDA texture	Classification		Frag- ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
Pa----- Patton	0-16	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	10-20
	16-38	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	38-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
PeA, PeB2----- Pekin	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-35	5-15
	8-30	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	30-58	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	58-80	Stratified silt loam to fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-85	20-30	5-15
Pg----- Peoga	0-18	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	18-50	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	20-30
	50-65	Stratified silty clay loam to silt loam.	CL, ML	A-6, A-7	0	100	100	90-100	70-95	35-50	10-25
Ph----- Petrolia	0-12	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	12-20
	12-70	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	95-100	80-100	60-100	20-45	8-20
PnB----- Plainfield Variant	0-12	Loamy fine sand	SM	A-2	0	100	100	60-85	10-20	---	NP
	12-30	Sand-----	SP	A-3	0	100	100	65-75	2-5	---	NP
	30-65	Sand, fine sand	SP	A-3	0	100	100	60-70	1-4	---	NP
PrB2, PrC2----- Princeton	0-12	Loam-----	CL, CL-ML	A-4, A-6	0	100	100	75-95	60-75	20-30	5-15
	12-26	Clay loam-----	SC, CL	A-6	0	100	100	80-90	35-55	25-35	10-15
	26-50	Sandy loam-----	SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0	100	100	60-70	30-40	15-25	5-15
	50-80	Stratified fine sand to silt.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
Ps. Psamments											
Ra----- Ragsdale	0-19	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	19-43	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	43-65	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
Rh----- Rahm	0-8	Silt loam-----	CL	A-6, A-7	0	100	100	90-100	75-95	30-50	10-25
	8-26	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	75-95	30-50	10-25
	26-72	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-30
	72-80	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-30
RI A----- Reesville	0-13	Silt loam-----	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	24-36	4-10
	13-36	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	22-50	4-28
	36-63	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	80-90	70-90	20-40	3-18
Rn----- Rensselaer	0-19	Clay loam-----	CL	A-6, A-7	0	100	100	85-100	70-90	35-40	20-32
	19-49	Clay loam-----	CL	A-6, A-7	0	100	100	85-100	70-90	33-47	15-26
	49-60	Clay loam-----	CL	A-6, A-7	0	100	100	85-100	70-90	33-47	15-26

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth In	USDA texture	Classification		Frag- ments > 3 inches Pet	Percentage passing sieve number--				Liquid limit Pet	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
St----- Stonelick	0-35	Fine sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0	85-100	70-100	50-70	30-60	20-32	NP-10
	35-60	Stratified loam to sand.	SM, SP-SM	A-2, A-4, A-3, A-1-B	0	85-100	70-95	40-60	5-40	---	NP
SyB3, SyC3, SyD3, SyF----- Sylvan	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	9-25	Silt loam-----	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30
	25-60	Silt loam, silt	CL, CL-ML	A-6, A-4	0	100	100	95-100	95-100	20-40	5-20
UnA, UnB2, UnB3, UnC3----- Uniontown	0-8	Silt loam-----	ML, CL-ML	A-4	0	100	95-100	90-100	80-100	20-35	2-10
	8-37	Silt loam, silty clay loam.	CL, ML	A-6, A-4, A-7	0	100	95-100	90-100	85-100	30-45	7-20
	37-60	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	90-100	90-100	85-100	75-100	30-45	7-20
Vn----- Vincennes	0-19	Loam-----	CL	A-6	0	100	100	85-100	60-90	25-35	10-20
	19-43	Clay loam-----	CL	A-6, A-7	0	100	100	60-100	50-80	35-45	15-25
	43-60	Stratified clay loam to sand.	SM, ML	A-2, A-4 A-6	0	100	85-100	40-90	15-55	15-35	NP-15
Wa----- Wakeland	0-8	Silt loam-----	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	8-60	Silt loam-----	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
WbA----- Weinbach	0-12	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-35	5-15
	12-20	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	8-15
	20-45	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	100	100	90-100	80-95	30-45	15-25
	45-60	Stratified silty clay loam to fine sand.	CL, ML, SM, SC	A-6, A-7, A-2, A-4	0	100	100	90-100	20-95	25-45	NP-20
WeD3, WeE, WeF----- Wellston	0-12	Silt loam-----	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	12-48	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	48-60	Silt loam, loam, gravelly sandy loam.	CL-ML, CL, SC, SM-SC	A-4, A-6 A-2	0-10	65-90	65-90	50-90	20-65	20-35	5-15
WhA, WhB, WhC2----- Wheeling	0-10	Loam-----	ML, CL, SM	A-4, A-6, A-7	0	90-100	90-100	85-100	45-90	20-50	1-25
	10-56	Clay loam, loam, sandy clay loam.	ML, CL, SM	A-4, A-6, A-7	0-5	90-100	80-100	75-100	45-80	20-50	1-25
	56-65	Stratified very fine sand to sandy loam.	GM, SM, GP	A-1, A-2, A-3, A-4	10-20	65-90	50-75	45-70	4-45	0-40	NP-10
Wm----- Wheeling Variant	0-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	20-35	4-12
	11-17	Loam-----	CL-ML, CL	A-6, A-4	0	100	100	85-95	60-75	20-35	4-12
	17-40	Clay loam-----	CL	A-6, A-7	0	100	100	85-95	60-70	30-47	12-26
	40-60	Clay loam-----	CL	A-6, A-7	0	100	100	90-100	70-80	30-47	12-26

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Wz----- Woodmere	0-7	Silt loam-----	CL	A-6, A-7	0	100	100	90-100	75-95	30-50	10-25
	7-23	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-30
	23-76	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	76-90	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-30
Zp----- Zipp	0-8	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	90-95	35-55	20-30
	8-48	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	48-75	Clay, silty clay.	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35
Zu----- Zipp Variant	0-10	Sandy loam-----	SM-SC, SM	A-2	0	100	100	60-70	30-40	<25	NP-5
	10-13	Loam-----	CL, CL-ML	A-6	0	100	100	85-95	60-75	20-35	5-15
	13-43	Clay-----	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35
	43-60	Stratified clay to sandy clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
AlA, AlB2, AlB3, AlC2, AlC3, AlD, AlD3, AlE----- Alford	0-7	0.6-2.0	0.22-0.24	5.1-7.3	Low-----	0.37	5-4	5
	7-47	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37		
	47-60	0.6-2.0	0.20-0.22	4.5-7.3	Low-----	0.37		
Ar----- Armiesburg	0-17	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	6
	17-60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.28		
As----- Armiesburg Variant	0-19	0.6-2.0	0.22-0.24	6.6-7.3	Low-----	0.24	5	5
	19-70	0.6-2.0	0.20-0.22	6.6-7.3	Low-----	0.37		
Bd----- Birds	0-10	0.2-0.6	0.22-0.24	5.6-7.8	Low-----	0.43	5	6
	10-60	0.2-0.6	0.20-0.22	5.1-7.8	Low-----	0.43		
BlB, BlC, BlD, BlF----- Bloomfield	0-15	6.0-20	0.07-0.12	5.1-6.5	Low-----	0.15	5	1
	15-36	2.0-20	0.06-0.17	5.1-6.5	Low-----	0.15		
	36-80	6.0-20	0.06-0.08	5.1-6.5	Low-----	0.15		
EkA, EkB2----- Elkinsville	0-16	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5
	16-65	0.6-2.0	0.18-0.22	4.5-6.0	Moderate-----	0.37		
	65-72	0.6-2.0	0.15-0.20	4.5-5.5	Moderate-----	0.37		
Ev----- Evansville	0-9	0.6-2.0	0.20-0.24	6.1-7.3	Low-----	0.37	5	5
	9-35	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.37		
	35-60	0.6-2.0	0.19-0.21	6.6-8.4	Low-----	0.37		
Ge----- Genesee	0-9	0.6-2.0	0.20-0.24	6.1-7.8	Low-----	0.37	5	5
	9-60	0.6-2.0	0.17-0.22	6.1-8.4	Low-----	0.37		
Gn----- Ginat	0-12	0.6-2.0	0.20-0.24	4.5-7.3	Low-----	0.43	4	5
	12-25	0.6-2.0	0.20-0.22	4.5-5.5	Low-----	0.43		
	25-48	<0.06	0.06-0.08	4.5-5.5	Low-----	0.43		
	48-60	0.2-0.6	0.06-0.08	4.5-5.5	Moderate-----	0.43		
Ha----- Haymond	0-9	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5
	9-33	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.37		
	33-60	0.6-2.0	0.20-0.22	6.1-7.3	Low-----	0.37		
HeA----- Henshaw	0-8	0.6-2.0	0.18-0.23	5.6-6.5	Low-----	0.43	4	---
	8-44	0.2-0.6	0.15-0.19	5.1-7.3	Low-----	0.43		
	44-60	0.2-0.6	0.17-0.22	6.6-8.4	Low-----	0.43		
HoB2----- Hosmer	0-8	0.6-2.0	0.20-0.24	4.5-6.0	Low-----	0.43	4	5
	8-29	0.6-2.0	0.18-0.22	4.5-5.5	Low-----	0.43		
	29-80	<0.06	0.06-0.08	4.5-5.0	Low-----	0.43		
HoC3, HoD3----- Hosmer	0-8	0.6-2.0	0.20-0.24	4.5-6.0	Low-----	0.43	4	5
	8-20	0.6-2.0	0.18-0.22	4.5-5.5	Low-----	0.43		
	20-80	<0.06	0.06-0.08	4.5-5.0	Low-----	0.43		
IoA, IoB2, IoB3-- Iona	0-8	0.6-2.0	0.22-0.24	5.1-7.3	Low-----	0.37	5-4	5
	8-39	0.2-0.6	0.18-0.22	5.1-7.3	Moderate-----	0.37		
	39-60	0.2-0.6	0.20-0.22	7.4-8.4	Low-----	0.37		
Ju----- Junius	0-11	2.0-6.0	0.06-0.16	5.6-7.3	Low-----	0.17	5	---
	11-65	6.0-20	0.04-0.08	6.1-7.8	Low-----	0.17		

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
Ld----- Landes	0-36 36-65	2.0-6.0 6.0-20	0.16-0.18 0.05-0.20	6.1-8.4 6.1-8.4	Low----- Low-----	0.20 0.20	5	3
Ly----- Lyles	0-20 20-55 55-60	0.6-2.0 0.6-2.0 2.0-6.0	0.13-0.15 0.12-0.14 0.05-0.08	6.1-7.3 6.1-7.3 6.6-8.4	Low----- Low----- Low-----	0.20 0.20 0.15	5	3
Nk----- Newark	0-7 7-35 35-60	0.6-2.0 0.6-2.0 0.6-2.0	0.18-0.22 0.18-0.23 0.15-0.22	5.6-7.8 5.6-7.8 5.6-7.8	Low----- Low----- Low-----	0.43 0.43 0.43	5	---
No----- Nolin	0-10 10-70	0.6-2.0 0.6-2.0	0.18-0.23 0.18-0.23	5.6-8.4 5.6-8.4	Low----- Low-----	0.43 0.43	5	---
OnA----- Onarga	0-15 15-44 44-60	0.6-6.0 0.6-6.0 6.0-20	0.13-0.22 0.15-0.19 0.05-0.13	5.6-6.5 5.1-6.5 5.1-7.8	Low----- Low----- Low-----	0.20 0.20 0.15	4-3	3
Pa----- Patton	0-16 16-38 38-60	0.6-2.0 0.6-2.0 0.6-2.0	0.21-0.23 0.18-0.20 0.18-0.22	6.6-7.3 6.1-7.8 7.4-7.8	Moderate----- Moderate----- Moderate-----	0.28 0.28 0.28	5	7
PeA, PeB2----- Pekin	0-8 8-30 30-58 58-80	0.6-2.0 0.6-2.0 <0.06 0.6-2.0	0.22-0.24 0.20-0.22 0.06-0.08 0.06-0.08	5.6-7.3 4.5-5.5 4.5-6.0 5.6-7.3	Low----- Low----- Low----- Low-----	0.43 0.43 0.43 0.43	4	5
Pg----- Peoga	0-18 18-50 50-65	0.6-2.0 0.06-0.2 0.06-0.2	0.20-0.24 0.18-0.20 0.19-0.21	5.1-7.3 4.5-5.5 4.5-6.5	Low----- Moderate----- Low-----	0.43 0.43 0.43	4	5
Ph----- Petrolia	0-12 12-70	0.2-0.6 0.2-0.6	0.21-0.23 0.18-0.20	5.6-6.0 6.1-7.8	Moderate----- Moderate-----	--- ---	---	7
PnB----- Plainfield Variant	0-12 12-30 30-65	6.0-20 6.0-20 6.0-20	0.12-0.14 0.06-0.08 0.05-0.07	5.6-7.3 5.6-6.6 5.6-7.3	Low----- Low----- Low-----	0.17 0.17 0.17	5	2
PrB2, PrC2----- Princeton	0-12 12-26 26-50 50-80	0.6-2.0 0.6-2.0 2.0-6.0 2.0-6.0	0.18-0.20 0.16-0.18 0.12-0.14 0.06-0.08	5.6-7.3 5.1-6.5 5.1-6.5 6.6-8.4	Low----- Low----- Low----- Low-----	0.24 0.32 0.32 0.17	5-4	5
Ps. Psamments								
Ra----- Ragsdale	0-19 19-43 43-65	0.6-2.0 0.06-0.2 0.06-0.2	0.22-0.24 0.18-0.20 0.20-0.22	6.1-7.3 6.1-7.3 6.6-8.4	Low----- Moderate----- Low-----	0.28 0.28 0.28	5	5
Rh----- Rahm	0-8 8-26 26-72 72-80	0.6-2.0 0.6-2.0 0.06-0.2 0.06-0.2	0.21-0.23 0.18-0.22 0.13-0.18 0.18-0.20	6.1-7.3 6.1-7.3 4.5-6.0 5.1-6.0	Moderate----- Moderate----- High----- Moderate-----	0.43 0.43 0.43 0.43	5	5
R1A----- Reesville	0-13 13-36 36-63	0.6-2.0 0.2-2.0 0.2-2.0	0.17-0.24 0.15-0.19 0.15-0.18	6.1-6.5 6.1-7.3 7.4-8.4	Low----- Moderate----- Low-----	0.37 0.37 0.37	5	6
Rn----- Rensselaer	0-19 19-49 49-60	0.06-0.2 0.06-0.2 0.06-0.2	0.21-0.23 0.15-0.19 0.14-0.16	6.6-7.3 6.6-7.3 6.6-7.3	Moderate----- Moderate----- Moderate-----	0.24 --- ---	5	7
St----- Stonelick	0-35 35-60	2.0-6.0 2.0-6.0	0.09-0.13 0.05-0.09	7.4-8.4 7.4-8.4	Low----- Low-----	0.24 0.24	5	3

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
SyB3, SyC3, SyD3, SyF----- Sylvan	0-9 9-25 25-60	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20 0.20-0.22	6.1-7.3 5.1-7.3 6.6-8.4	Low----- Moderate----- Moderate-----	0.37 0.37 0.37	5	6
UnA, UnB2, UnB3, UnC3----- Uniontown	0-8 8-37 37-60	0.6-2.0 0.6-2.0 0.2-2.0	0.19-0.33 0.18-0.22 0.18-0.22	5.1-7.3 5.1-7.8 6.6-8.4	Low----- Low----- Low-----	0.37 0.37 0.37	4	---
Vn----- Vincennes	0-19 19-43 43-60	0.6-2.0 0.06-0.2 0.2-0.6	0.20-0.24 0.15-0.19 0.12-0.16	5.1-7.3 4.5-5.5 4.5-5.5	Low----- Moderate----- Moderate-----	0.43 0.43 0.43	5	5
Wa----- Wakeland	0-8 8-60	0.6-2.0 0.6-2.0	0.22-0.24 0.20-0.22	6.6-7.3 5.6-7.3	Low----- Low-----	0.37 0.37	5	5
WbA----- Weinbach	0-12 12-20 20-45 45-60	0.6-2.0 0.6-2.0 <0.06 0.2-0.6	0.20-0.24 0.20-0.22 0.14-0.18 0.19-0.21	4.5-7.3 4.5-5.5 4.5-5.5 4.5-6.0	Low----- Low----- Moderate----- Low-----	0.43 0.43 0.43 0.43	4	5
WeD3, WeE, WeF--- Wellston	0-12 12-48 48-60	0.6-2.0 0.6-2.0 0.6-2.0	0.18-0.22 0.17-0.21 0.12-0.17	5.1-6.5 4.5-6.0 4.5-6.0	Low----- Low----- Low-----	0.37 0.37 0.37	4	6
WhA, WhB, WhC2--- Wheeling	0-10 10-56 56-65	0.6-6.0 0.6-2.0 6.0-20	0.12-0.18 0.08-0.12 0.04-0.08	5.1-6.0 5.1-6.0 5.1-6.0	Low----- Low----- Low-----	0.32 0.28 0.24	4	---
Wm----- Wheeling Variant	0-11 11-17 17-40 40-60	0.6-2.0 0.6-2.0 0.2-0.6 0.2-0.6	0.22-0.24 0.17-0.19 0.15-0.19 0.14-0.19	5.1-6.5 5.1-6.0 5.1-6.0 5.1-6.0	Low----- Low----- Moderate----- Moderate-----	0.37 0.37 0.37 0.37	4	5
Wz----- Woodmere	0-7 7-23 23-76 76-90	0.6-2.0 0.2-0.6 0.2-0.6 0.2-0.6	0.21-0.23 0.18-0.20 0.11-0.13 0.18-0.20	6.1-7.3 6.1-7.3 4.5-6.0 4.5-6.0	Moderate----- Moderate----- High----- Moderate-----	0.43 0.43 0.43 0.43	5	5
Zp----- Zipp	0-8 8-48 48-75	0.2-2.0 <0.2 <0.2	0.12-0.21 0.11-0.13 0.08-0.10	6.1-7.3 6.1-7.3 7.9-8.4	High----- High----- High-----	0.28 0.28 0.28	5	4
Zu----- Zipp Variant	0-10 10-13 13-43 43-60	0.6-6.0 0.6-2.0 <0.2 <0.2	0.13-0.15 0.20-0.22 0.09-0.11 0.09-0.18	6.1-7.3 4.5-5.5 4.5-5.5 4.5-5.5	Low----- Low----- High----- High-----	0.20 0.32 0.32 0.32	5	3

TABLE 18.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
AlA, AlB2, AlB3, AlC2, AlC3, AlD, AlD3, AlE----- Alford	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Ar----- Armiesburg	B	Frequent----	Brief-----	Oct-Jun	>6.0	---	---	>60	---	High-----	Moderate	Low.
As----- Armiesburg Variant	B	Rare-----	---	---	>6.0	---	---	>60	---	High-----	Low-----	Low.
Bd----- Birds	C/D	Frequent----	Long-----	Mar-Jun	0-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
B1B, B1C, B1D, B1F----- Bloomfield	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Low-----	High.
EkA, EkB2----- Elkinsville	B	Rare-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Ev----- Evansville	B/D	Rare-----	---	---	0.-1.0	Apparent	Jan-May	>60	---	High-----	High-----	Low.
Ge----- Genesee	B	Frequent----	Brief-----	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Gn----- Ginat	D	Rare-----	---	---	0-1.0	Perched	Jan-May	>60	---	High-----	High-----	High.
Ha----- Haymond	B	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---	High-----	Low-----	Low.
HeA----- Henshaw	C	None-----	---	---	1.0-2.0	Apparent	Nov-Mar	>60	---	---	High-----	Moderate.
HoB2, HoC3, HoD3-- Hosmer	C	None-----	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	High.
IoA, IoB2, IoB3-- Iona	B	None-----	---	---	2.0-4.0	Perched	Mar-Apr	>60	---	High-----	High-----	Moderate.
Ju----- Junius	C	None-----	---	---	0.5-1.5	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.
Ld----- Landes	B	Occasional	Brief-----	Jan-May	>6.0	---	---	>60	---	Moderate	Low-----	Low.
Ly----- Lyles	B/D	Frequent----	Brief-----	Dec-May	0-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>				
Nk----- Newark	C	Common-----	Brief-----	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High-----	High-----	Low.
No----- Nolin	B	Common-----	Brief-----	Feb-May	>6.0	---	---	>60	---	---	Low-----	Moderate.
OnA----- Onarga	B	Rare-----	---	---	>6.0	---	---	>60	---	Moderate	Low-----	High.
Pa----- Patton	B/D	Rare-----	---	---	0-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
PeA, PeB2----- Pekin	C	Rare-----	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	High.
Pg----- Peoga	C	Rare-----	---	---	0.-1.0	Apparent	Jan-May	>60	---	High-----	High-----	High.
Ph----- Petrolia	D	Frequent-----	Long-----	Mar-Jun	0-3.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Moderate.
PnB----- Plainfield Variant	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Low-----	Moderate.
PrB2, PrC2----- Princeton	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ps. Psamments												
Ra----- Ragsdale	B/D	Frequent-----	Brief-----	Dec-May	0.-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Rh----- Rahm	C	Common-----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
RI A----- Reesville	C	None-----	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Rn----- Rensselaer	C	Rare-----	---	---	0-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
St----- Stonelick	B	Frequent-----	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low-----	Low.
SyB3, SyC3, SyD3, SyF----- Sylvan	B	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
UnA, UnB2, UnB3, UnC3----- Uniontown	B	None-----	---	---	2.5-6.0	Apparent	Nov-May	>60	---	High-----	Low-----	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
Vn----- Vincennes	C/D	Rare-----	---	---	<u>Ft</u> 0-1.0	Apparent	Jan-May	<u>In</u> >60	---	High-----	High-----	High.
Wa----- Wakeland	B/D	Frequent-----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
WbA----- Weinbach	C	Rare-----	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
WeD3, WeE, WeF----- Wellston	B	None-----	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
WhA, WhB, WhC2----- Wheeling	B	Rare-----	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Moderate	Low-----	Moderate.
Wm----- Wheeling Variant	C	Rare-----	---	---	2.0-4.0	Apparent	Jan-Apr	>60	---	High-----	Low-----	Moderate.
Wz----- Woodmere	B	Occasional	Brief-----	Feb-Apr	3.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	High.
Zp----- Zipp	C/D	Occasional	Very brief	Dec-May	0-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Low.
Zu----- Zipp Variant	D	Occasional	Brief-----	Mar-Apr	0-2.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.

TABLE 19.--ENGINEERING TEST DATA

[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution										Liquid limit	Plasticity index	Moisture density		
			Percentage passing sieve--							Percentage smaller than-					Maximum dry	Optimum moisture	
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm	Pct	Lb/ ft <sup>3</sup>			Pct
Evansville sandy loam: <sup>1</sup> (S76IN-129-001)																	
Ap----- 0 to 9	A-4(12)	ML	100	--	--	0	--	99	98	65	30	20	38	10	105	19	
B2g-----20 to 35	A-7-6(24)	CL	100	--	--	0	--	99	98	73	39	32	46	21	105	20	
Cg-----35 to 60	A-7-6(26)	CL	100	--	--	0	--	99	98	68	33	25	45	24	105	20	
Nolin sandy loam: <sup>2</sup> (S76IN-129-002)																	
Ap----- 0 to 10	A-6(14)	CL	100	--	--	0	--	--	94	57	31	21	35	15	108	19	
B22-----28 to 48	A-6(15)	CL	100	--	--	0	--	--	95	54	26	19	39	14	107	18	
C1-----48 to 55	A-4(01)	ML	100	--	--	0	--	--	71	32	15	9	26	4	115	15	
Weinbach sandy loam: <sup>3</sup> (S76IN-129-003)																	
Ap----- 0 to 8	A-4(09)	ML	100	--	--	0	--	92	84	57	25	13	38	9	101	21	
Bx1-----20 to 35	A-7-6(16)	CL	100	--	--	0	--	96	89	68	45	35	41	17	104	20	
C-----45 to 60	A-6(18)	CL	100	--	--	0	--	97	92	68	39	28	40	18	105	19	

<sup>1</sup>Evansville sandy loam: 1,200 feet north and 100 feet west of the southeast corner of sec. 1, T. 7 S., R. 10 W.

<sup>2</sup>Nolin sandy loam: 2,304 feet north and 164 feet west of the southeast corner of sec. 29, T. 6 S., R. 14 W.

<sup>3</sup>Weinbach sandy loam: 170 feet west and 78 feet north of the southeast corner of sec. 6, T. 8 S., R. 14 W.

TABLE 20.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
*Alford-----	Fine-silty, mixed, mesic Typic Hapludalfs
Armiesburg-----	Fine-silty, mixed, mesic Fluventic Hapludolls
Armiesburg Variant-----	Coarse-silty, mixed, mesic Fluventic Hapludolls
Birds-----	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Bloomfield-----	Coarse-loamy, mixed, mesic Psammentic Hapludalfs
Elkinsville-----	Fine-silty, mixed, mesic Ultic Hapludalfs
Evansville-----	Fine-silty, mixed, nonacid, mesic Typic Haplaquepts
Genesee-----	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Ginat-----	Fine-silty, mixed, mesic Typic Fragiqualfs
Haymond-----	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
*Henshaw-----	Fine-silty, mixed, mesic Aquic Hapludalfs
Hosmer-----	Fine-silty, mixed, mesic Typic Fragiudalfs
Iona-----	Fine-silty, mixed, mesic Typic Hapludalfs
*Junius-----	Mixed, mesic Typic Psammaquents
Landes-----	Coarse-loamy, mixed, mesic Fluventic Hapludolls
Lyles-----	Coarse-loamy, mixed, mesic Typic Haplaquolls
Newark-----	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nolin-----	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Onarga-----	Coarse-loamy, mixed, mesic Typic Argiudolls
Patton-----	Fine-silty, mixed, mesic Typic Haplaquolls
*Pekin-----	Fine-silty, mixed, mesic Aquic Fragiudalfs
Peoga-----	Fine-silty, mixed, mesic Typic Ochraqualfs
Petrolia-----	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Plainfield Variant-----	Mixed, mesic Typic Udipsamments
Princeton-----	Fine-loamy, mixed, mesic Typic Hapludalfs
Ragsdale-----	Fine-silty, mixed, mesic Typic Argiaquolls
Rahm-----	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
*Reesville-----	Fine-silty, mixed, mesic Aeric Ochraqualfs
Rensselaer-----	Fine-loamy, mixed, mesic Typic Argiaquolls
Stonelick-----	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Sylvan-----	Fine-silty, mixed, mesic Typic Hapludalfs
*Uniontown-----	Fine-silty, mixed, mesic Typic Hapludalfs
Vincennes-----	Fine-loamy, mixed, acid, mesic Typic Haplaquepts
Wakeland-----	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Weinbach-----	Fine-silty, mixed, mesic Aeric Fragiqualfs
Wellston-----	Fine-silty, mixed, mesic Ultic Hapludalfs
Wheeling-----	Fine-loamy, mixed, mesic Ultic Hapludalfs
Wheeling Variant-----	Fine-loamy, mixed, mesic Aquultic Hapludalfs
Woodmere-----	Fine, mixed, mesic Dystric Fluventic Eutrochrepts
Zipp-----	Fine, mixed, nonacid, mesic Typic Haplaquepts
Zipp Variant-----	Fine, mixed, acid, mesic Typic Haplaquept



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