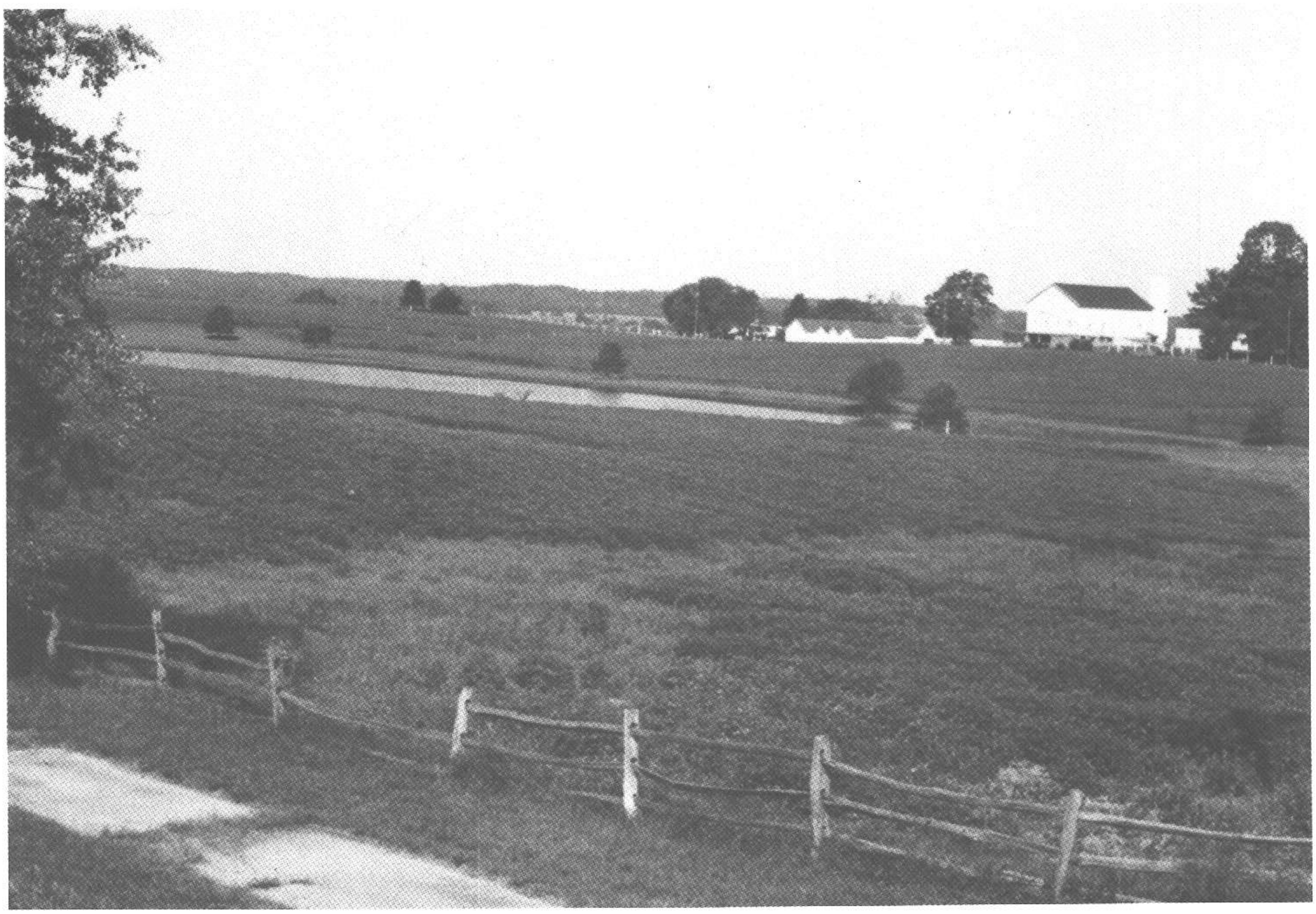
United States Department of Agriculture

Soil Conservation Service

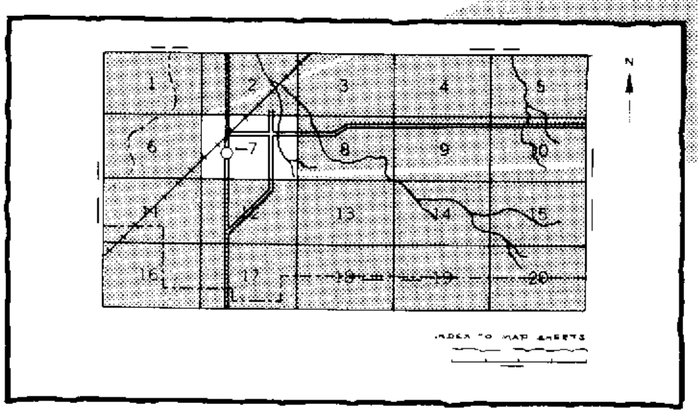
In cooperation with Purdue University Agricultural Experiment Station and Indiana Department of Natural Resources, Soil and Water Conservation Committee

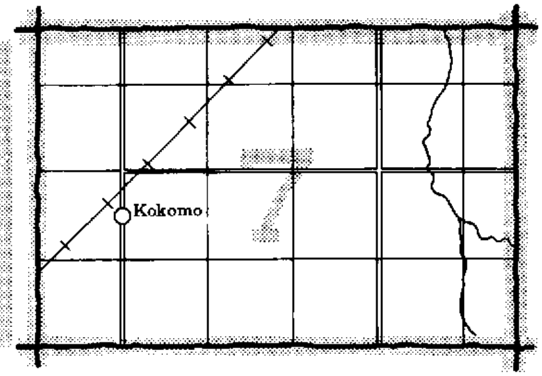
Soil Survey of Wayne County, Indiana



HOW TO USE

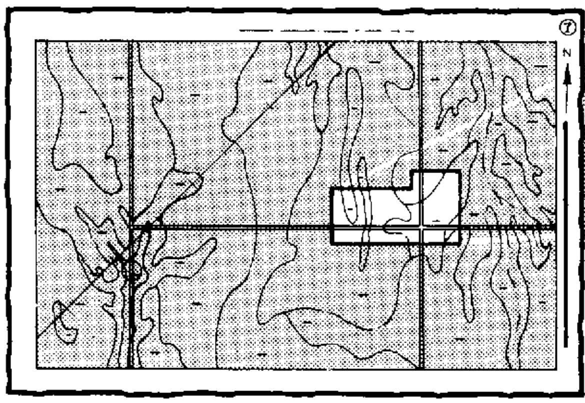
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

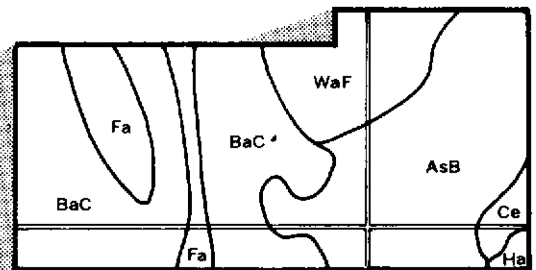




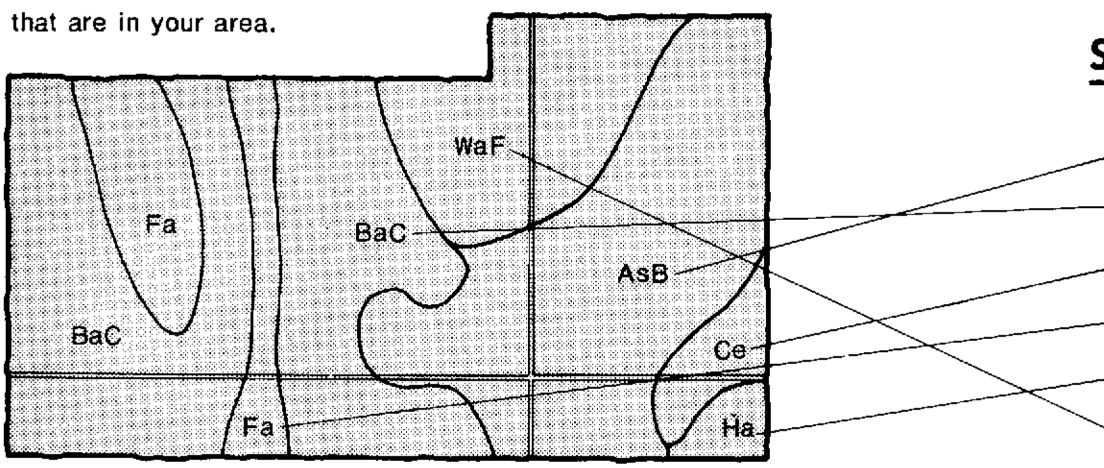
2. Note the number of the map sheet and turn to that sheet.

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





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



Symbols

AsB
BaC
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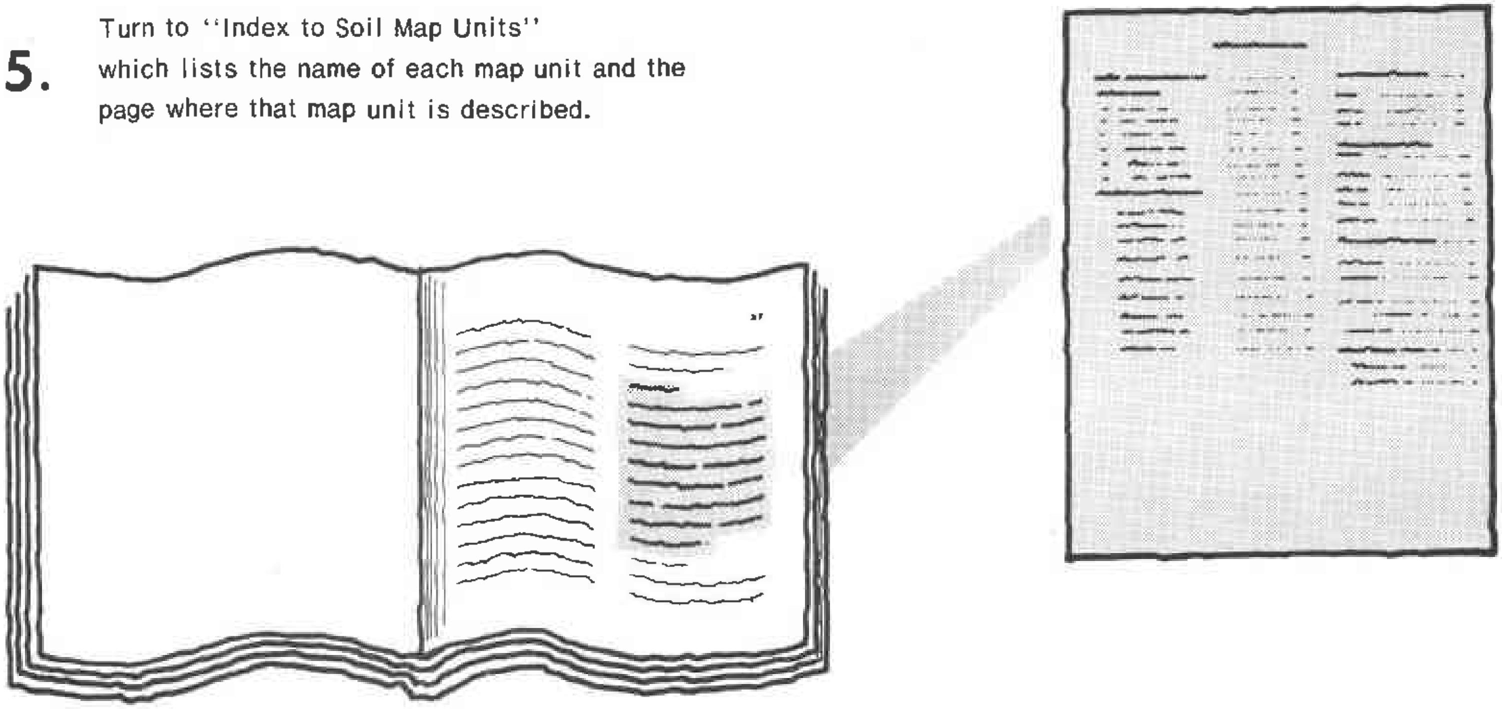
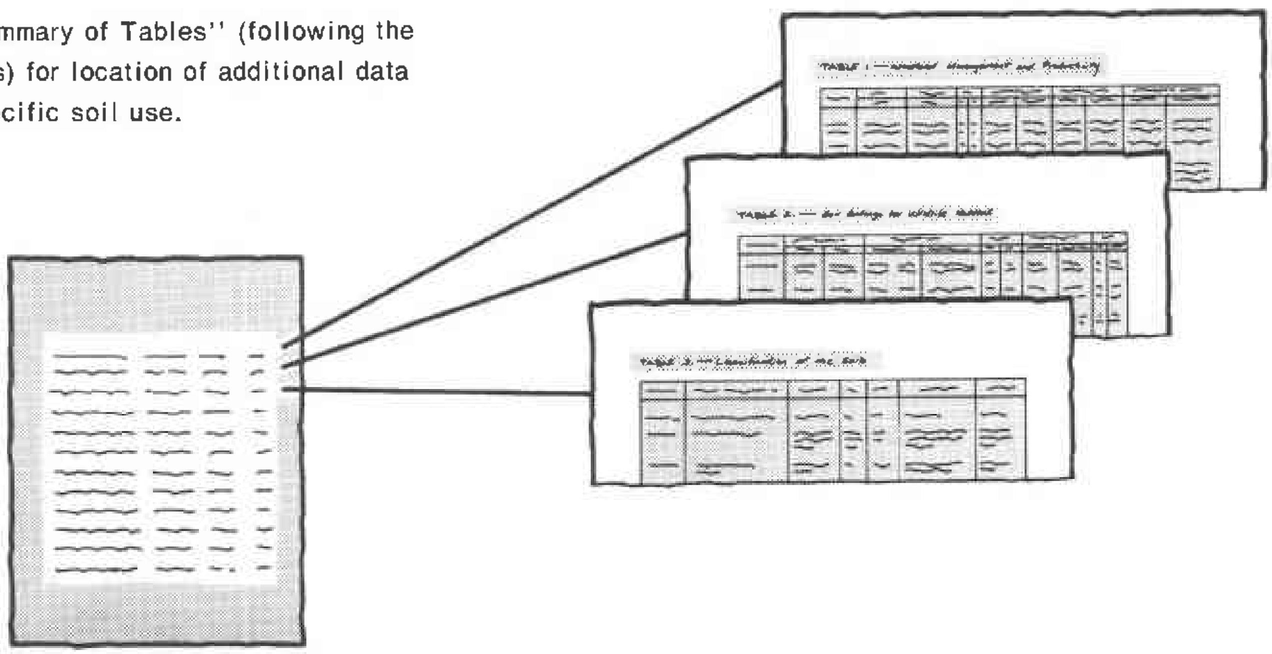
THIS SOIL SURVEY

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.



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.

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Soil Series

Issued August 1987

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Wayne County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as 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 soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Eddleman
State Conservationist
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Location of Wayne County in Indiana.

Soil Survey of Wayne County, Indiana

By James R. Blank, Soil Conservation Service

Fieldwork by James R. Blank, Soil Conservation Service, and John R. Meland and Mark S. Plank, Indiana Department of Natural Resources, Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service, in cooperation with Purdue University Agricultural Experiment Station and Indiana Department of Natural Resources, Soil and Water Conservation Committee

WAYNE COUNTY is on the eastern edge of Indiana. It has an area of 258,682 acres, or about 404 square miles. It has a population of about 79,000. Richmond, the county seat, is on the eastern edge of the county.

The main farm enterprises are the production of cash-grain crops and raising of livestock. Corn, soybeans, and wheat are the main crops. The major kinds of livestock are hogs, beef cattle, and dairy cows.

Construction of housing has increased in rural areas throughout the county. A large number of the county residents are employed by industries in Richmond, New Castle, and Connersville.

This soil survey updates the survey of Wayne County published in 1925 (*3*). It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

The paragraphs that follow provide general information about the county. They describe relief, water supply, climate, transportation facilities, and trends in land use.

Relief

The highest point in Wayne County, which is also the highest point in Indiana, is 1,257 feet above sea level. It is near the junction of the Randolph County line and North Cart Road, in Franklin Township, about 1.5 miles northwest of Bethel. The lowest point is 800 feet above sea level. It is along the Whitewater River and Pottershop Road, in Abington Township.

Wayne County is an undulating till plain dissected by the tributaries of the Whitewater River. The county has a variety of landforms. Relief ranges from nearly level to very steep. The nearly level soils are on bottom land, terraces, and upland flats. The steepest soils border the valleys of the major streams, in areas where considerable dissection has occurred.

Water Supply

Most of the water used in Wayne County is ground water. The principal sources are deep deposits of sand and gravel, seams of sand and gravel in glacial till, and sand and gravel overlying limestone bedrock of Ordovician age. The area south of Richmond has inadequate supplies of ground water because the bedrock is close to the surface.

Surface water is of limited extent in the county. The Middlefork Reservoir is the only major source of surface water. It supplies Richmond with about 50 percent of its water.

The Wayne County Resource Inventory Council, Inc. (RIC), has compiled resource data for the county. The RIC has devoted two of its maps to water supplies. The first map shows "Water Resources" in the county. All available well data are plotted onto a base map. On a second map, areas delineated on a base map are rated for "Water Availability." The ratings range from excellent to none. These maps are available at the Wayne County Planning Department in the Court House Annex, Richmond.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Wayne County is cold in winter but quite hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. The normal annual precipitation is adequate for all crops that are suited to the temperature and length of growing season in the county.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Cambridge City in 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 28 degrees F, and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Cambridge City on January 29, 1963, is -28 degrees. In summer the average temperature is 71 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 29, 1952, is 102 degrees.

Growing degree days are shown in table 1. They 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.

The total annual precipitation is 39.3 inches. Of this, about 22 inches, or more than 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 4.19 inches at Cambridge City on July 20, 1969. Thunderstorms occur on about 45 days each year. Tornadoes and severe thunderstorms occur occasionally. These storms are usually local in extent and of short duration and cause damage in scattered small areas.

The average seasonal snowfall is about 23 inches. The greatest snow depth at any one time during the period of record was 11 inches. On the average, 16 days of the year have at least 1 inch of snow on the ground. 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 85 percent. The sun shines 70 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 11 miles per hour, in winter.

Transportation Facilities

Wayne County has about 23 miles of interstate highways, 130 miles of other federal highways and state highways, and 768 miles of county roads. Most of the county roads are paved. A public airport is south of Richmond, near Boston. A few small private runways are throughout the county. Four main railroad lines cross the county.

Trends in Land Use

During the period 1958 to 1975, the acreage of urban land increased by 1 percent and the acreage of all categories of agricultural land decreased by the same amount. About 90 percent of the county remained agricultural. In 1982, the county had an estimated 47,000 acres of urban and built-up land. The acreage of this land is increasing at the rate of about 1,000 acres per year. It is expected to increase slowly at the expense of farmland (fig. 1).

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil

Figure 1.—Urban land encroaching on prime farmland in an area of Sleeth silt loam.

scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map 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 soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The names, descriptions, and delineations of the soils identified on the general soil map of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

Soil Descriptions

Dominantly Nearly Level Soils That Are Well Drained and Are Subject to Flooding

These soils are on flood plains. They make up about 1 percent of the county. They are used mainly for cultivated crops or pasture. They are poorly suited to urban development because of the hazard of flooding.

1. Stonelick Association

Deep, nearly level, well drained soils formed in alluvium; on bottom land

This association consists of soils on flood plains along streams. These flood plains are lower than the adjacent stream terraces. Slopes range from 0 to 2 percent.

This association makes up about 1 percent of the county. It is about 88 percent Stonelick soils and 12 percent minor soils.

Typically, the Stonelick soils have a surface layer of dark grayish brown loam. The subsoil is brown sandy loam.

Minor in this association are the very poorly drained Sloan and somewhat poorly drained Shoals soils in slight depressions.

This association is generally used for cultivated crops or for pasture. Some areas are wooded. The Stonelick soils are well suited to cultivated crops, pasture, and woodland and are generally unsuited to urban development. The major management concern is the hazard of flooding.

Dominantly Nearly Level to Strongly Sloping Soils That Are Well Drained

These soils make up about 20 percent of the county. They are used mainly for cultivated crops. The main management concerns are erosion and slope. Most areas are suited to urban development.

2. Eldean-Ockley Association

Nearly level to strongly sloping, well drained soils that are moderately deep and deep to sand and gravel and formed in outwash and in loess and outwash; on uplands

This association consists of soils on terraces bordering flood plains along the major drainageways that dissect the county. These terraces are higher than the adjacent flood plains and lower than the adjacent uplands. Slopes range from 0 to 18 percent.

This association makes up about 20 percent of the county. It is about 35 percent Eldean soils, 25 percent Ockley soils, and 40 percent minor soils (fig. 2).

Eldean soils are in nearly level to strongly sloping areas on broad terraces. Typically, they have a surface layer of dark brown loam and a subsoil of brown and strong brown loam, clay loam, clay, and gravelly loam. Sand and gravel are at a depth of 20 to 40 inches.

Ockley soils are in nearly level and gently sloping areas on broad terraces. Typically, they have a surface layer of brown silt loam and a subsoil of brown and dark yellowish brown silty clay and clay loam. Sand and gravel are at a depth of more than 40 inches.

Minor in this association are Genesee, Stonelick, Shoals, Sleeth, Westland, Mahalasville, and Rodman soils. The well drained Genesee and Stonelick and somewhat poorly drained Shoals soils are on flood plains

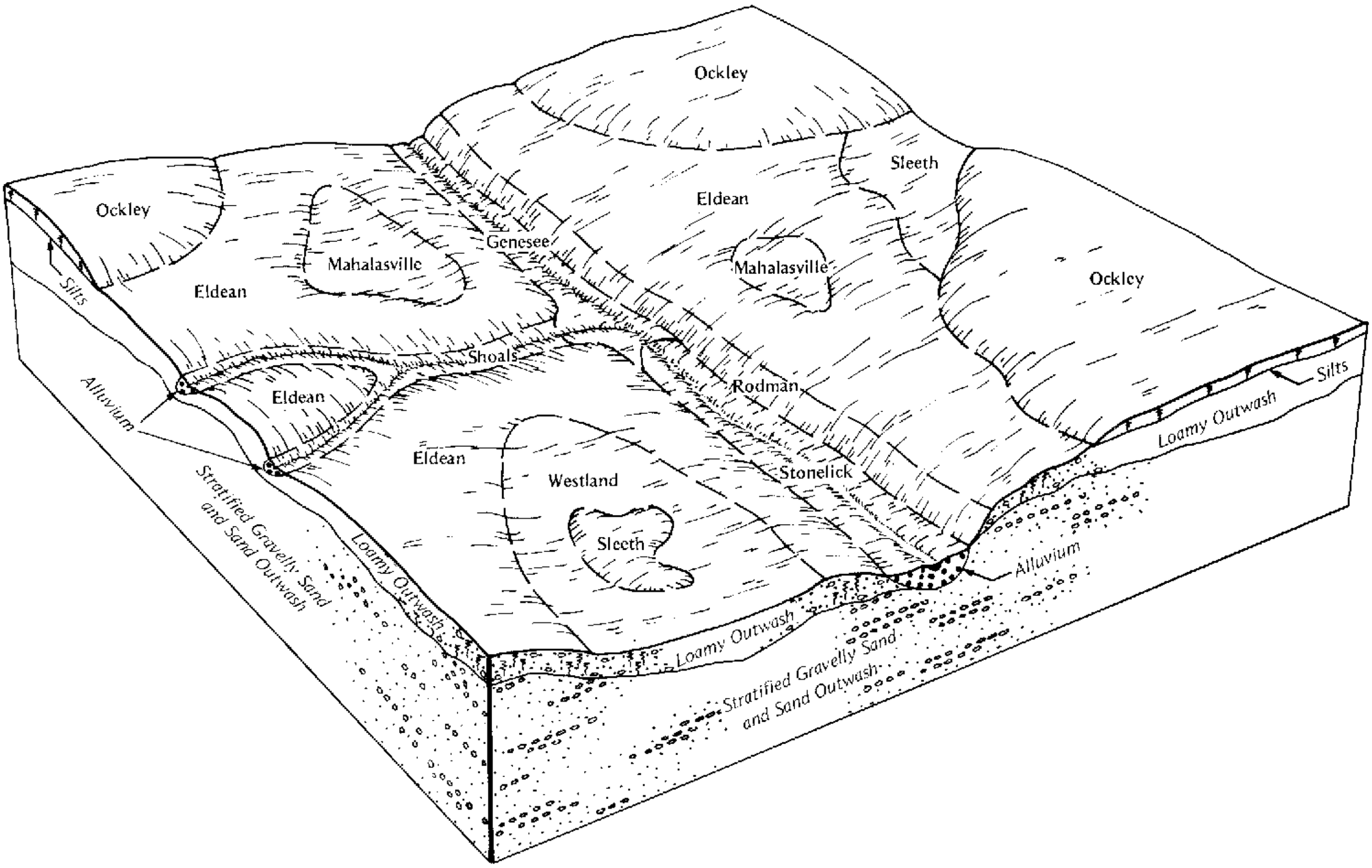

Figure 2.—Pattern of soils and parent material in the Eldean-Ockley association.

along drainageways. The somewhat poorly drained Sleeth and very poorly drained Westland and Mahalasville soils are on flats. The excessively drained Rodman soils are on the steeper side slopes.

This association is generally used for cultivated crops or for pasture. A few areas are wooded. The nearly level and gently sloping areas of the major soils are well suited and the more sloping areas fairly well suited to cultivated crops. The main management concerns are erosion, droughtiness, and slope. All of the major soils are well suited to pasture and woodland. They are well suited to urban development. The main management concerns are a poor filtering capacity and low strength.

Dominantly Nearly Level to Very Steep Soils That Are Well Drained to Somewhat Poorly Drained

These soils are on till plains and moraines. They make up about 54 percent of the county. Most areas are used for cultivated crops. The main management concerns are erosion, wetness, and slope. The soils are poorly suited to urban development because of restricted permeability, wetness, and slope.

3. Xenia-Russell-Miami Association

Deep, nearly level to strongly sloping, moderately well drained and well drained soils formed in glacial till and in loess and glacial till; on uplands

This association consists of soils on broad ridgetops and the sides of drainageways on loess-covered uplands. The loess is thinner on the side slopes and thicker on the ridgetops. Slopes range from 1 to 18 percent.

This association makes up about 3 percent of the county. It is about 29 percent Xenia soils, 23 percent Russell soils, 14 percent Miami soils, and 34 percent minor soils (fig. 3).

The moderately well drained Xenia soils are in nearly level and gently sloping areas on the broad ridgetops. Typically, they have a surface layer of brown silt loam and a subsoil of dark yellowish brown and brown silty clay loam and loam.

The well drained Russell soils are in gently sloping and moderately sloping areas on side slopes and narrow ridgetops along drainageways. Typically, they have a surface layer of brown silt loam and a subsoil of dark yellowish brown and brown silty clay loam and clay loam.

The well drained Miami soils are in gently sloping to strongly sloping areas on side slopes. Typically, they have a surface layer of dark brown silt loam and a subsoil of dark brown clay loam and loam.

Minor in this association are Genesee, Shoals, Treaty, Fincastle, and Hennepin soils. The well drained Genesee and somewhat poorly drained Shoals soils are along narrow drainageways and streams. The very poorly drained Treaty soils are in depressions. The somewhat poorly drained Fincastle soils are on small flats. The well drained Hennepin soils are on the steeper side slopes.

This association is generally used for cultivated crops or for pasture. A few areas are wooded. The major soils are well suited to cultivated crops and pasture. The hazard of erosion is the main management concern. The soils are well suited to woodland. They are poorly suited to urban development, mainly because of low strength, frost action, restricted permeability, and wetness.

4. Miami-Crosby-Strawn Association

Deep, nearly level to very steep, well drained and somewhat poorly drained soils formed dominantly in glacial till; on uplands

This association consists of soils on ridgetops and side slopes along drainageways in the uplands. The somewhat poorly drained soils are on the ridgetops, and the well drained soils are on the side slopes. Slopes range from 1 to 50 percent.

This association makes up about 46 percent of the county. It is about 40 percent Miami soils, 22 percent Crosby soils, 21 percent Strawn soils, and 17 percent minor soils (fig. 4).

The well drained Miami soils are in gently sloping to very steep areas on the higher parts of the uplands or on side slopes along drainageways. Typically, they have

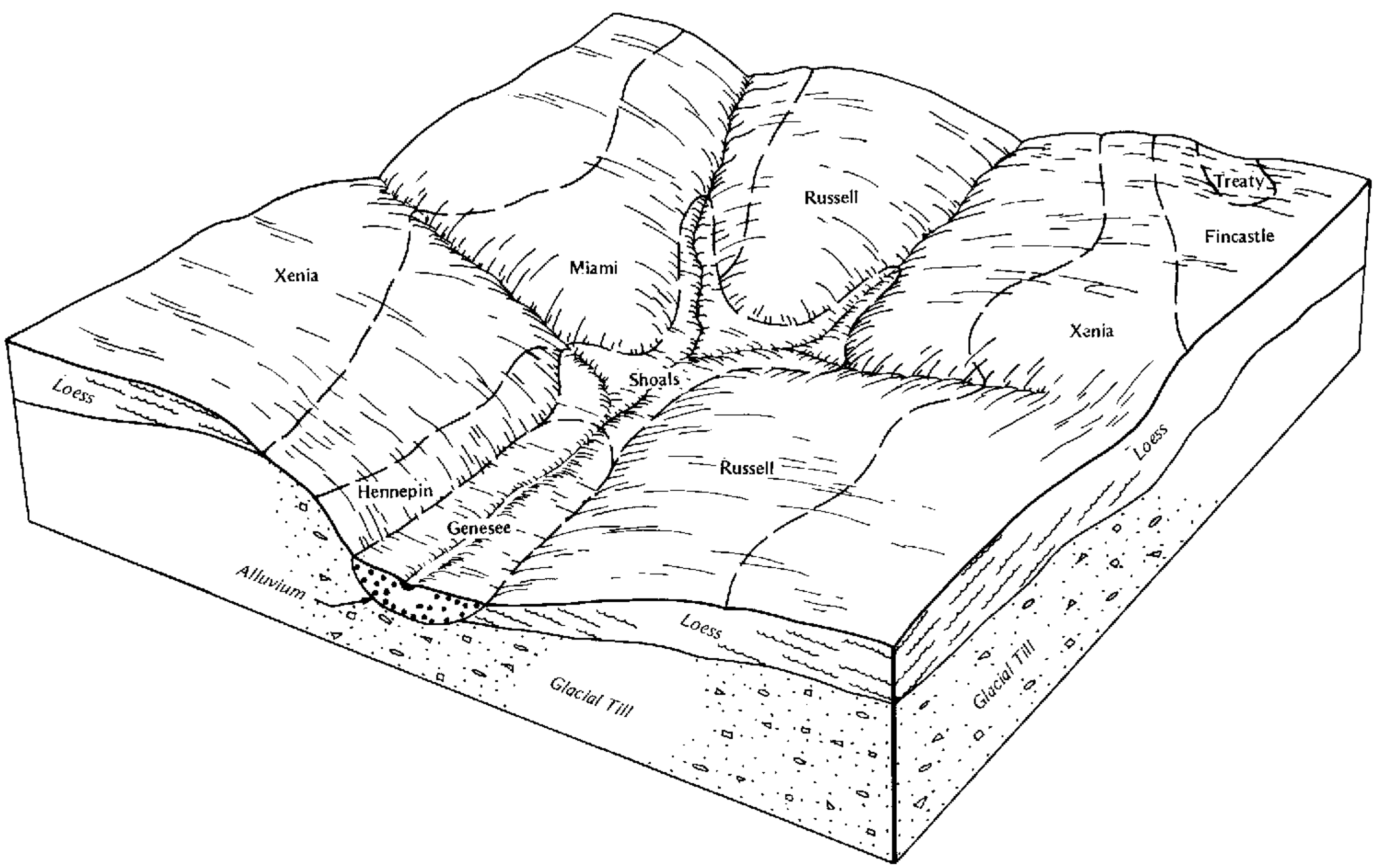

Figure 3.—Pattern of soils and parent material in the Xenia-Russell-Miami association.

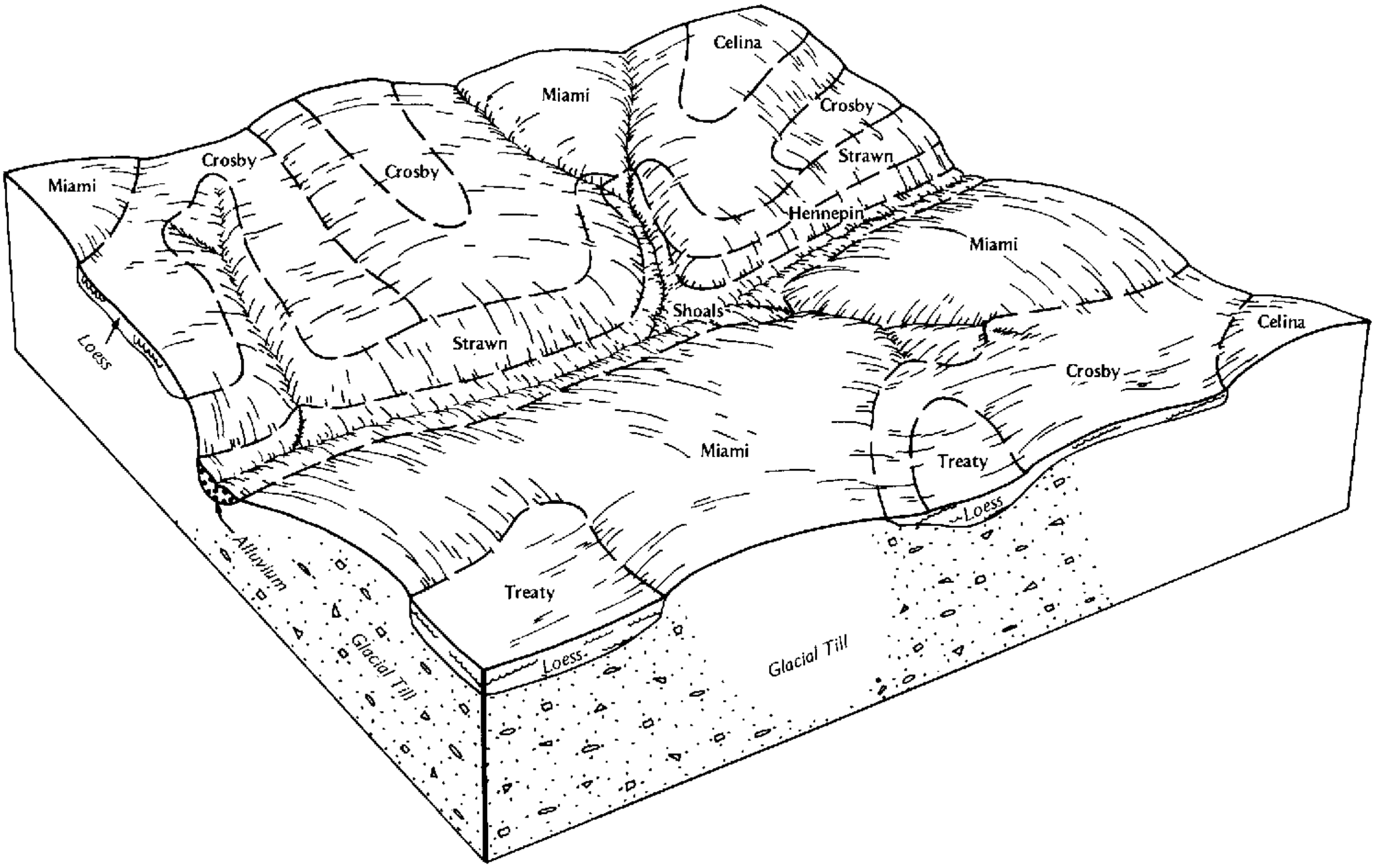

Figure 4.—Pattern of soils and parent material in the Miami-Crosby-Strawn association.

a surface layer of dark brown silt loam and a subsoil of dark brown clay loam and loam.

The somewhat poorly drained Crosby soils are in nearly level and gently sloping areas on ridgetops. Typically, the surface layer is dark grayish brown silt loam. The subsoil is grayish brown, mottled silty clay loam in the upper part; dark grayish brown, mottled clay loam in the next part; and brown, mottled loam in the lower part.

The well drained Strawn soils are in gently sloping to strongly sloping areas on severely eroded side slopes along drainageways. Typically, they have a surface layer of brown clay loam and a subsoil of yellowish brown clay loam.

Minor in this association are Treaty, Celina, Genesee, Stonelick, Shoals, and Hennepin soils. The very poorly drained Treaty soils are in narrow drainageways and shallow depressions. The moderately well drained Celina soils are on the lower slopes and slight knolls. The well drained Genesee and Stonelick and somewhat poorly drained Shoals soils are on flood plains along narrow drainageways and streams. The well drained Hennepin soils are on the steeper side slopes.

This association is generally used for cultivated crops or for pasture. A few areas are wooded. The major soils are well suited to cultivated crops and to hay and pasture. The main management concerns are the hazard of erosion and wetness. The soils are well suited to woodland. They are poorly suited to urban development, mainly because of slope, wetness, and restricted permeability.

5. Losantville-Crosby Association

Deep, nearly level to strongly sloping, well drained and somewhat poorly drained soils formed dominantly in glacial till; on uplands

This association consists of soils on broad ridgetops and side slopes along drainageways in the uplands. Slopes range from 1 to 18 percent.

This association makes up about 5 percent of the county. It is about 71 percent Losantville soils, 19 percent Crosby soils, and 10 percent minor soils.

The well drained Losantville soils are gently sloping to strongly sloping and are on side slopes along drainageways. Typically, they have a surface layer of brown silt loam and a subsoil of dark yellowish brown clay loam.

The somewhat poorly drained Crosby soils are nearly level and gently sloping and are on the higher, irregularly shaped flats and on low knolls. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of brown, mottled clay loam.

Minor in this association are the well drained Eldean soils on stream terraces, the well drained Genesee soils on flood plains, and the very poorly drained Treaty soils in depressions.

This association is generally used for cultivated crops or for pasture. A few areas are wooded. The major soils are well suited to cultivated crops. The main management concerns are the hazard of erosion and wetness. The soils are well suited to pasture and woodland. They are poorly suited to urban development, mainly because of wetness, slope, and restricted permeability.

Dominantly Nearly Level to Moderately Sloping Soils That Are Somewhat Poorly Drained, Very Poorly Drained, and Well Drained

These soils are on till plains and moraines. They make up about 20 percent of the county. Many areas are drained and are used for cultivated crops. The main management concerns are wetness and erosion. The soils are poorly suited to urban development because of restricted permeability and wetness.

6. Ragsdale-Treaty-Fincastle Association

Deep, nearly level, very poorly drained and somewhat poorly drained soils formed in loess and in loess and glacial till; on uplands

This association consists of soils in islandlike areas surrounded by depressions and swales on loess-covered uplands. Slopes range from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 21 percent Ragsdale soils, 19 percent Treaty soils, 14 percent Fincastle soils, and 46 percent minor soils.

The very poorly drained Ragsdale soils are in the swales and depressions where the loess cap is thicker. Typically, the surface layer is very dark brown silty clay loam. The subsoil is grayish brown, dark grayish brown, and yellowish brown silty clay loam.

The very poorly drained Treaty soils are in depressions and swales. Typically, the surface layer is very dark grayish brown silty clay loam. The subsoil is dark grayish brown, mottled silty clay loam in the upper part and brown, mottled clay loam in the lower part.

The somewhat poorly drained Fincastle soils are on islandlike, slight rises. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown, mottled silty clay loam and clay loam.

Minor in this association are Miami, Russell, Xenia, and Reesville soils and Haplaquepts. The well drained Miami and Russell and moderately well drained Xenia soils are in the more sloping areas. The somewhat poorly drained Reesville soils are on flats. The somewhat poorly drained and very poorly drained Haplaquepts are in disturbed areas.

This association is generally used for cultivated crops or for pasture. Some undrained areas are wooded. The major soils are well suited to cultivated crops and pasture and fairly well suited to woodland. Wetness is the main management concern. The soils are poorly suited to urban development, mainly because of wetness, ponding, frost action, and restricted permeability.

7. Crosby-Treaty Association

Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained soils formed in loess and glacial till; on uplands

This association consists of soils in islandlike areas surrounded by depressions and swales on uplands. Slopes range from 0 to 6 percent.

This association makes up 10 percent of the county. It is about 60 percent Crosby soils, 20 percent Treaty soils, and 20 percent minor soils.

The somewhat poorly drained Crosby soils are nearly level and gently sloping and are on islandlike knolls on the higher parts of the landscape. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of grayish brown and dark grayish brown, mottled silt loam and clay loam.

The very poorly drained Treaty soils are nearly level and are in depressions and swales. Typically, the surface layer is very dark grayish brown silty clay loam. The subsoil is dark grayish brown silty clay loam in the upper part and olive brown and grayish brown, mottled clay loam in the lower part.

Minor in this association are Strawn, Miami, Celina, Genesee, and Shoals soils. The well drained Strawn and Miami and moderately well drained Celina soils are on the sides of knolls and the larger drainageways. The well drained Genesee and somewhat poorly drained Shoals soils are on flood plains along small streams.

This association is generally used for cultivated crops or for pasture. Some undrained areas are wooded. The major soils are well suited to cultivated crops and pasture and fairly well suited to woodland. Wetness is the main management concern. The soils are poorly suited to urban development, mainly because of wetness, ponding, and restricted permeability.

8. Crosby-Losantville-Treaty Association

Deep, nearly level to moderately sloping, somewhat *poorly drained, well drained, and very poorly drained soils formed in glacial till and in loess and glacial till; on uplands*

This association consists of soils on side slopes and small flats and in drainageways and depressions on rolling uplands. Slopes range from 0 to 12 percent.

This association makes up about 8 percent of the county. It is about 42 percent Crosby soils, 34 percent Losantville soils, 15 percent Treaty soils, and 9 percent minor soils.

The somewhat poorly drained Crosby soils are nearly level and gently sloping and are on the higher, irregularly shaped flats and low knolls. Typically, they have a surface layer of dark grayish brown silt loam and a subsoil of brown, mottled clay loam.

The well drained Losantville soils are gently sloping and moderately sloping and are on side slopes along drainageways. Typically, they have a surface layer of brown loam and a subsoil of yellowish brown clay loam.

The very poorly drained Treaty soils are nearly level and are in depressions and narrow, shallow drainageways. Typically, the surface layer is very dark gray silty clay loam. The subsoil is dark grayish brown and olive brown silty clay loam in the upper part and dark brown, mottled clay loam in the lower part.

Minor in this association are the well drained Eldean soils on stream terraces, the well drained Genesee soils on flood plains along drainageways, and the moderately well drained Celina soils in gently sloping areas.

This association is generally used for cultivated crops or for pasture. A few areas are wooded. The major soils are well suited to cultivated crops. The main management concerns are the hazard of erosion, wetness, and large stones. The soils are fairly well suited to pasture and woodland. They are poorly suited to urban development, mainly because of wetness, slope, restricted permeability, and ponding.

Dominantly Gently Sloping to Very Steep Soils That Are Deep and Moderately Deep and Are Well Drained

These soils make up about 5 percent of the county. The less sloping soils are used for cultivated crops. Erosion and slope are the main limitations. The soils are poorly suited to urban development because of the slope, the depth to bedrock, and restricted permeability.

9. Miami-Wynn-Eden Association

Deep and moderately deep, gently sloping to very steep, well drained soils formed in glacial till, in material weathered from limestone and shale bedrock, and in glacial drift and material weathered from limestone and shale bedrock; on uplands

This association consists of soils on narrow ridges and steep side slopes adjacent to drainageways in the uplands. The Wynn and Eden soils are on bedrock-controlled topography. Slopes range from 2 to 50 percent.

This association makes up 5 percent of the county. It is about 23 percent Miami soils, 16 percent Wynn soils, 13 percent Eden soils, and 48 percent minor soils (fig. 5).

The well drained Miami soils are in gently sloping to steep areas on the slightly higher parts of the landscape. They are more than 60 inches deep over bedrock. Typically, they have a surface layer of dark brown silt loam and a subsoil of dark brown clay loam and loam.

The well drained Wynn soils are in gently sloping to strongly sloping areas above the Eden soils. The depth to bedrock is 20 to 40 inches. Typically, the surface layer is dark grayish brown silt loam. The subsoil is brown silty clay loam in the upper part and olive brown clay loam in the lower part.

The well drained Eden soils are in steep and very steep areas on the side slopes along drainageways. They are 20 to 40 inches deep over bedrock. Typically, they have a surface layer of dark grayish brown flaggy silty clay loam and a subsoil of yellowish brown flaggy silty clay.

Minor in this association are Treaty, Millsdale, Randolph, Crosby, Hennepin, Ockley, Stonelick, and Shoals soils. The very poorly drained Treaty soils are in depressions near the Miami soils. The very poorly drained Millsdale soils are in depressions and drainageways near the Wynn soils. The somewhat poorly drained Randolph soils are in nearly level areas near the Wynn soils. The somewhat poorly drained Crosby soils are in gently sloping areas near the Miami soils. The well drained Hennepin soils are on the steeper side slopes along drainageways. The well drained Ockley soils are on narrow terraces along drainageways. The well drained Stonelick and somewhat poorly drained Shoals soils are on flood plains along drainageways.

Some areas are used for cultivated crops or for pasture. Some are wooded. The gently sloping and moderately sloping areas of the major soils are fairly well suited and the more sloping areas poorly suited to cultivated crops. The main management concerns are the hazard of erosion and the slope. All of the major soils are well suited to pasture and woodland. They are poorly suited to urban development, mainly because of the slope, the depth to bedrock, and restricted permeability.

Broad Land Use Considerations

The soils in Wayne County generally are well suited to cultivated crops and poorly suited to urban development. Deciding which land should be used for urban development is important. Each year, a small amount of land is developed for urban uses in Richmond, Cambridge City, Hagerstown, and other towns. An estimated 37,000 acres in the county, or about 14 percent of the total acreage, is urban or built-up land. The general soil map is helpful in planning the general

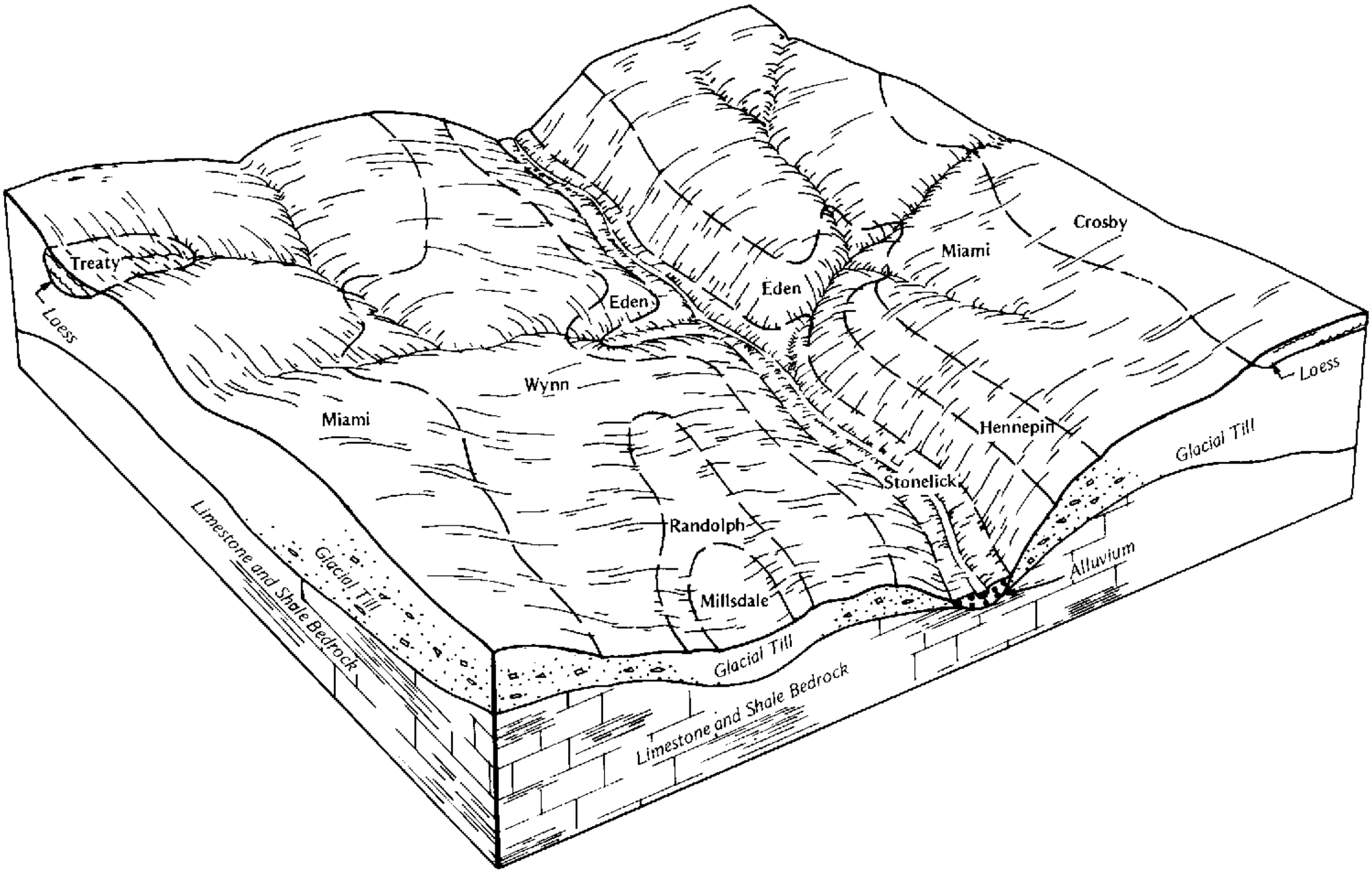

Figure 5.—Pattern of soils and parent material in the Miami-Wynn-Eden association.

outline of urban areas, but it cannot be used in the selection of sites for specific urban structures.

Areas where the soils are so unfavorable that urban development is not possible are extensive. In areas of the Stonelick association on flood plains, flooding is a severe hazard. Extensive drainage systems are needed on the wet soils in the Crosby-Treaty and Ragsdale-Treaty-Fincastle associations. The Crosby, Wynn, and Eden soils and the steeper Miami soils in the Miami-Crosby-Strawn and Miami-Wynn-Eden associations are severely limited as sites for urban development.

The Eldean-Ockley association has many sites that can be developed for urban uses. The Ockley and Eldean soils are well suited to urban development. The Ockley soils also are well suited to cultivated crops.

The Xenia-Russell-Miami, Miami-Crosby-Strawn, Losantville-Crosby, Ragsdale-Treaty-Fincastle, Crosby-Treaty, and Crosby-Losantville-Treaty associations are well suited to farming, but they are poorly suited to nonfarm uses, mainly because of wetness and moderately slow or slow permeability. The soils are well suited to farming because they generally have been sufficiently drained for farm crops.

The major soils in the Eldean-Ockley association are well suited to vegetables and other specialty crops. They are well drained and warm up earlier in the spring than the wetter soils.

Most of the soils in the county are well suited or fairly well suited to woodland. Commercially valuable trees are less common on the wetter soils in the Ragsdale-Treaty-Fincastle, Crosby-Treaty, and Crosby-Losantville-Treaty associations than on the soils in the other associations.

The Miami-Crosby-Strawn association is well suited to parks and extensive recreation areas. Hardwood forests enhance the beauty of some areas in this association. Undrained areas in the Crosby-Treaty association are good nature-study areas. All of the associations provide habitat for many important species of wildlife.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Miami silt loam, 2 to 6 percent slopes, eroded, is a phase in the Miami series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Urban land-Miami complex, 2 to 6 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits, Quarry, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The names, descriptions, and delineations of the soils identified on the detailed soil maps of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

CeB2—Celina silt loam, 1 to 5 percent slopes, eroded. This nearly level and gently sloping, deep, moderately well drained soil is on till plains and moraines. Individual areas are irregularly shaped and are 3 to 50 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsurface layer also is dark grayish brown silt loam. It is about 6 inches thick. The subsoil is yellowish brown and brown, mottled, firm clay loam about 20 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the loess cap is thicker. In other places the subsoil has less clay. In some areas the depth to glacial till is less than 24 or more than 40 inches. In areas around some of the small drainageways, the slope is more than 5 percent. In places the surface layer is dark yellowish brown clay loam.

Included with this soil in mapping are the somewhat poorly drained Crosby soils in the less sloping areas. Also included are small areas of the more sloping, well drained Losantville and Miami soils and some areas where most of the surface layer has been removed by erosion. Included soils make up about 15 percent of the unit.

Available water capacity is high in the Celina soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content. The water table is often at a depth of 2.0 to 3.5 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that help to control erosion and runoff are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture or hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The wetness and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings without basements. The wetness is a severe limitation on sites for dwellings with basements. A drainage system is needed to lower the water table. Strengthening foundations, footings, and basement walls, installing foundation drain tile, and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling and by wetness. Frost action and low strength are severe limitations on sites for local streets and roads. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The wetness and the restricted permeability are severe limitations if this soil is used as a site for septic tank absorption fields. The moderately slowly permeable material should be replaced with more permeable material. Installing perimeter drains around the outer edges of the absorption field helps to remove excess water.

The land capability classification is IIe. The woodland ordination symbol is 5A.

CrA—Crosby silt loam, 1 to 4 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on slight rises on till plains and moraines. Individual areas are irregular in shape and are 3 to 300 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer is grayish brown silt loam about 7 inches thick. The subsoil is about 13 inches thick. It is mottled and firm. The upper part is dark grayish brown clay loam, and the lower part is brown loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the loess cap is thicker. In other places the subsoil has less clay. In some areas the depth to glacial till is less than 20 or more than 40 inches. In areas around some of the small drainageways, the slope is more than 5 percent. In some areas the underlying material is stratified silt loam and sand. In other areas, the soil is on broad flats and has a slope of less than 1 percent.

Included with this soil in mapping are small areas of the very poorly drained Treaty soils in depressions. Also included are small areas of the well drained Losantville, Miami, and Strawn soils on slopes along drainageways and on dome-shaped islands on flats. Included soils make up about 15 percent of the unit.

Available water capacity is high in the Crosby soil. Permeability is slow. Surface runoff also is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a wide range in moisture content. The water table is often at a depth of 1 to 3 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. Many are used for pasture or are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. The seasonal high water table is the main limitation. Also, erosion is a hazard in the more sloping areas. Subsurface drains help to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion and maintain or improve tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and birdsfoot trefoil, for hay or pasture. It is better suited to grasses than to deep-rooted legumes unless subsurface drainage is improved. A drainage system is necessary. Grazing during wet periods can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The wooded areas are not drained. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The wetness is a severe limitation if this soil is used as a site for dwellings. A properly designed drainage system is needed in conjunction with storm drains. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The wetness and the restricted permeability are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. Perimeter drains help to remove excess water.

The land capability classification is IIe. The woodland ordination symbol is 4A.

CtA—Crosby silt loam, stony subsoil, 1 to 6 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on moraines and till plains. Individual areas are irregular in shape and are 3 to 75 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 13 inches thick. It is brown, mottled, firm silty clay loam, clay loam, and loam. It has stones more than 10 inches in diameter. The underlying material to a depth of about 60 inches is brown, mottled loam. In some places the subsoil and underlying material have fewer stones. In other places the loess cap is thicker. In some areas the subsoil has less clay. In other areas the depth to glacial till is less than 20 or more than 40 inches. In places the underlying material is stratified silt loam, gravelly loam, and sand. In some areas the soil is on broad flats and has a slope of less than 1 percent. In other areas the surface layer is dark brown loam.

Included with this soil in mapping are small areas of the very poorly drained Treaty soils in depressions. Also included are small areas of the gently sloping, well drained Losantville soils on knolls and on slopes along drainageways. Included soils make up about 15 percent of the unit.

Available water capacity is moderate in the Crosby soil. Permeability is slow. Surface runoff also is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a wide range in moisture content. Stones more than 10 inches in diameter are near the surface. They can hinder tillage. The water table is often at a depth of 1 to 3 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture or are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. Erosion is a hazard in the more sloping areas. The seasonal high water table is the major limitation. A subsurface drainage system can help to remove excess water. The stones more than 10 inches in diameter, however, can hinder the installation of subsurface drains. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion and maintain or improve tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and birdsfoot trefoil, for hay or pasture. A drainage system is necessary. Grazing during wet periods can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The wooded areas are not drained. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The wetness is a severe limitation if this soil is used as a site for dwellings. A properly designed drainage system is needed in conjunction with storm drains. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The wetness and the restricted permeability are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. Perimeter drains help to remove excess water.

The land capability classification is IIe. The woodland ordination symbol is 4A.

EdF—Eden flaggy silty clay loam, 25 to 40 percent slopes. This steep and very steep, moderately deep, well drained soil is on upland side slopes. Individual areas generally are long and narrow and are 10 to 60 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is dark grayish brown flaggy silty clay loam about 4 inches thick. The subsoil is dark yellowish brown, firm flaggy silty clay about 17 inches thick. The underlying material is yellowish brown flaggy clay about 15 inches thick. Weathered shale interbedded with thin layers of fractured limestone bedrock is at a depth of about 36 inches. In some areas the subsoil is clayey. In other areas the soil has fewer rock fragments throughout. In places most of the surface layer has been lost through erosion. In some small areas clay loam glacial till is within a depth of 20 inches.

Included with this soil in mapping are the well drained Miami and Strawn soils and the less sloping Wynn soils. Miami and Strawn soils are less clayey than the Eden soil. Also included are areas of the excessively drained

Rodman soils and small areas of soils that are less than 20 inches deep over bedrock. Rodman soils are in landscape positions similar to those of the Eden soil. Included soils make up less than 15 percent of the unit.

Available water capacity is low in the Eden soil. Permeability is slow. Surface runoff is very rapid. The organic matter content is moderate in the surface layer.

Most areas are used as woodland. A few are used for pasture. Because of the steep and very steep slope and a severe erosion hazard, this soil is generally unsuited to row crops and to hay and pasture. The slope severely limits the use of farm equipment. As a result, forage crops cannot be easily established and maintained. Overgrazing or grazing when the soil is too wet causes surface compaction and reduces plant density and plant hardiness. Proper stocking rates and timely deferment of grazing help to prevent surface compaction and maintain good plant density. Erosion is a hazard in heavily grazed areas.

This soil is fairly well suited to trees. The erosion hazard, the equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, culverts, and drop structures. Special logging methods, such as yarding the logs uphill with a cable, minimize the use of rubber-tired and crawler tractors. The trees should be logged only during dry periods. Planting is difficult because of the flaggy surface layer. Clearcutting should be avoided. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation or by cutting, spraying, or girdling. Some replanting may be needed.

Because of the slope, this soil is generally unsuited to dwellings. It is generally unsuited to septic tank absorption fields because of the slope, the slow permeability, and the depth to bedrock. The slope and low strength are severe limitations on sites for local roads. The roads should be constructed on the contour if possible. A more stable base material, such as sand or gravel, is needed.

The land capability classification is VIIe. The woodland ordination symbol is 4R.

EoA—Eldean loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains and terraces. It is moderately deep over gravelly loamy coarse sand. Individual areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is dark brown loam about 9 inches thick. The subsoil is about 25 inches thick. The upper part is brown, friable loam; the next part is brown and strong brown, firm clay loam and clay; and the lower part is brown, friable gravelly loam. The underlying material to a depth of about 60 inches is pale brown, loose gravelly loamy coarse sand. In a few areas the depth to the underlying material is more than 40 inches. In a few places the surface layer is silt loam. In some areas the subsoil is loamy. In other areas the underlying material is loam glacial till. In places the depth to sand and gravel is less than 20 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Sleeth soils in slight depressions. Also included are small areas of the very poorly drained Westland soils in depressions and a few small areas of gently sloping and moderately sloping soils on small rises and along drainageways. Included soils make up 5 to 10 percent of the unit.

Available water capacity is low in the Eldean soil. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain (fig. 6). Production is limited by the low available water capacity, particularly during years when rainfall is below normal or is poorly distributed. Returning crop residue to the soil and growing cover crops reduce the hazard of drought by conserving moisture. They also improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. It is better suited to deep-rooted legumes than to other species because of the low available water capacity. Drought is the major hazard. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

Limitations are slight if this soil is used as a site for dwellings with basements. The shrink-swell potential, however, is a moderate limitation on sites for dwellings without basements. Properly designing foundations and footings and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity in the underlying material is a severe limitation. It can result in the contamination of ground water. Either a modified disposal system or an alternative site is needed.

Figure 6.—Corn in an area of Eldean loam, 0 to 2 percent slopes.

The land capability classification is IIs. The woodland ordination symbol is 4A.

EoB2—Eldean loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on outwash plains and terraces. It is moderately deep over very gravelly coarse sandy loam. Individual areas are irregular in shape and are 3 to 75 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is brown loam about 8 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown and reddish brown, firm clay loam, and the lower part is reddish brown, firm gravelly clay loam. The underlying material to a depth of about 60 inches is yellowish brown very gravelly coarse sandy loam. In a few areas the depth to the underlying material is more than 40 inches. In some places it is less than 20 inches. In other places the subsoil is loamy. In some areas the underlying material is loam till. In other areas the surface layer is silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Sleeth soils on flats and small areas of the very poorly drained Westland soils in depressions. Also included are some small areas where most of the surface layer has been removed by erosion. Included soils make up about 5 to 10 percent of the unit.

Available water capacity is low in the Eldean soil. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops, hay, or pasture. A few small areas are wooded.

This soil is well suited to corn, soybeans, and small grain. Drought and erosion are the major hazards. Production is limited by the low available water capacity, particularly during years when rainfall is below normal or is poorly distributed. Crop rotations that include grasses and legumes and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion and improve or maintain tilth, the organic matter content, and the available water capacity.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Drought is a hazard. As a result, the soil is better suited to deep-rooted legumes than to other species. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

Limitations are slight if this soil is used as a site for dwellings with basements. The shrink-swell potential, however, is a moderate limitation on sites for dwellings without basements. Properly designing foundations and footings and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity in the underlying material is a severe limitation. It can result in the contamination of ground water. Either a modified disposal system or an alternative site is needed.

The land capability classification is IIe. The woodland ordination symbol is 4A.

EoC2—Eldean loam, 6 to 12 percent slopes, eroded. This moderately sloping, well drained soil is on outwash plains and terraces. It is moderately deep over very gravelly coarse sandy loam. Individual areas are irregular in shape and are 3 to 20 acres in size.

In a typical profile, the surface layer is brown loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is strong brown and brown, firm clay loam, and the lower part is dark brown, firm gravelly clay loam. The underlying material to a depth of about 60 inches is brown, loose very gravelly coarse sandy loam. In a few areas the soil is shallower to the underlying material. In places the surface layer is gravelly loam or gravelly clay loam. In some areas the subsoil is loamy. In other areas limestone bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of severely eroded soils. These soils make up about 10 to 15 percent of the unit.

Available water capacity is low in the Eldean soil. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few small areas are used for hay or pasture or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. Drought and erosion are the major hazards. Production is limited by the low available water capacity, particularly during years when rainfall is below normal or is poorly distributed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and winter cover crops help to prevent excessive soil loss, conserve moisture, and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Drought is a hazard. As a result, the soil is better suited to deep-rooted legumes than to other species. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings. Properly designing foundations and footings and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. The buildings should be designed so that they conform to the natural slope of the land. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity in the underlying material is a severe limitation. It can result in the contamination of ground water. A modified disposal system or one connected to a sanitary sewer system is needed.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

EoD2—Eldean loam, 12 to 18 percent slopes, eroded. This strongly sloping, well drained soil is on outwash plains and terraces. It is moderately deep over very gravelly coarse sandy loam. Individual areas are elongated and are 3 to 10 acres in size.

In a typical profile, the surface layer is brown loam about 7 inches thick. The subsoil is about 27 inches thick. The upper part is dark yellowish brown and dark brown, firm clay loam, and the lower part is dark brown, firm sandy clay loam. The underlying material to a depth of about 60 inches is yellowish brown very gravelly coarse sandy loam. In a few areas the soils are shallower to the underlying material. In some areas the subsoil is loamy. In other areas the surface layer is gravelly loam, gravelly clay loam, or silty clay loam. In places the underlying material is loam glacial till.

Included with this soil in mapping are small areas of severely eroded soils that have a clay loam surface layer. Also included are small areas of the excessively drained Rodman soils on the steeper slopes. Included soils make up less than 15 percent of the unit.

Available water capacity is low in the Eldean soil. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for hay or pasture. Some small areas are wooded.

This soil is poorly suited to corn and soybeans because of the hazard of erosion. A crop rotation dominated by grasses and legumes is the most effective means of controlling runoff and erosion. The slope hinders the use of farm machinery. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, and grassed waterways help to prevent excessive soil loss.

This soil is fairly well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet can cause surface compaction, excessive runoff and erosion, and poor tilth. Proper stocking rates, timely deferment of grazing, and pasture rotation help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are the erosion hazard, the equipment limitation, and plant competition. Proper road design and careful harvesting can help to control erosion and overcome the equipment limitation. Adequate site preparation and spraying, cutting, or girdling help to control plant competition.

The slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Erosion can be controlled during construction by building on the contour, by removing as little vegetation as possible, and by establishing a temporary plant cover as soon as possible in disturbed areas. The slope and low strength are severe limitations on sites for local roads and streets. The roads should be constructed on the contour if possible. The base should be strengthened with better suited material, such as sand or gravel.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity and the slope are severe limitations. The absorption field should be installed on the contour. A modified disposal system or one connected to a sanitary sewer system is needed.

The land capability classification is IVe. The woodland ordination symbol is 4R.

ExB3—Eldean clay loam, 2 to 6 percent slopes, severely eroded. This gently sloping, well drained soil is on outwash plains and terraces. It is moderately deep over gravelly coarse sandy loam. Individual areas are elongated, irregularly shaped, or oval and are 2 to 30 acres in size.

In a typical profile, the surface layer is dark yellowish brown clay loam about 9 inches thick. The subsoil is about 17 inches thick. The upper part is dark brown, firm clay loam, and the lower part is brown and dark brown, friable and firm gravelly loam. The underlying material to a depth of about 60 inches is yellowish brown, loose gravelly coarse sandy loam. In a few areas gravelly coarse sand is within a depth of 20 inches. In some areas the surface layer is reddish brown silty clay loam. In other areas gravelly loam is at a depth of about 20 inches. In places the subsoil is loamy.

Included with this soil in mapping are small areas of the somewhat poorly drained Sleeth soils on flats. Also included are a few small areas of the very poorly drained Mahalasville soils in depressions. Included soils make up about 10 to 15 percent of the unit.

Available water capacity is low in the Eldean soil. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is medium. The organic matter content is moderately low in the surface layer. This layer can become cloddy if tilled when the moisture content is too high.

Most areas are used for cultivated crops, hay, or pasture. This soil is fairly well suited to cultivated crops. Drought and erosion are the major hazards. Production is limited by the low available water capacity, particularly during years when rainfall is below normal or is poorly distributed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways help to prevent excessive soil loss, conserve moisture, and improve or maintain tilth.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Drought is a hazard. As a result, the soil is better suited to deep-rooted legumes than to other species. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

Limitations are slight if this soil is used as a site for dwellings with basements. The shrink-swell potential, however, is a moderate limitation on sites for dwellings without basements. Properly designing foundations and footings and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity is a severe limitation. It can result in the contamination of ground water. A modified disposal system is needed.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

ExC3—Eldean clay loam, 6 to 18 percent slopes, severely eroded. This moderately sloping and strongly sloping, well drained soil is on outwash plains and terraces. It is moderately deep over very gravelly coarse sandy loam. Individual areas are elongated, irregularly shaped, or oval and are 2 to 30 acres in size.

In a typical profile, the surface layer is dark yellowish brown clay loam about 10 inches thick. The subsoil is about 13 inches thick. It is strong brown and firm. The upper part is clay loam, and the lower part is gravelly clay loam. The underlying material to a depth of about 60 inches is brown, loose very gravelly coarse sandy loam. In a few areas gravelly coarse sand is within a depth of 20 inches. In some areas the surface layer is reddish brown silty clay loam. In other areas the depth to the underlying material is less than 20 inches. In places the subsoil is loamy.

Included with this soil in mapping are small areas of the very poorly drained Mahalasville soils in depressions. Also included are less sloping areas of less eroded Eldean soils and small areas of soils that are more than 40 inches deep over sand and gravel. Included soils make up 5 to 10 percent of the unit.

Available water capacity is low in the Eldean soil. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is rapid. The organic matter content is moderately low in the surface layer. This layer is firm and can become cloddy or compacted unless it is tilled within a fairly narrow range in moisture content.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is generally unsuited to corn, soybeans, and small grain. Establishing a seedbed and a uniform stand of corn commonly is difficult. Production is limited by the low available water capacity, particularly during years when rainfall is below normal or is poorly distributed.

This soil is fairly well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay and pasture. A cover of these plants is effective in controlling erosion. The soil is better suited to deep-rooted legumes than to grasses because of the low available water capacity. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The shrink-swell and the slope are moderate limitations if this soil is used as a site for dwellings. The buildings should be designed so that they conform to the natural slope of the land. Properly designing foundations and footings and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. Erosion and siltation of watercourses can be minimized by developing lot-size parcels of land as a unit, by disturbing as little of the surface as possible, by retaining as much of the existing vegetation as possible, and by revegetating the disturbed areas as soon as possible. Silting basins can control siltation.

Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel. The roads should be constructed on the contour and graded to shed water.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity is a severe limitation. The slope also is a limitation. A modified disposal system or one connected to a sanitary sewer is needed. The absorption field should be designed so that it conforms to the natural slope of the land. If the limitations cannot be overcome, an alternative site is needed.

The land capability classification is VIe. The woodland ordination symbol is 4A.

FcA—Fincastle silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on flats in the uplands and in small, islandlike areas surrounded by dark, depressional soils. Individual areas are irregularly shaped and are 5 to 30 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown, mottled silt loam about 6 inches thick. The subsoil is about 42 inches thick. It is mottled and firm. The upper part is dark grayish brown and brown silty clay loam, and the lower part is brown and dark grayish brown clay loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the soil has a thicker loess cap. In other places it has a thinner loess cap and contains less clay in the subsoil. In some areas the subsoil is clayey. In other areas the depth to loam glacial till is less than 40 inches. In places the underlying material is stratified silt loam and very fine sand.

Included with this soil in mapping are small areas of the very poorly drained Treaty soils in depressions. Also included are small areas of the gently sloping, well drained Russell and moderately well drained Xenia soils on slight rises. Included soils make up less than 10 percent of the unit.

Available water capacity is high in the Fincastle soil. Permeability is moderate in the upper part of the soil and moderately slow in the underlying material. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a wide range in moisture content. The water table is often at a depth of 1 to 3 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture or are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. The seasonal high water table is the major limitation. Subsurface drains help to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. A system of conservation tillage that leaves crop residue on the surface increases or maintains the organic matter content and helps to maintain good tilth.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and birdsfoot trefoil, for hay or pasture. Unless drained, it is better suited to grasses than to deep-rooted legumes. A drainage system is necessary. Grazing during wet periods can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The wetness is a severe limitation if this soil is used as a site for dwellings. A properly designed drainage system is needed in conjunction with storm drains. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The wetness and the restricted permeability are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. Perimeter drains help to remove excess water.

The land capability classification is IIw. The woodland ordination symbol is 4A.

Ge—Genesee silt loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. It is flooded for brief periods from late in fall through spring. Individual areas are long and narrow and are 5 to 100 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 12 inches thick. The subsoil is brown, friable silt loam about 12 inches thick. The underlying material to a depth of about 60 inches is brown and grayish brown silt loam and loam. In a few areas the soil is slightly acid or neutral throughout. In some places the surface layer and subsoil have less clay. In other places the surface layer is very dark grayish brown silty clay loam. In some areas the surface layer and subsoil are grayer. In other areas the soil has more sand. In a few areas the depth to the underlying material is less than 20 inches. In places the underlying material is sand and gravel within a depth of 20 inches or below a depth of 40 inches.

Included with this soil in mapping are a few areas of moderately well drained soils. Also included are areas of the somewhat poorly drained Shoals and very poorly drained Sloan soils in slight depressions. Included soils make up less than 15 percent of the unit.

Available water capacity is very high in the Genesee soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Many areas are wooded. Some are used for cultivated crops. A few are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Local flooding is a hazard, but it usually does not occur during the growing season. The fast velocity of the floodwater can cause scouring in areas used for row crops. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain or improve tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. The major concerns in managing pastured areas are overgrazing, grazing when the soil is wet, and the hazard of flooding. Grazing during wet periods causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

Because of the flooding, this soil is generally unsuited to dwellings and septic tank absorption fields. Alternative sites should be considered. The flooding is a severe hazard on sites for local roads and streets. Constructing the roads on raised, well compacted fill material helps to prevent flood damage.

The land capability classification is IIw. The woodland ordination symbol is 8A.

Hb—Haplaquepts, loamy. These nearly level, deep, somewhat poorly drained and very poorly drained soils are in an area that has been cut and filled. This area is irregular in shape and is about 475 acres in size.

In a typical profile, the surface layer is yellowish brown, mottled loam or silt loam about 8 inches thick. The next layer is brown, mottled, firm loam, silt loam, or clay loam about 24 inches thick. Below this is an original soil that had a surface layer of dark grayish brown or very dark grayish brown silt loam and a subsoil of grayish brown, mottled, firm silty clay loam or clay loam. In some areas the surface layer is grayish brown or yellowish brown clay loam. In other areas the subsoil is about 12 inches of grayish brown or yellowish brown, mottled, firm clay loam or silty clay loam and is underlain by yellowish brown, mottled loam or silt loam, which extends to a depth of 60 inches or more.

Included with these soils in mapping are undisturbed areas of the nearly level, somewhat poorly drained Fincastle and Reesville and very poorly drained Ragsdale soils in depressions. Also included are the moderately well drained Xenia soils on slightly higher parts of the landscape. Included soils make up less than 15 percent of the unit.

Available water capacity is high in the Haplaquepts. Permeability is moderately slow. Surface runoff is slow. The organic matter content is low in the surface layer. Tilth varies because of the diverse textures in the surface layer. The water table is often at or near the surface during winter and early spring.

Most areas are used for cultivated crops or hay. If drained, these soils are fairly well suited to corn, soybeans, and small grain. The seasonal high water table is the major limitation. Subsurface drains help to remove excess water. If the drainage system functions properly, a conservation cropping system that is dominanted by row crops is suitable. In areas where the underlying material has been exposed by filling or cutting, special treatment may be needed to change the reaction from mildly alkaline to neutral. Conservation tillage systems that leave crop residue on the surface or in the surface layer help to maintain or improve the organic matter content and tilth.

These soils are well suited to grasses and legumes, such as bromegrass, timothy, and clover, for hay. A drainage system is necessary.

The wetness is a severe limitation if these soils are used as sites for dwellings. It can be reduced by a subsurface drainage system. The wetness and frost action are severe limitations on sites for local roads and streets. Drainage ditches, culverts, and subsurface drains reduce the wetness. The base should be strengthened with better suited material. The wetness and the moderately slow permeability are severe limitations on sites for septic tank absorption fields. A modified disposal system is needed.

No land capability classification or woodland ordination symbol is assigned.

HeF—Hennepin loam, 25 to 50 percent slopes. This steep and very steep, deep, well drained soil is on hillsides and sharp breaks along drainageways. Individual areas are generally elongated and are 3 to 10 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is brown, friable loam about 8 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the subsoil has more clay. In other places the surface layer is dark yellowish brown clay loam. In some areas the part of the underlying material within a depth of 20 inches is stratified loam and very fine sand.

Included with this soil in mapping are a few areas of the moderately steep Miami soils. These soils are deeper to the underlying material than the Hennepin soil. Also included are a few areas where limestone bedrock is at a depth of about 24 inches. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Hennepin soil. Permeability is moderately slow. Surface runoff is very rapid. The organic matter content is moderate in the surface layer.

Most areas are used as woodland. Some are used for hay or pasture. Because of the steep and very steep slope and a severe erosion hazard, this soil is generally unsuited to cultivated crops. The slope limits the use of equipment.

This soil is poorly suited to grasses and legumes for pasture and is generally unsuited to hay because of the slope. Because of the equipment limitation, stands of forage crops cannot be easily established or maintained. Overgrazing is a management concern. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the erosion hazard and the equipment limitation. Plant competition also is a concern. Special harvesting equipment is needed. Logging roads should be constructed on the contour. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling.

Because of the slope, this soil is generally unsuited to dwellings, local roads and streets, and septic tank absorption fields.

The land capability classification is VIIe. The woodland ordination symbol is 5R.

Hu—Houghton muck, undrained. This nearly level, deep, very poorly drained soil is in depressional areas on uplands and outwash plains. It is frequently ponded by runoff from the higher lying adjacent areas. Individual areas are generally round and are 5 to 15 acres in size.

In a typical profile, the surface layer is dark reddish brown muck about 9 inches thick. Below this to a depth of about 60 inches is black and olive gray muck. In narrow strips around the edge of most areas, the muck is less than 50 inches thick. In some small areas less than 50 inches of organic material overlies sandy or loamy material or marl. In some places the surface layer is mucky silt loam. In other places sandy or loamy material is within a depth of 24 inches.

Included with this soil in mapping are many narrow strips of the mineral, very poorly drained Mahalasville soils. These soils make up less than 15 percent of the unit.

Available water capacity is very high in the Houghton soil. Permeability is moderate. Surface runoff is very slow. The organic matter content is very high in the surface layer. The water table is near or above the surface during late winter and early spring.

Most areas are not drained and are used as wetland wildlife habitat. Some are used as permanent pasture. A few are drained and used for cultivated crops. The natural vegetation of sedges, cattails, and water-tolerant grasses, trees, and shrubs provides good habitat for wetland wildlife. Wildlife benefit from the abundance of protective cover and from the seed-bearing woody shrubs.

This soil is generally unsuited to corn, soybeans, and hay. The wetness is a serious limitation. Since most areas are depressional and do not have suitable outlets, a drainage system is commonly not feasible. This soil is well suited to reed canarygrass for pasture.

This soil is poorly suited to trees, but hardwoods commonly grow around the perimeter of the mapped areas. Plant competition, seedling mortality, the equipment limitation, and the windthrow hazard are management concerns. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. The trees that can withstand the wetness should be selected for planting. Equipment should be used only when the ground is frozen because of the high water table and the unstable soil material. Plant competition can be controlled by adequate site preparation or by spraying, cutting, or girdling.

Because of the ponding, this soil is generally unsuited to dwellings and septic tank absorption fields. The ponding, frost action, and low strength are severe limitations on sites for local roads. Replacing the muck with better suited base material and elevating the roadbed help to overcome these limitations.

The land capability classification is Vw. The woodland ordination symbol is 2W.

LbB2—Losantville silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on rises and along drainageways on moraines. Individual areas are irregular in shape and are 10 to 70 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is dark yellowish brown, firm clay about 9 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In a few places the subsoil is thicker. In some places the surface layer is loam. In other places the subsoil has less clay. In some areas the underlying glacial till is within a depth of 10 inches or below a depth of 20 inches. In a few areas the surface layer is dark yellowish brown clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby soils on small flats. Also included are areas of the very poorly drained Treaty soils in depressions or drainageways and areas where most of the surface layer has been removed by erosion. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, and grassed waterways help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the major management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

Limitations are slight if this soil is used as a site for dwellings without basements. The wetness, however, is a moderate limitation on sites for dwellings with basements. It can be controlled by backfilling along footings and basement walls with coarser textured material and by installing foundation drain tile. Frost action is a moderate limitation on sites for local roads and streets. It can be controlled by providing adequate road ditches and culverts.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIe. The woodland ordination symbol is 4A.

LbC2—Losantville silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on knobs and breaks along drainageways on moraines. Individual areas generally are elongated and irregular in shape and are 5 to 30 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is dark yellowish brown, firm clay about 13 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In places the subsoil is thicker and has less clay. In a few places the surface layer is dark yellowish brown loam or clay loam. In some areas the loam glacial till is at a depth of less than 10 or more than 20 inches. In other areas the underlying material is sand and gravel.

Included with this soil in mapping are small areas of the less sloping, somewhat poorly drained Crosby soils on small flats. Also included are small areas of the very poorly drained Treaty soils on the bottom of small drainageways and areas where most of the surface layer has been removed by erosion. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, grassed waterways, and grade stabilization structures. Regular additions of organic material improve fertility and tilth, help to prevent crusting, and increase the rate of water infiltration.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the major management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The slope and the wetness are moderate limitations if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Backfilling along footings and basement walls with coarser textured material and installing foundation drain tile help to control the wetness. Erosion can be minimized by disturbing as little of the surface as possible and by revegetating as soon as possible after construction. Topsoil should be stockpiled before construction and replaced after construction.

Frost action and the slope are moderate limitations on sites for local roads and streets. Frost action can be controlled by replacing the base material and providing adequate road ditches and culverts. The roads should be constructed on the contour and graded to shed water.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification symbol is IIIe. The woodland ordination symbol is 4A.

LbD2—Losantville silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on narrow ridges and side slopes in the uplands. Individual areas are elongated and are 3 to 10 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is dark brown, firm clay about 12 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some areas the surface layer is clay loam. In other areas the loam glacial till is within a depth of 10 inches. In places the subsoil is thicker and has less clay.

Included with this soil in mapping are a few areas of the gently sloping, somewhat poorly drained Crosby soils on ridgetops and small areas of the very poorly drained Treaty soils on the bottom of narrow drainageways. Also included are areas where most of the surface layer has been removed by erosion. Included soils make up less than 15 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Many areas of this soil are used for hay or pasture. Many are wooded. Some are used for cultivated crops.

Because of the hazard of erosion, this soil is poorly suited to corn, soybeans, and small grain. Small grain can be occasionally grown to reestablish stands of grasses and legumes. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, and grassed waterways help to prevent excessive soil loss. A crop rotation dominated by grasses and legumes is the most effective means of controlling runoff and erosion.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The major management concerns are the hazard of erosion, the equipment limitation, and plant competition. Proper road design and careful harvesting can help to control erosion and overcome the equipment limitation. The trees should be harvested during dry periods or when the ground is frozen. Special harvesting equipment may be needed because of the slope. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling.

The slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. If large areas are developed, erosion is a hazard. The existing vegetation should be retained where possible, and only small areas should be disturbed. Topsoil should be stockpiled before construction and replaced after construction. Disturbed areas should be revegetated as soon as possible. Diversions and grassed waterways can be used between lots to control erosion. Silting basins can control siltation of nearby streams.

The slope is a severe limitation on sites for local roads and streets. It can be overcome by cutting and filling and by building the roads and streets on the contour where possible.

The restricted permeability and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. The absorption field should be designed so that it conforms to the natural slope of the land.

The land capability classification is IVe. The woodland ordination symbol is 4R.

LcC3—Losantville clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on knobs and breaks along drainageways on moraines. Individual areas generally are elongated and irregular in shape and are 5 to 60 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is brown clay loam about 7 inches thick. The subsoil is dark yellowish brown and brown, firm clay loam about 9 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the subsoil is thicker and has less clay. In other places it is silty. In some areas the calcareous loam till is at the surface. In a few areas the surface layer is dark yellowish brown clay. In places it is silt loam or loam.

Included with this soil in mapping are a few small areas of the nearly level and gently sloping, somewhat poorly drained Crosby and very poorly drained Treaty soils on the bottom of drainageways. These soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderately low in the surface layer. This layer is firm and can become cloddy if it is tilled when the moisture content is too high.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is poorly suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Examples are a crop rotation dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, grassed waterways, and grade stabilization structures. Regular additions of organic material improve fertility and tilth, help to prevent crusting, and increase the rate of water infiltration.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The slope and the wetness are moderate limitations if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. A drainage system is needed on sites for dwellings with basements. Because of the erosion hazard, as much of the existing vegetation as possible should be retained and a plant cover should be reestablished in disturbed areas as soon as possible.

Frost action and the slope are moderate limitations on sites for local roads and streets. Frost action can be controlled by replacing the base material and providing adequate road ditches and culverts. The roads should be constructed on the contour and graded to shed water.

The restricted permeability and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. The absorption field should be designed so that it conforms to the natural slope of the land.

The land capability classification is IVe. The woodland ordination symbol is 4A.

LcD3—Losantville clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on narrow ridges and side slopes in the uplands. Individual areas are elongated and are 3 to 20 acres in size.

In a typical profile, the surface layer is dark brown clay loam about 6 inches thick. The subsoil is dark yellowish brown, firm clay about 9 inches thick. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the surface layer is silt loam or loam. In other places the subsoil is thicker and has less clay. In some areas it is silty. In other areas the calcareous loam till is at the surface. In a few areas the surface layer is dark yellowish brown clay. In places it is silt loam or loam.

Included with this soil in mapping are a few areas of the gently sloping, somewhat poorly drained Crosby soils on ridgetops. Also included are small areas of the very poorly drained Treaty soils on the bottom of narrow drainageways. Included soils make up less than 15 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderately low in the surface layer. This layer is firm and can become cloddy if it is tilled when the moisture content is too high.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is generally unsuited to corn, soybeans, and small grain because of the hazard of erosion.

This soil is fairly well suited to pasture grasses and legumes, such as bromegrass, timothy, and alfalfa, and is poorly suited to hay. A cover of pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The major management concerns are the hazard of erosion, the equipment limitation, and plant competition. Proper road design and careful harvesting can help to control erosion and overcome the equipment limitation. The trees should be harvested during dry periods or when the ground is frozen. Special harvesting equipment may be needed because of the slope. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling.

The slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they comform to the natural slope of the land. If large areas are developed, erosion is a hazard. The existing vegetation should be retained where possible, and only small areas should be disturbed. Topsoil should be stockpiled before construction and replaced after construction. Disturbed areas should be revegetated as soon as possible. Diversions and grassed waterways can be used between lots to control erosion. Silting basins can control siltation of nearby streams.

The slope is a severe limitation on sites for local roads and streets. It can be overcome by building the roads and streets on the contour where possible.

The restricted permeability and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. The absorption field should be designed so that it conforms to the natural slope of the land.

The land capability classification is VIe. The woodland ordination symbol is 4R.

LeB2—Losantville loam, stony subsoil, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on rises on moraines and along drainageways. Individual areas are irregular in shape and are 5 to 60 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown loam about 7 inches thick. The subsoil is yellowish brown, firm clay loam about 11 inches thick. It contains stones. The underlying material to a depth of about 60 inches is yellowish brown loam. In a few places the subsoil is thicker. In some places the surface layer is silt loam. In other places the subsoil has less clay. In some areas the depth to the underlying material is less than 10 or more than 20 inches. In a few areas the surface layer is dark yellowish brown clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby soils on small flats and areas of the very poorly drained Treaty soils in depressions or drainageways. Also included are some small areas where most of the surface layer has been removed by erosion. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content. Stones more than 10 inches in diameter are near the surface. They can hinder tillage.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, and grassed waterways help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth.

Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

Limitations are slight if this soil is used as a site for dwellings without basements. The wetness, however, is a moderate limitation on sites for dwellings with basements. It can be reduced by subsurface drains. Frost action is a moderate limitation on sites for local roads and streets. It can be controlled by adequate road ditches and culverts.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIe. The woodland ordination symbol is 4A.

LxC3—Losantville clay loam, stony subsoil, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on knolls and breaks along drainageways on moraines and till plains. Individual areas generally are elongated and irregular in shape and are 3 to 30 acres in size.

In a typical profile, the surface layer is dark yellowish brown clay loam about 8 inches thick. The subsoil is yellowish brown, firm clay loam about 5 inches thick. It contains stones. The underlying material to a depth of about 60 inches is light yellowish brown loam. In some areas the surface layer and some of the subsoil have been removed by erosion. In these areas the light colored, calcareous underlying material is at or near the surface. In other areas the subsoil is thicker and has less clay. In places the subsoil is silty. In a few areas the surface layer is dark yellowish brown clay. In other areas it is silt loam or loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby soils on small flats. Also included are small areas of the very poorly drained Treaty soils in small drainageways. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Losantville soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderately low in the surface layer. This layer is firm and can become cloddy and hard if it is tilled when the moisture content is too high. Stones more than 10 inches in diameter are near the surface. They can hinder tillage.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is fairly well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The slope and the wetness are moderate limitations if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. A drainage system is needed on sites for dwellings with basements. Erosion can be minimized by disturbing as little of the surface as possible and by revegetating as soon as possible after construction. Topsoil should be stockpiled before construction and replaced after construction.

The slope and frost action are moderate limitations on sites for local roads and streets. Frost action can be controlled by replacing the base material and providing adequate road ditches and culverts. The roads should be constructed on the contour and graded to shed water.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IVe. The woodland ordination symbol is 4A.

Ma—Mahalasville silt loam. This nearly level, deep, very poorly drained soil is in depressions on terraces and moraines. It is frequently ponded by runoff from the higher lying adjacent areas. Individual areas are irregular in shape and are 5 to 75 acres in size. The dominant size is about 10 acres.

In a typical profile, the surface layer of very dark grayish brown silt loam is about 10 inches thick. The subsurface layer is very dark gray, mottled silty clay loam about 6 inches thick. The subsoil is about 31 inches thick. It is mottled and firm. The upper part is gray silty clay loam, and the lower part is pinkish gray silt loam. The underlying material to a depth of about 60 inches is dark gray and brown, mottled silt loam. In a few small areas gravel and sand are within a depth of 60 inches. In some areas the surface layer is lighter colored. In other areas it is mucky silt loam or silty clay loam. In places 10 to 15 inches of recent alluvium overlies the dark grayish brown or very dark grayish brown surface layer.

Included with this soil in mapping are a few small areas of somewhat poorly drained soils on slight rises. Also included are small areas of Eldean and Ockley soils on the slopes surrounding the Mahalasville soil. Included soils make up less than 10 percent of the unit.

Available water capacity is high in the Mahalasville soil. Permeability is slow in the upper part of the soil and moderately rapid in the underlying material. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content. The water table is near or above the surface during winter and early spring.

Most areas of this soil are used for cultivated crops, hay, or pasture. A few small areas support native hardwoods that can withstand wetness.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness caused by ponding and the seasonal high water table is the major limitation. Surface drains, subsurface drains, or open ditches are needed to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. A system of conservation tillage that leaves crop residue on the surface helps to maintain tilth and the organic matter content. The soil is well suited to fall plowing or chiseling.

This soil is well suited to grasses and legumes, such as reed canarygrass and white clover, for hay or pasture. It is better suited to grasses than to deep-rooted legumes because of the wetness. A drainage system is needed. Grazing during wet periods can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Windthrown trees should be periodically removed. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the ponding, this soil is generally unsuited to dwellings and sanitary facilities. The ponding, low strength, and frost action are severe limitations on sites for local roads and streets. Surface and subsurface drains help to control the ponding. The base should be strengthened with better suited material, such as sand or gravel.

The land capability classification is IIw. The woodland ordination symbol is 5W.

MnB2—Miami silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on rises on till plains and moraines and along drainageways. Individual areas are irregular in shape and are 3 to 30 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part is dark yellowish brown, friable loam; the next part is dark yellowish brown, firm clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the subsoil is thinner and has more clay. In other places the silty mantle is thicker. In some areas the underlying material is loose sand and gravel. In other areas the soil has stratified silt loam and sand at a depth of 40 to 60 inches. In places the depth to the underlying material is more than 40 inches.

Included with this soil in mapping are a few areas of the somewhat poorly drained Crosby soils on small flats. Also included are areas of the very poorly drained Treaty soils on the bottom of drainageways. Included soils make up less than 15 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and runoff are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, grassed waterways, and grade stabilization structures. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling.

Frost action, the shrink-swell potential, and low strength are moderate limitations on sites for local roads and streets. They can be overcome by providing adequate road ditches and culverts and by strengthening or replacing the base material.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIe. The woodland ordination symbol is 5A.

MnC2—Miami silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on knobs and breaks along drainageways in the uplands. Individual areas generally are elongated and irregular in shape and are 3 to 30 acres in size. The dominant size is about 15 acres.

In a typical profile, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil is about 23 inches thick. The upper part is brown, firm clay loam, and the lower part is yellowish brown, firm clay loam and loam. The underlying material to a depth of about 60 inches is light yellowish brown loam. In some places the surface layer is clay loam. In other places the subsoil has more clay and is thinner. In some areas the silty mantle is thicker. In other areas the underlying material is loose sand and gravel. In places the soil has stratified silt loam and sand at a depth of 40 to 60 inches.

Included with this soil in mapping are a few areas of the less sloping, somewhat poorly drained Crosby soils on small flats and a few small areas of the nearly level or depressional, very poorly drained Treaty soils on the bottom of drainageways. Also included are some small areas where most of the surface layer has been removed by erosion. Included soils make up less than 10 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Many are used for hay or pasture or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, grassed waterways, and grade stabilization structures. Regular additions of organic material help to control erosion, conserve moisture, and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture (fig. 7). A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Properly designing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Erosion can be minimized by disturbing as little of the surface as possible and by revegetating as soon as possible after construction. Topsoil should be stockpiled before construction and replaced after construction.

Frost action, the slope, and the shrink-swell potential are moderate limitations on sites for local roads and streets. Strengthening or replacing the base material and providing adequate road ditches and culverts help to prevent the road damage caused by frost action and by shrinking and swelling. The roads should be constructed on the contour and graded to shed water.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

MnD2—Miami silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on narrow ridges and side slopes in the uplands. Individual areas are elongated and are 3 to 10 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 22 inches thick. The upper part is brown, firm clay loam; the next part is brown and very dark grayish brown, firm clay loam; and the lower part is brown, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In some places the surface layer is clay loam. In other places the subsoil has more clay and is thinner. In some small areas the underlying material is loose sand and gravel. In some areas the soil has stratified silt loam and sand at a depth of 40 to 60 inches.

Included with this soil in mapping are a few areas of the moderately well drained Celina soils on narrow ridgetops and small areas of the well drained Hennepin soils on the adjacent slopes. The subsoil of the Hennepin soils is thinner than that of the Miami soil. Also included are small areas of the very poorly drained

Figure 7.—Bromegrass and alfalfa hay in an area of Miami silt loam, 6 to 12 percent slopes, eroded.

Treaty soils on the bottom of drainageways and some areas where most of the surface layer has been removed by erosion. Included soils make up less than 15 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for hay or pasture. Many are wooded. Some are used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grain because of the hazard of erosion. Small grain can be occasionally grown to reestablish stands of grasses and legumes. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, and grassed waterways help to prevent excessive soil loss. A crop rotation dominated by grasses and legumes is the most effective means of controlling runoff and erosion.

This soil is fairly well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. If large areas are developed, erosion is a hazard. The existing vegetation should be retained where possible, and only small areas should be disturbed. Topsoil should be stockpiled before construction and replaced after construction. Disturbed areas should be revegetated as soon as possible. Diversions and grassed waterways can be used between lots to control erosion. Silting basins can control siltation of nearby streams. The slope is a severe limitation on sites for local roads and streets. It can be overcome by building the roads and streets on the contour where possible.

The restricted permeability and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. The absorption field should be enlarged and installed on the contour and should be designed so that the effluent does not surface at the base of the slopes. If the limitations cannot be overcome, an alternative site is needed or the septic tank system should be connected to commercial sewers and treatment facilities.

The land capability classification is IVe. The woodland ordination symbol is 5A.

MnE—Miami silt loam, 18 to 25 percent slopes. This moderately steep, deep, well drained soil is on side slopes along drainageways. Individual areas are irregular in shape and are 3 to 20 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is pale brown loam about 3 inches thick. The subsoil is about 19 inches thick. The upper part is dark brown and yellowish brown, firm clay loam, and the lower part is yellowish brown, firm loam. The underlying material to a depth of about 60 inches is light yellowish brown loam. In some areas the surface layer is clay loam. In other areas the subsoil has more clay and is thinner. In places the slope is less than 18 percent.

Included with this soil in mapping are a few areas of the well drained Hennepin soils on the adjacent slopes. The subsoil of these soils is thinner than that of the Miami soil. Also included are a few small areas where most of the surface layer has been removed by erosion. Included soils make up less than 10 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is rapid. The organic matter content is moderate in the surface layer.

Most areas are wooded. Some are used for hay or pasture. This soil is generally unsuited to corn, soybeans, and small grain because of a severe hazard of erosion.

This soil is fairly well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture. A cover of these plants is effective in controlling erosion. The slope limits the use of farm machinery. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are the erosion hazard, the equipment limitation, and plant competition. Special harvesting and planting equipment may be needed because of the slope. Clearcutting and disturbing the surface can cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling.

Because of the slope, this soil is generally unsuited to dwellings. The slope is a severe limitation on sites for local roads. It can be overcome by building the roads on the contour where possible. Because of the restricted permeability and the slope, the soil is generally unsuited to septic tank absorption fields.

The land capability classification is VIe. The woodland ordination symbol is 5R.

MnF—Miami silt loam, 25 to 50 percent slopes. This very steep, deep, well drained soil is on side slopes along drainageways. Individual areas are elongated and irregular in shape and are 5 to 350 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 22 inches of yellowish brown, firm clay loam and silt loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In some areas the surface layer is loam or gravelly loam. In other areas the subsoil is thinner and has more clay. In places the slope is less than 25 percent.

Included with this soil in mapping are a few areas of the well drained Hennepin soils on the adjacent slopes. These soils have a subsoil that is thinner than that of the Miami soil. They make up 5 to 10 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is very rapid. The organic matter content is moderate in the surface layer.

Most areas are wooded. A few are used for pasture. This soil is generally unsuited to cultivated crops and to hay and pasture because of the slope, which severely restricts the use of equipment.

This soil is poorly suited to trees. The major management concerns are the hazard of erosion, the equipment limitation, and plant competition. Special harvesting equipment may be needed because of the slope. Proper road design and careful harvesting can help to control erosion and overcome the equipment limitation. The trees should be harvested during dry periods or when the ground is frozen. Clearcutting should be avoided. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling.

Because of the slope, this soil is generally unsuited to dwellings. The slope is a severe limitation on sites for local roads. It can be overcome by building the roads on the contour where possible. Because of the slope and the restricted permeability, the soil is generally unsuited to septic tank absorption fields.

The land capability classification is VIIe. The woodland ordination symbol is 5R.

MrA—Miami silt loam, gravelly substratum, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on till plains and moraines. Individual areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown and yellowish brown, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown loam. Gravelly material is at a depth of 5 to 8 feet. In some areas it is stratified. In other areas the depth to the underlying material is greater. In some places the subsoil has more clay. In other places 20 to 40 inches of loamy outwash overlies the loam glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby and very poorly drained Treaty soils in shallow depressions. These soils make up 7 to 15 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. No major limitations or hazards affect cropping. A conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain or increase the organic matter content and help to maintain good tilth.

The soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture or hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

The restricted permeability is a moderate limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is I. The woodland ordination symbol is 5A.

MrB2—Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on till plains and moraines and along drainageways. Individual areas are irregular in shape and are 5 to 50 acres in size. The dominant size is about 15 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 dark brown and dark yellowish brown, firm clay loam, and the lower part is yellowish brown, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. Gravelly material is at a depth of 5 to 8 feet. In some places it is stratified. In other places the depth to the underlying material is greater. In some areas the subsoil has more clay. In other areas 20 to 40 inches of loamy outwash overlies the loam glacial till. In places the surface layer is dark yellowish brown clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby and very poorly drained Treaty soils in shallow depressions and drainageways. These soils make up 2 to 10 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, and grassed waterways help to prevent excessive soil loss and improve or maintain tilth.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture or hay. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

The restricted permeability is a moderate limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIe. The woodland ordination symbol is 5A.

MrC2—Miami silt loam, gravelly substratum, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on breaks along drainageways in the uplands. Individual areas are elongated or irregular in shape and are 3 to 20 acres in size.

In a typical profile, the surface layer is brown silt loam about 5 inches thick. The subsoil is about 27 inches thick. The upper part is brown, firm silty clay loam; the next part is brown, firm clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. Gravelly material is at a depth of 5 to 8 feet. In some places it is stratified. In other places the depth to the underlying material is greater. In some areas the subsoil has more clay. In other areas 20 to 40 inches of loamy outwash overlies the loam glacial till. In places the surface layer is dark yellowish brown clay loam.

Included with this soil in mapping are small areas of the very poorly drained Treaty soils and a few small areas where most of the surface layer has been removed by erosion. Included soils are in drainageways. They make up 2 to 8 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Many areas of this soil are used for cultivated crops. Some are used for hay or pasture or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, grassed waterways, and grade stabilization structures.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture or hay. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. Properly designing foundations and footings and backfilling with sand and gravel help to prevent the structural damage caused by shrinking and swelling. The dwellings should be designed so that they conform to the natural slope of the land. Erosion can be controlled by developing lot-size parcels of land as a unit, by retaining as much of the existing vegetation as possible, and by reestablishing a plant cover in disturbed areas as soon as possible. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

The slope and the restricted permeability are moderate limitations if this soil is used as a site for septic tank absorption fields. Grading helps to modify the slope. Increasing the size of the absorption field helps to overcome the restricted permeability.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

Ms—Millsdale silty clay loam. This nearly level, moderately deep, very poorly drained soil is in depressions, swales, and narrow drainageways on till plains and terraces. It is frequently ponded by runoff from the higher lying adjacent areas. Individual areas generally are oval or long and narrow and are 10 to 80 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is very dark gray silty clay loam about 10 inches thick. The subsoil is about 10 inches thick. It is mottled and firm. The upper part is very dark gray silty clay loam, and the lower part is light brownish gray channery clay. The underlying material is light yellowish brown flaggy clay loam about 8 inches thick. Fractured, interbedded limestone and shale bedrock is at a depth of about 28 inches. In some places the depth to bedrock is more than 40 or less than 20 inches. In other places the surface layer is mucky silty clay loam. In some areas the subsoil is loamy. In other areas 20 to 40 inches of silty material overlies loam glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Randolph soils on the slightly higher convex slopes. Also included, along drainageways, are the well drained Wynn soils, which are more sloping than the Millsdale soil. Included soils make up less than 10 percent of the unit.

Available water capacity is low in the Millsdale soil. Permeability is moderately slow. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if tilled when too wet. The root zone may be restricted by the bedrock within a depth of 40 inches. The seasonal high water table is near or above the surface during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or support native hardwoods that can withstand wetness.

This soil is fairly well suited to corn, soybeans, and small grain. Most areas have been drained by subsurface and surface drains. The wetness and the depth to bedrock are the major limitations. The bedrock can hinder the installation of subsurface drains. A surface drainage system may be required if the soil is not deep enough for subsurface tile drainage. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or maintains tilth and the organic matter content. The soil is well suited to fall plowing or chiseling.

This soil is well suited to grasses and legumes, such as reed canarygrass and white clover, for hay or pasture. A drainage system is necessary. Overgrazing reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Windthrown trees should be periodically removed. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the ponding and the shrink-swell potential, this soil is generally unsuited to dwellings. It is generally unsuited to septic tank absorption fields because of the ponding, the moderately slow permeability, and the depth to bedrock. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. A drainage system is needed to reduce the wetness and thus the hazard of frost action. The base should be strengthened with better suited material, such as sand or gravel.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

OcA—Ockley silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad outwash plains and terraces. Individual areas are irregular in shape and are 10 to 100 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 40 inches thick. The upper part is brown, friable silty clay loam, and the lower part is dark yellowish brown, firm and friable clay loam and sandy clay loam. The underlying material to a depth of about 60 inches is brown very gravelly coarse sand. In a few areas the soil is shallower to the underlying material. In some areas the subsoil has more clay. In some places the underlying material is stratified loam, sandy loam, and silt loam. In other places it is loam till.

Included with this soil in mapping are small areas of the somewhat poorly drained Sleeth and very poorly drained Westland soils in slight depressions. These soils make up 5 to 10 percent of the unit.

Available water capacity is high in the Ockley soil. Permeability is moderate in the upper part of the soil and very rapid in the underlying material. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops, hay, or pasture. Some are wooded.

This soil is well suited to corn, soybeans, and small grain. Winter cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain the organic matter content and fertility and improve tilth.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture or hay. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel. Limitations are slight if the soil is used as a site for septic tank absorption fields.

The land capability classification is I. The woodland ordination symbol is 5A.

OcB2—Ockley silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on outwash plains and terraces. Individual areas are irregular in shape and are 3 to 15 acres in size.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam, and the lower part is dark yellowish brown, firm clay loam. The underlying material to a depth of about 60 inches is light brownish gray gravelly coarse sand. In a few areas the soil is shallower to the underlying material. In some places the subsoil has more clay. In other places the surface layer is loam or clay loam. In some areas the underlying material is loam till. In other areas it is stratified loam, sandy loam, and silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Sleeth and very poorly drained Westland soils in slight depressions. These soils make up 5 to 10 percent of the unit.

Available water capacity is high in the Ockley soil. Permeability is moderate in the upper part of the soil and very rapid in the underlying material. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil is used for cultivated crops, hay, or pasture. Some are wooded.

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for pasture or hay. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel. Limitations are slight if the soil is used as a site for septic tank absorption fields.

The land capability classification is IIe. The woodland ordination symbol is 5A.

Or—Orthents, loamy. These nearly level to moderately sloping, deep, somewhat excessively drained soils occur as spoil from gravel pits, landfills, and fill areas.

In a typical profile, the surface layer is brown gravelly coarse sandy loam about 4 inches thick. The underlying material to a depth of about 60 inches is brown coarse sandy loam and gravelly loam. In places the surface layer is gravelly loam.

Included with these soils in mapping are the well drained Eldean soils in areas that have not been disturbed. Also included are the very poorly drained Westland soils in some of the lower depressions. Included soils make up less than 8 percent of the unit.

Available water capacity is very low in the Orthents. Permeability is rapid. Surface runoff is slow or medium. The organic matter content is low in the surface layer. This layer cannot be easily tilled because of the content of gravel.

Most of the acreage is open land. A few areas are used as woodland. These soils are fairly well suited to trees. Seedling mortality is the major management concern. It is caused by droughtiness. The trees that can withstand dry periods should be selected for planting. Replanting may be necessary.

These soils are generally unsuitable as sites for septic tank absorption fields because of a poor filtering capacity, which can result in contamination of ground water supplies. A modified septic tank absorption field is needed. Otherwise, the septic tank system should be connected to a sanitary sewer. Onsite investigation is needed before the soils are used as sites for dwellings.

No land capability classification or woodland ordination symbol is assigned.

Pr—Pits, Quarry. This map unit consists of open excavations from which soil material has been removed and the underlying bedrock exposed (fig. 8). The excavations vary in depth. Typically, they are in areas of glacial drift that are shallow to bedrock. Some pits have been abandoned because the rock is of poor quality. Where the water table is close to the surface, the pits contain water. Individual areas are generally square or rectangular and are 10 to 40 acres in size.

Included with the pits in mapping are areas where soil material and rock have been dumped adjacent to the excavations. The soils beneath this dumped material commonly are similar to the adjacent soils.

The abandoned pits are not suitable for agricultural or urban uses. They generally are suited only to wildlife habitat and some recreation uses.

No land capability classification or woodland ordination symbol is assigned.

Rc—Ragsdale silty clay loam. This nearly level, deep, very poorly drained soil is in slight depressions on uplands. In some areas it is frequently ponded by runoff from the higher lying adjacent areas. Individual areas are irregular in shape and are 60 to 300 acres in size. The dominant size is about 75 acres.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 11 inches thick. The subsoil is about 49 inches thick. The upper part is grayish brown, mottled, friable silty clay loam; the next

Figure 8.—An area of Pits, Quarry.

part is dark grayish brown and grayish brown, mottled, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silt loam. The underlying material to a depth of about 70 inches is yellowish brown silt loam. In places the surface layer is lighter colored. In a few areas the loess cap is thinner. In some places the surface layer is silt loam. In other places the underlying material to a depth of about 60 inches is loam glacial till. In some areas it is stratified. In a few areas the depth to the underlying material is less than 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Reesville soils on slight rises and swells. These soils make up 5 to 10 percent of the unit.

Available water capacity is very high in the Ragsdale soil. Permeability is moderate. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer. This layer can become cloddy if tilled when the moisture content is too high. The water table is often near or above the surface during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture. Undrained areas are wooded.

If drained, this soil is well suited to corn, soybeans, and small grain. Most areas are drained by subsurface drains and open ditches. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain or improve tilth and the organic matter content. The soil is well suited to fall plowing or chiseling.

This soil is well suited to grasses and legumes, such as reed canarygrass and clover, for hay or pasture. It is better suited to grasses than to deep-rooted legumes because of the wetness. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Windthrown trees should be periodically removed. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the ponding, this soil is generally unsuited to dwellings and sanitary facilities. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. These limitations can be overcome by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The land capability classification is IIw. The woodland ordination symbol is 5W.

RhA—Randolph silt loam, 0 to 2 percent slopes. This nearly level, moderately deep, somewhat poorly drained soil is on till plains and terraces. Individual areas are irregularly shaped and are 3 to 30 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer also is dark grayish brown silt loam. It is about 6 inches thick. The subsoil is about 22 inches thick. It is mottled and firm. The upper part is grayish brown silty clay loam, the next part is brown silty clay, and the lower part is light olive brown very channery clay loam. The underlying material is light gray very flaggy loam about 3 inches thick. Fractured, interbedded limestone and shale bedrock is at a depth of about 39 inches. In some places the depth to bedrock is more than 40 inches, and in other places it is less than 20 inches. In some areas the underlying material is loam glacial till, and in other areas it is sand and gravel.

Included with this soil in mapping are the very poorly drained Millsdale soils in depressions. Also included are small areas of the more sloping, well drained Wynn soils. Included soils make up less than 10 percent of the unit.

Available water capacity is low in the Randolph soil. Permeability is moderately slow. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content. The root zone may be restricted by the bedrock within a depth of 40 inches. The water table is often at a depth of 1.0 to 2.5 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. The wetness and the depth to bedrock are limitations. A drainage system has been installed in some areas, but additional drainage measures are needed in many areas. The bedrock can hinder the installation of subsurface drains. A surface drainage system may be needed in areas where the soil is not deep enough for subsurface drains. Because of the low available water capacity, the soil can become droughty during years of low rainfall. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and cover crops increase the organic matter content, conserve moisture, and help to maintain good tilth.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and white clover, for hay or pasture. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The wetness is a severe limitation if this soil is used as a site for dwellings without basements. The wetness and the depth to bedrock are severe limitations on sites for dwellings with basements. An adequate drainage system reduces the wetness. Draining the soil is difficult, however, because bedrock is within a depth of 40 inches. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The depth to bedrock, the wetness, and the restricted permeability are severe limitations if this soil is used as a site for septic tank absorption fields. A modified disposal system or one connected to a public or commercial sewage disposal system may be needed. Some of the adjacent soils are better sites.

The land capability classification is IIIw. The woodland ordination symbol is 4A.

RkA—Reesville silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on large and small flats in the uplands. Individual areas are irregular in shape and are 3 to 80 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 12 inches thick. The subsoil is about 36 inches thick. The upper part is brown, mottled, friable silty clay loam; the next part is brown, mottled, firm silty clay loam; and the lower part is brown, mottled, friable silt loam. The underlying material to a depth of about 60 inches is brown and yellowish brown silt loam and loam. In a few areas the loess cap is thinner. In some places the soil is deeper to the underlying material. In other places the underlying material is stratified silt loam and very fine sand. In some areas the subsoil is clayey or loamy.

Included with this soil in mapping are small areas of the very poorly drained Ragsdale soils in depressions and drainageways. These soils make up more than 15 percent of the unit.

Available water capacity is high in the Reesville soil. Permeability is moderately slow. Surface runoff is slow.

The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content. The water table is often at a depth of 1.0 to 2.5 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. Some are used for pasture or hay or are wooded.

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Subsurface drains help to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain or increase the organic matter content and maintain good tilth.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and clover, for pasture or hay. Because of the wetness, it is better suited to grasses than to deep-rooted legumes. Subsurface drains are needed. Grazing during wet periods can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth.

This soil is fairly well suited to trees. The equipment limitation and plant competition are the major management concerns. Equipment should be used only during dry periods or when the ground is frozen. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling.

The wetness is a severe limitation if this soil is used as a site for dwellings. A properly designed drainage system is needed in conjunction with storm drains. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The wetness and the restricted permeability are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. Perimeter drains help to remove excess water. Public or commercial sewers and treatment facilities should be considered.

The land capability classification is IIw. The woodland ordination symbol is 4W.

RmD—Rodman gravelly loam, 15 to 25 percent slopes. This strongly sloping to moderately steep, excessively drained soil is in domelike areas on uplands. It is shallow over gravelly coarse sand. Individual areas are irregularly shaped and are 5 to 20 acres in size.

In a typical profile, the surface layer is dark brown gravelly loam about 5 inches thick. The subsoil is brown, friable gravelly loam about 14 inches thick. The underlying material to a depth of about 60 inches is brown and pale brown gravelly coarse sand. In some places the surface layer and subsoil have fewer coarse fragments. In other places the surface layer is loam or clay loam. In some areas the depth to the underlying material is less than 8 or more than 20 inches.

Included with this soil in mapping are a few areas of the well drained Miami soils at the base of slopes or on the slopes. These soils make up less than 10 percent of the unit.

Available water capacity is very low in the Rodman soil. Permeability is moderately rapid in the upper part of the soil and very rapid in the underlying material. Surface runoff is rapid. The organic matter content is high in the surface layer.

Most areas are used as woodland. Some are used for hay or pasture. This soil is generally unsuited to corn, soybeans, and small grain because of droughtiness and a severe hazard of erosion. The slope limits the use of machinery.

This soil is poorly suited to grasses and legumes for pasture and is generally unsuited to hay. Because of the droughtiness, maintaining a stand of pasture grasses is difficult. Overgrazing causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The major management concerns are the equipment limitation, seedling mortality, and the erosion hazard. Special harvesting equipment may be needed. Logging roads should be built on the contour. The trees selected for planting should be those that can withstand droughtiness. Replanting may be necessary. Disturbing the surface can cause erosion. As a result, a cover of vegetation or mulch is needed.

Because of the slope, this soil is generally unsuited to dwellings. It is generally unsuited to septic tank absorption fields because of a poor filtering capacity and the slope. The slope is a severe limitation on sites for local roads. It can be overcome by building the roads on the contour where possible.

The land capability classification is VIIs. The woodland ordination symbol is 4R.

RmF—Rodman gravelly loam, 25 to 50 percent slopes. This steep and very steep, excessively drained soil is on side slopes on outwash plains, moraines, and kames. It is shallow over gravelly coarse sand. Individual areas are elongated or irregular in shape and are 5 to 20 acres in size.

In a typical profile, the surface layer is very dark grayish brown gravelly loam about 3 inches thick. The subsurface layer is very dark grayish brown gravelly loam about 3 inches thick. The subsoil is brown, friable gravelly loam about 6 inches thick. The underlying material to a depth of about 60 inches is brown, loose gravelly coarse sand. In places the soil does not have a dark surface layer. In other places the surface layer is loam or clay loam. In some areas the depth to the underlying material is less than 8 or more than 20 inches.

Included with this soil in mapping are small areas of the less sloping Eldean soils on the adjacent slopes. Also included are small areas of eroded soils that have an exposed subsoil. Included soils make up less than 15 percent of the unit.

Available water capacity is very low in the Rodman soil. Permeability is moderately rapid in the upper part of the soil and very rapid in the underlying material. Surface runoff is very rapid. The organic matter content is high in the surface layer.

Most areas are used as woodland. Some are used for hay or pasture. Because of a severe hazard of erosion and the very low available water capacity, this soil is generally unsuited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The slope limits the use of farm machinery. Because of the droughtiness, maintaining a stand of pasture grasses is difficult. Deep-rooted legumes are better suited than shallow-rooted grasses.

This soil is poorly suited to trees. The major management concerns are the equipment limitation, the erosion hazard, and seedling mortality. Special harvesting equipment may be needed. Logging roads should be built on the contour. Clearcutting should be avoided. Disturbing the surface can cause excessive erosion. The trees selected for planting should be those that can withstand the droughtiness. Replanting may be necessary.

Because of the slope, this soil is generally unsuited to dwellings. It is generally unsuited to septic tank absorption fields because of a poor filtering capacity and the slope. The slope is a severe limitation on sites for local roads. It can be overcome by building the roads on the contour where possible. Controlling erosion and runoff is very difficult and expensive.

The land capability classification is VIIs. The woodland ordination symbol is 4R.

RsB2—Russell silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on broad ridgetops and side slopes on till plains and moraines. Individual areas are elongated or irregular in shape and are 5 to 140 acres in size. The dominant size is about 25 acres.

In a typical profile, the surface layer is brown silt loam about 11 inches thick. The subsoil is about 43 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is brown, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In a few areas the loess cap is thicker. In a few other areas it is thinner. In some places the subsoil is thinner and has more clay. In other places it is loamy. In some areas the surface layer is clay loam. In other areas the underlying material is stratified silt loam and sand. In places the depth to the underlying material is less than 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Fincastle soils in depressions and drainageways. Also included are small areas of the gently sloping, moderately well drained Xenia soils on ridgetops. Included soils make up about 10 percent of the unit.

Available water capacity is high in the Russell soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture or hay or are wooded.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, and grassed waterways. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The restricted permeability is a moderate limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIe. The woodland ordination symbol is 5A.

RsC2—Russell silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on ridgetops and side slopes adjacent to drainageways on till plains and moraines. Individual areas are elongated or irregular in shape and are 5 to 80 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 60 inches thick. The upper part is brown, firm silty clay loam; the next part is strong brown, firm silty clay loam and clay loam; and the lower part is brown, friable loam. The underlying material to a depth of about 80 inches is yellowish brown loam. In some areas the loess cap is thinner. In some places the subsoil is thinner and has more clay. In other places it is loamy. In some areas the surface layer is clay loam. In other areas the underlying material is stratified silt loam and sand. In places the depth to the underlying material is less than 40 or more than 70 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Fincastle soils in depressions and drainageways. Also included are small areas of the nearly level and gently sloping, moderately well drained Xenia soils on ridgetops. Included soils make up 8 to 12 percent of the unit.

Available water capacity is high in the Russell soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture or hay or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, and grassed waterways. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings. Properly designing foundations and footings, installing foundation drains, and backfilling with sand and gravel help to prevent the structural damage caused by shrinking and swelling. The buildings should be designed so that they conform to the natural slope of the land. Cutting and filling can modify the slope. Erosion can be controlled by disturbing as little of the surface as possible and by revegetating disturbed areas as soon as possible.

Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The slope and the restricted permeability are moderate limitations if this soil is used as a site for septic tank absorption fields. The absorption field should be installed on the contour and should be designed so that the effluent does not surface at the base of the slopes. Enlarging the absorption field helps to overcome the restricted permeability.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

Sh—Shoals silt loam, occasionally flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is flooded for brief periods from late in fall through spring. Individual areas are long and narrow and are 5 to 25 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 3 inches thick. The underlying material to a depth of about 60 inches is loam. The upper part is dark grayish brown and grayish brown and has reddish brown and brown mottles, and the lower part is grayish brown, brown, and yellowish brown. In places the surface layer is very dark grayish brown loam. In some areas the subsoil is clayey. In a few areas the underlying material is stratified silt loam, loam, or very fine sand.

Included with this soil in mapping are a few areas of the well drained Genesee soils on the slightly higher parts of the landscape. Also included are small areas of the very poorly drained Sloan soils in slight depressions. Included soils make up less than 15 percent of the unit.

Available water capacity is high in the Shoals soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content. The water table is often at a depth of 1 to 3 feet during winter and early spring.

Most areas of this soil are wooded. Some are used for cultivated crops.

This soil is well suited to corn, soybeans, and small grain. The flooding and the wetness are the major management concerns. Subsurface or surface drains help to remove excess water. Crops are occasionally replanted because the flooding has destroyed the stands. The velocity of the floodwater can cause scouring in areas used for row crops. If the soil is drained, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves a protective amount of crop residue on the surface help to maintain or improve tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. A drainage system is needed. Grazing during wet periods causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, and plant competition are the main management concerns. Equipment should be used only during dry periods or when the ground is frozen. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. An alternative site should be selected. Flooding, wetness, and frost action are severe limitations on sites for local roads and streets. Constructing the roads on raised, well compacted fill material and providing adequate road ditches and culverts help to prevent the damage caused by these limitations.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Sk—Sleeth silt loam. This nearly level, deep, somewhat poorly drained soil is on broad outwash plains and terraces. Individual areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer also is dark grayish brown silt loam about 8 inches thick. The subsoil is about 30 inches thick. It is dark grayish brown, mottled, firm silty clay loam and clay loam. The underlying material to a depth of about 60 inches is light brownish gray gravelly coarse sand. In places limestone bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of the well drained Eldean and Ockley soils in the slightly higher landscape positions. Also included are small areas of the very poorly drained Westland soils in depressions. Included soils make up 2 to 10 percent of the unit.

Available water capacity is high in the Sleeth soil. Permeability is moderate in the upper part of the soil and very rapid in the underlying material. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a wide range in moisture content. The water table is often at a depth of 1 to 3 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. Some are wooded or are used for pasture or hay.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Subsurface drains help to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain or increase the organic matter content and maintain good tilth.

This soil is well suited to grasses and legumes, such as bromegrass and clover, for pasture or hay. Because of the wetness, it is better suited to grasses than to deep-rooted legumes. Grazing during wet periods can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The wetness is a severe limitation if this soil is used as a site for dwellings. A properly designed drainage system is needed. Subsurface and surface drains remove excess water. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The wetness is a severe limitation if this soil is used as a site for septic tank absorption fields. It can be reduced by perimeter drains.

The land capability classification is IIw. The woodland ordination symbol is 5A.

Sn—Sloan silty clay loam, occasionally flooded. This nearly level, deep, very poorly drained soil is on low flats and in depressions on flood plains. It is flooded for brief periods from late in fall through spring. Individual areas are irregularly shaped and are 5 to 30 acres in size.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsurface layer is very dark gray clay loam about 9 inches thick. The subsoil is about 21 inches thick. The upper part is grayish brown, friable silty clay loam, and the lower part is gray, friable loam. The underlying material to a depth of about 60 inches is grayish brown, friable fine sandy loam. In places the subsoil has less clay. In a few places the underlying material is stratified sand and gravel. In some areas the subsoil is clayey. In other areas the surface layer is dark grayish brown loam or silt loam.

Included with this soil in mapping are a few areas of the well drained Genesee and Stonelick soils in the higher landscape positions. Also included are small areas of the somewhat poorly drained Shoals soils around the edge of the depressions. Included soils make up less than 15 percent of the unit.

Available water capacity is high in the Sloan soil. Permeability is moderately slow or moderate. Surface runoff is very slow. The organic matter content is high in the surface layer. This layer can become cloddy and compacted if it is tilled when the moisture content is too high. The water table is often at or near the surface during winter and early spring.

This soil is used for cultivated crops, hay, pasture, or woodland. It is fairly well suited to corn, soybeans, and small grain. The flooding and the wetness are the major management concerns. Subsurface or surface drains help to remove excess water. Crops are occasionally replanted because the flooding has destroyed the stands. The velocity of the floodwaters can cause scouring in areas used for row crops. If the soil is drained, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves a protective amount of crop residue on the surface help to maintain or improve tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. A drainage system is needed. Grazing during wet periods causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Windthrown trees should be periodically removed. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. An alternative site should be selected. Flooding, wetness, and low strength are severe limitations on sites for local roads and streets. They can be overcome by constructing the roads on raised, well compacted fill material and by providing adequate road ditches and culverts.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

St—Stonelick loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. It is flooded for very brief periods from late in fall through spring. Individual areas are long and narrow and are 5 to 100 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is dark grayish brown loam about 6 inches thick. The subsurface layer also is dark grayish brown loam. It is about 3 inches thick. The underlying material to a depth of about 60 inches is brown and very pale brown sandy loam and gravelly loamy sand. In places the subsoil has more clay. In some small areas the surface layer is sandy loam or very fine sand.

Included with this soil in mapping are a few areas of the very poorly drained Sloan and somewhat poorly drained Shoals soils in slight depressions. These soils make up less than 10 percent of the unit.

Available water capacity is low in the Stonelick soil. Permeability is moderately rapid. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content.

Some areas of this soil are used for cultivated crops. Some are wooded. A few are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Local flooding is a hazard, but it usually does not occur during the growing season. The velocity of the floodwater can cause scouring in areas used for row crops. Because of the low available water capacity, the soil may become droughty during years of low rainfall. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface conserve moisture and help to maintain or improve the organic matter content and tilth.

This soil is well suited to grasses and legumes for hay and pasture. The major concerns in managing pastured areas are overgrazing, grazing when the soil is wet, and the hazard of flooding. Grazing during wet periods causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

Because of the flooding, this soil is generally unsuited to dwellings, local roads and streets, and septic tank absorption fields. An alternative site should be considered.

The land capability classification is IIw. The woodland ordination symbol is 4A.

SuB3—Strawn clay loam, 2 to 6 percent slopes, severely eroded. This gently sloping, deep, well drained soil is on rises on till plains and moraines and along drainageways. Individual areas are irregular in shape and are 3 to 50 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown clay loam about 5 inches thick. The subsoil is about 17 inches thick. It is brown, firm clay loam and loam. The underlying material to a depth of about 60 inches is dark yellowish brown loam. In places the subsoil is thicker. In some areas it has more clay, and in other areas it has less clay. In places the calcareous loam till is at the surface.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby soils along drainageways and the very poorly drained Treaty soils in the drainageways. These soils make up less than 15 percent of the unit.

Available water capacity is moderate in the Strawn soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderately low in the surface layer. This layer can become cloddy and hard if it is tilled when too wet.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is fairly well suited to corn, soybeans, and small grain. Preparing a seedbed and establishing a uniform stand of crops commonly are difficult. Extra power is needed for tillage, which should be done under proper moisture conditions. Erosion is a severe hazard if cultivated crops are grown. It can be controlled by a crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, grassed waterways, and grade stabilization structures. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

Limitations are slight if this soil is used as a site for dwellings. Frost action and low strength are moderate limitations on sites for local roads and streets. They can be overcome by strengthening or replacing the base material with coarser textured material that can support vehicular traffic.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

SuC3—Strawn clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on knobs and breaks along drainageways in the uplands. Individual areas are generally elongated and irregular in shape and are 3 to 40 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is brown clay loam about 7 inches thick. The subsoil is yellowish brown, firm clay loam about 7 inches thick. The underlying material to a depth of about 60 inches is pale brown loam. In some areas the subsoil is thicker. In some places it has more clay, and in other places it has less clay. In some areas the calcareous loam till is at the surface.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Crosby soils on small flats. Also included are a few small areas of the nearly level or depressional, very poorly drained Treaty soils on the bottom of drainageways. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Strawn soil. Permeability is moderately slow. Surface runoff is rapid. The organic matter content is moderately low in the surface layer. This layer is firm and can become cloddy if it is tilled when the moisture content is too high.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is poorly suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Examples are a crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, grassed waterways, and grade stabilization structures. Regular additions of other material improve fertility and tilth, help to prevent crusting, and increase the rate of water infiltration.

This soil is fairly well suited to grasses and legumes for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The slope is a moderate limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Cutting and filling can modify the slope. Because of the erosion hazard, as much of the existing vegetation as possible should be retained and a plant cover should be reestablished in disturbed areas as soon as possible. Frost action, slope, and low strength are moderate limitations on sites for local roads and streets. The base material should be strengthened or replaced. The roads should be constructed on the contour and graded to shed water.

The restricted permeability is a severe limitation if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation.

The land capability classification is IVe. The woodland ordination symbol is 4A.

SuD3—Strawn clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on side slopes on till plains and moraines. Individual areas are elongated and are 4 to 20 acres in size.

In a typical profile, the surface layer is yellowish brown clay loam about 4 inches thick. The subsoil is dark yellowish brown, firm clay loam about 16 inches thick. The underlying material to a depth of about 60 inches is pale brown loam. In some areas the subsoil is thicker. In some places it has more clay, and in other places it has less clay. In some areas the calcareous loam till is at the surface.

Included with this soil in mapping are a few areas of the very poorly drained Treaty soils on the bottom of drainageways. Also included are small areas of less sloping and less eroded soils on narrow ridgetops. Included soils make up less than 10 percent of the unit.

Available water capacity is moderate in the Strawn soil. Permeability is moderately slow. Surface runoff is rapid. The organic matter content is moderately low in the surface layer. This layer is firm and can become cloddy if it is tilled when the moisture content is too high. It cannot be easily tilled when the moisture content is low.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is generally unsuited to corn, soybeans, and small grain because further erosion is a severe hazard.

This soil is fairly well suited to grasses, such as bromegrass or orchardgrass, and legumes, such as alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The hazard of erosion, the equipment limitation, seedling mortality, and plant competition are management concerns. Proper road design and careful harvesting during dry periods or when the ground is frozen reduce the erosion hazard and help to overcome the equipment limitation. Special harvesting equipment may be needed because of the slope. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special site preparation, such as furrowing before planting, may be needed.

The slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Only the less sloping areas should be developed. If large areas are developed, erosion is a hazard. The existing vegetation should be retained where possible, and only small areas should be disturbed. Topsoil should be stockpiled before construction and replaced after construction. Disturbed areas should be revegetated as soon as possible. Diversions and grassed waterways can be used between lots to control erosion. Silting basins can control siltation of nearby streams.

The slope is a severe limitation on sites for local roads and streets. It can be overcome by building the roads and streets on the contour where possible.

The restricted permeability and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. The absorption field should be installed on the contour and should be designed so that the effluent does not surface at the base of the slopes. Enlarging the absorption field helps to overcome the restricted permeability.

The land capability classification is VIe. The woodland ordination symbol is 4R.

Tr—Treaty silty clay loam. This nearly level, deep, very poorly drained soil is in depressions, swales, and narrow drainageways on till plains and moraines. In some areas it is frequently ponded by runoff from the higher lying adjacent areas. Individual areas are irregularly shaped and are 3 to 70 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsurface layer is black silty clay loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part is dark grayish brown, firm silty clay loam, and the lower part is brown, firm clay loam. The underlying material to a depth of about 60 inches is light brownish gray loam. In places the loess cap is thicker. In some areas the surface layer is dark grayish brown and is less than 10 inches thick. In other areas the subsoil is clayey.

Included with this soil in mapping are the somewhat poorly drained Crosby and Fincastle soils on slight rises. Also included are the sloping, well drained Miami soils along drainageways. Included soils make up less than 15 percent of the unit.

Available water capacity is high in the Treaty soil. Permeability is moderate in the upper part of the soil and moderately slow in the underlying material. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer. This layer can become cloddy and hard if it is tilled when too wet. The water table is often near or above the surface during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are wooded or are used for pasture or hay.

This soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Subsurface and surface drains are needed to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain or improve tilth and the organic matter content. The soil is well suited to fall plowing or chiseling.

This soil is well suited to grasses and legumes, such as reed canarygrass and clover, for hay or pasture. It is better suited to grasses than to deep-rooted legumes because of the wetness. A drainage system is needed. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Windthrown trees should be periodically removed. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the ponding, this soil is generally unsuited to dwellings and septic tank absorption fields. Low strength, ponding, and frost action are severe limitations on sites for local roads. These limitations can be overcome by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Ts—Treaty silty clay loam, stony subsoil. This nearly level, deep, very poorly drained soil is in depressions, swales, and narrow drainageways on till plains and moraines. The depressional areas are frequently ponded by runoff from the higher lying adjacent areas. Individual areas are generally elongated and irregular in shape and are 3 to 20 acres in size.

In a typical profile, the surface layer is very dark gray silty clay loam about 10 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 47 inches thick. It is mottled and firm. The upper part is dark grayish brown and olive brown silty clay loam, and the lower part is dark brown clay loam that contains stones. The underlying material to a depth of about 80 inches is brown, mottled loam. In places the surface layer is lighter colored. In a few areas the loess cap is thicker. In some areas the surface layer is silt loam. In a few areas the subsoil is less than 20 or more than 60 inches thick. In places no stones are in the subsoil or underlying material.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Crosby soils on small knolls. Also included are a few small areas of the gently sloping Losantville soils along drainageways. Included soils make up about 10 percent of the unit.

Available water capacity is high in the Treaty soil. Permeability is moderate in the upper part of the soil and moderately slow in the underlying material. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer. This layer can become cloddy if it is tilled when the moisture content is too high. Some stones more than 10 inches in diameter are near the surface. They can hinder tillage. The water table is near or above the surface during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture. A few undrained areas are used as woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness caused by ponding and the seasonal high water is the major limitation. Surface and subsurface drains are needed to remove excess water. In places the stones more than 10 inches in diameter hinder the installation of subsurface drains. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Applying a system of conservation tillage, returning crop residue to the soil, and growing cover crops help to maintain or improve tilth and the organic matter content. The soil is well suited to fall plowing or chiseling.

This soil is well suited to grasses and legumes, such as bromegrass and clover, for hay or pasture. It is better suited to grasses than to deep-rooted legumes because of the wetness. A drainage system is needed. Grazing when the soil is wet can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, plant competition, the windthrow hazard, and seedling mortality are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling. Windthrown trees should be periodically removed. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the ponding, this soil is generally unsuited to dwellings and septic tank absorption fields. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. These limitations can be overcome by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The land capability classification is IIw. The woodland ordination symbol is 5W.

UmB—Urban land-Miami complex, 2 to 6 percent slopes. This map unit consists of Urban land and a gently sloping, deep, well drained Miami soil. It is on uplands. Individual areas are 30 to 130 acres in size and are 55 to 70 percent Urban land and 15 to 30 percent Miami soil. The Urban land and Miami soil occur as areas so intricately mixed or so small that mapping them separately is not practical.

The Urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soil series is not feasible.

In a typical profile, the Miami soil has a surface layer of dark brown silt loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part is dark yellowish brown, firm loam; the next part is dark yellowish brown, firm clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction. Some small areas have been cut, built up, or smoothed.

Included with this unit in mapping are small areas of Crosby and Treaty soils. The somewhat poorly drained Crosby soils are in the less sloping areas. The very poorly drained Treaty soils are in shallow depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderate in the surface layer.

The Miami soil is used for parks, open areas, building site development, lawns, and gardens. It is well suited to grasses, flowers, shrubs, and trees. A cover of these plants reduces the erosion hazard.

The shrink-swell potential is a moderate limitation if the Miami soil is used as a site for dwellings. Erosion is a hazard in recreational areas. Backfilling around building foundations with coarse textured material helps to prevent the structural damage caused by shrinking and swelling. Erosion can be controlled by developing lot-size parcels of land as a unit, by disturbing as little of the surface as possible, and by revegetating disturbed areas as soon as possible. A drainage system is needed around buildings.

The shrink-swell potential, frost action, and low strength are moderate limitations on sites for local roads and streets. They can be overcome by providing adequate road ditches and culverts and by strengthening or replacing the base material. The roads should be constructed on the contour and graded to shed water.

The restricted permeability is a severe limitation if the Miami soil is used as a site for septic tank absorption fields. Public sewers are accessible in most areas.

The somewhat poorly drained and very poorly drained included soils are severely limited as sites for buildings and recreational development because of the wetness. Areas used for these purposes should be artificially drained and protected from ponding. Onsite investigation is essential to evaluate and plan the development of specific sites.

No land capability classification or woodland ordination symbol is assigned.

UmC—Urban land-Miami complex, 6 to 12 percent slopes. This map unit consists of Urban land and a moderately sloping, deep, well drained Miami soil. It is on uplands. Individual areas are 20 to 50 acres in size and are 50 to 65 percent Urban land and 20 to 30 percent Miami soil. The Urban land and Miami soil occur as areas so intricately mixed or so small that mapping them separately is not practical.

The Urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soil series is not feasible.

In a typical profile, the Miami soil has a surface layer of dark yellowish brown silt loam about 7 inches thick. The subsoil is about 23 inches thick. The upper part is brown, firm clay loam, and the lower part is yellowish brown, firm clay loam or loam. The underlying material to a depth of about 60 inches is yellowish brown loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction. Some small areas have been cut, built up, or smoothed.

Included with this unit in mapping are small areas of the somewhat poorly drained Crosby and very poorly drained Treaty soils in shallow depressions and drainageways. These soils make up 5 to 10 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderate in the surface layer.

The Miami soil is used for parks, open areas, building site development, lawns, and gardens. It is well suited to grasses, flowers, vegetables, shrubs, and trees. A cover of these plants reduces the erosion hazard.

The slope and the shrink-swell potential are moderate limitations if the Miami soil is used as a site for dwellings and recreational development. Also, erosion is a hazard. The slope hinders the use of machinery during construction. Backfilling around building foundations with coarser textured material helps to prevent the structural damage caused by shrinking and swelling. Erosion can be controlled by developing lot-size parcels of land as a unit, by disturbing as little of the surface as possible, and by revegetating disturbed areas as soon as possible.

The slope, frost action, and the shrink-swell potential are moderate limitations on sites for local roads and streets. The roads should be constructed on the contour and graded to shed water. The base material should be strengthened or replaced.

The restricted permeability is a severe limitation if the Miami soil is used as a site for septic tank absorption fields. Public sewers are accessible in most areas.

The somewhat poorly and very poorly drained included soils are severely limited as sites for buildings and recreational development because of the wetness. Areas used for these purposes should be artificially drained and protected from ponding. Onsite investigation is essential to evaluate and plan the development of specific sites.

No land capability classification or woodland ordination symbol is assigned.

UoA—Urban land-Miami complex, gravelly substratum, 0 to 2 percent slopes. This map unit consists of Urban land and a nearly level, deep, well drained Miami soil. It is on uplands. Individual areas are 50 to 120 acres in size and are 55 to 70 percent Urban land and 20 to 30 percent Miami soil. The Urban land areas and Miami soil occur as areas so intricately mixed or so small that mapping them separately is not practical.

The Urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soil series is not feasible.

In a typical profile, the Miami soil has a surface layer of brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown and yellowish brown, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown loam. Gravelly material is at a depth of 5 to 8 feet. In some places the underlying material is stratified. In other places the soil has been radically altered. Some of the low areas have been filled or leveled during construction. Some small areas have been cut, built up, or smoothed.

Included with this unit in mapping are small areas of the somewhat poorly drained Crosby and very poorly drained Treaty soils in slight depressions and drainageways. These soils make up 10 to 15 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer.

The Miami soil is used for parks, open areas, building site development, lawns, and gardens. It is suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is generally not a major problem unless the surface is disturbed and is bare for a considerable period.

Limitations are slight if the Miami soil is used as a site for dwellings with basements. The shrink-swell potential, however, is a moderate limitation on sites for dwellings without basements. Properly designing footings and foundations and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

The restricted permeability is a moderate limitation if the Miami soil is used as a site for septic tank absorption fields. Public sewers are accessible in most areas.

Play areas and walkways that are subject to heavy foot traffic may require special surfacing to prevent excessive erosion. Onsite investigation is essential to evaluate and plan the development of specific sites.

No land capability classification or woodland ordination symbol is assigned.

UoB—Urban land-Miami complex, gravelly substratum, 2 to 6 percent slopes. This map unit consists of Urban land and a gently sloping, deep, well drained Miami soil. It is on uplands. Individual areas are 30 to 80 acres in size and are 55 to 70 percent Urban land and 20 to 30 percent Miami soil. The Urban land areas and Miami soil occur as areas so intricately mixed or so small that mapping them separately is not practical.

The Urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soil series is not feasible.

In a typical profile, the Miami soil has a surface layer of brown silt loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is dark brown and dark yellowish brown, firm clay loam, and the lower part is yellowish brown, firm loam. The underlying material to a depth of about 60 inches is yellowish brown loam. Gravelly material is at a depth of 5 to 8 feet. In some places the underlying material is stratified. In other places the soil has been radically altered. Some of the low areas have been filled or leveled during construction. Some small areas have been cut, built up, or smoothed.

Included with this unit in mapping are small areas of the somewhat poorly drained Crosby and very poorly drained Treaty soils in slight depressions and drainageways. These soils make up 5 to 15 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer.

The Miami soil is used for parks, open areas, building site development, lawns, and gardens. It is suited to grasses, flowers, vegetables, trees, and shrubs. A cover of these plants reduces the erosion hazard.

Limitations are slight if the Miami soil is used as a site for dwellings with basements. The shrink-swell potential, however, is a moderate limitation on sites for dwellings without basements. Properly designing foundations and footings and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. Erosion can be controlled by developing lot-size parcels of land as a unit, by retaining as much of the existing vegetation as possible, and by reestablishing a plant cover in disturbed areas as soon as possible.

Low strength is a moderate limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel. The roads should be constructed on the contour and graded to shed water.

The restricted permeability is a moderate limitation if the Miami soil is used as a site for septic tank absorption fields. Public sewers are accessible in most areas.

Play areas and walkways that are subject to heavy foot traffic may require special surfacing. Onsite investigation is essential to evaluate and plan the development of specific sites.

No land capability classification or woodland ordination symbol is assigned.

Us—Urban land-Millsdale complex. This map unit consists of Urban land and a nearly level, moderately deep, very poorly drained Millsdale soil. It is in shallow depressions and drainageways. The Millsdale soil is subject to ponding after heavy rains. Individual areas range from 20 to 100 acres in size and are 60 to 70 percent Urban land and 20 to 25 percent Millsdale soil. The Urban land and Millsdale soil occur as areas so intricately mixed or so small that mapping them separately is not practical.

The Urban land part is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soil series is not feasible.

In a typical profile, the Millsdale soil has a surface layer of very dark gray silty clay loam about 10 inches thick. The subsoil also is about 10 inches thick. The upper part is very dark gray, mottled, firm silty clay loam, and the lower part is light brownish gray, mottled, firm channery clay loam. The underlying material is light yellowish brown flaggy clay loam about 8 inches thick. Fractured, interbedded limestone and shale bedrock is at a depth of about 28 inches. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction. Some small areas have been cut, built up, or smoothed.

Included with this unit in mapping are areas of Wynn and Randolph soils. The well drained Wynn soils are in sloping areas next to the depressions and drainageways. The somewhat poorly drained Randolph soils are in the slightly higher landscape positions. Included soils make up 10 to 15 percent of the unit.

Many areas of this map unit are drained through sewer systems, gutters, drainage tile, and surface ditches. Unless drained, the Millsdale soil has a seasonal high water table near or above the surface. During wet periods some low lying areas are ponded by runoff from higher areas.

Available water capacity is low in the Millsdale soil. Permeability is moderately slow. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer.

The Millsdale soil is used for parks, open areas, building site development, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs if excess water is removed. During dry parts of the year, the soil may become droughty because of the shallowness to bedrock. Supplemental watering of lawns, gardens, trees, and shrubs may be needed during these periods. Erosion is not a major problem unless the surface is disturbed and is bare for a considerable period or unless the area is used as a watercourse.

The ponding, the shrink-swell potential, and the depth to bedrock are severe limitations if the Millsdale soil is used as a site for dwellings or recreation development. Measures that drain the soil and control the ponding are needed. Buildings should be constructed without basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. These limitations can be overcome by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The ponding, the restricted permeability, and the depth to bedrock are severe limitations if the Millsdale soil is used as a site for septic tank absorption fields. All sanitary facilities should be connected to commercial sewers and treatment facilities. Onsite investigation is essential to evaluate and plan the development of specific sites.

No land capability classification or woodland ordination symbol is assigned.

We—Westland silty clay loam. This nearly level, deep, very poorly drained soil is in depressions, swales, and narrow drainageways on outwash plains and terraces. It is subject to ponding after heavy rains. Individual areas are irregular in shape and are 6 to 75 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is very dark gray silty clay loam about 10 inches thick. The subsoil is about 37 inches thick. The upper part is dark gray, firm silty clay loam; the next part is dark gray, firm clay loam; and the lower part is olive gray and grayish brown, mottled, firm and friable clay loam and loam. The underlying material to a depth of about 60 inches is light brownish gray gravelly coarse sand. In places the soil is shallower to the underlying material. In a few areas the surface layer is lighter in color. In some areas it is mucky silt loam. In other areas limestone bedrock is within a depth of 60 inches. In places the subsoil is silty or clayey. In a few areas the underlying material is stratified loam and very fine sand.

Included with this soil in mapping are small, islandlike areas of the somewhat poorly drained Sleeth soils. Also included are the well drained Eldean and Ockley soils in the slightly higher or sloping areas. Included soils make up 1 to 10 percent of the unit.

Available water capacity is high in the Westland soil. Permeability is moderate in the upper part of the soil and very rapid in the underlying material. Surface runoff is very slow or ponded. The organic matter content is high in the surface layer. This layer can be easily tilled only within a fairly narrow range in moisture content. It tends to be sticky and plastic when wet and hard and cloddy when dry. The water table is often near or above the surface layer during winter and early spring.

Most areas of this soil are used for cultivated crops. Some are wooded or are used for pasture or hay.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Subsurface drains, surface drains, or open ditches are needed to remove excess water. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain or improve tilth and the organic matter. The soil is well suited to fall plowing or chiseling.

This soil is well suited to grasses and legumes, such as reed canarygrass and clover, for pasture or hay. It is better suited to grasses than to deep-rooted legumes because of the wetness. A drainage system is needed. Overgrazing or grazing when the soil is wet causes compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Windthrown trees should be periodically removed. Seedlings can survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. The trees that can withstand the wetness should be selected for planting. Replanting may be necessary.

Because of the ponding, this soil is generally unsuited to dwellings and sanitary facilities. Ponding, frost action, and low strength are severe limitations on sites for local roads. These limitations can be overcome by providing adequate road ditches and culverts and by adding a more stable base material, such as sand or gravel.

The land capability classification is IIw. The woodland ordination symbol is 5W.

WyB2—Wynn silt loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately deep, well drained soil is on till plains and terraces. Individual areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is firm silty clay loam about 16 inches thick. The upper part is brown, and the lower part is olive brown. The underlying material is brown clay about 5 inches thick. Fractured limestone and shale bedrock is at a depth of about 31 inches. In places the soil is more than 40 inches deep over bedrock. In some areas loam glacial till is at a depth of about 40 inches. In other areas the subsoil is loamy.

Included with this soil in mapping are the very poorly drained Millsdale soils on the bottom of drainageways and in depressions. Also included are the nearly level, somewhat poorly drained Randolph soils. Included soils make up less than 10 percent of the unit.

Available water capacity is low in the Wynn soil. Permeability is slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or are wooded.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways. Because of the low available water capacity, the soil may become droughty during years of low rainfall. Cover crops help to control erosion, increase the available water capacity, and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. The soil is better suited to deep-rooted legumes than to grasses because of the low available water capacity. Overgrazing or grazing when the soil is too wet can cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. On sites for dwellings with basements, the depth to bedrock is an additional limitation. Excavating the rock or designing the dwelling so that it comforms to the depth to bedrock helps to overcome this limitation. If the limitation cannot be overcome, an alternative site should be considered. Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

The restricted permeability and the depth to bedrock are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome these limitations. In areas where the limitations cannot be overcome, the septic tank system should be connected to a commercial sewer if one is available.

The land capability classification is IIe. The woodland ordination symbol is 5A.

WyC2—Wynn silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately deep, well drained soil is on till plains and terraces. Individual areas are irregular in shape and are 3 to 20 acres in size. The dominant size is about 10 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is about 19 inches thick. The upper part is dark brown, firm silt loam; the next part is dark yellowish brown, firm clay loam; and the lower part is yellowish brown, firm channery clay. The underlying material is brown very flaggy clay about 11 inches thick. Fractured limestone and shale bedrock is at a depth of about 34 inches. In places the soil is more than 40 or less than 20 inches deep over bedrock. In some areas loam glacial till is within a depth of 40 inches. In other areas the subsoil is loamy.

Included with this soil in mapping are areas of the very poorly drained Millsdale soils on the bottom of drainageways and in depressions. Also included are small areas of the nearly level, somewhat poorly drained Randolph soils and areas of the well drained Eden soils on the steeper slopes. Eden soils are more clayey than the Wynn soil. Included soils make up less than 15 percent of the unit.

Available water capacity is low in the Wynn soil. Permeability is slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture or are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. Drought and erosion are the major hazards. Production is limited by the low available water capacity, particularly during years when rainfall is below normal or is poorly distributed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and contour farming help to prevent excessive soil loss. Cover crops also help to control erosion, increase the available water capacity, and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. The soil is better suited to deep-rooted legumes than to grasses because of the low available water capacity. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by cutting, spraying, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings. Properly designing foundations, footings, and basement walls and backfilling around the foundations with sand and gravel help to prevent the structural damage caused by shrinking and swelling. The dwellings should be designed so that they conform to the natural slope of the land. Cutting and filling can modify the slope. The depth to bedrock is a moderate limitation on sites for dwellings with basements. Unless the rock is excavated, the design of the dwelling should accommodate the depth to bedrock. Erosion can be controlled by disturbing as little of the surface as possible and by revegetating disturbed areas as soon as possible.

Low strength is a severe limitation on sites for local roads and streets. It can be overcome by strengthening the base with better suited material, such as sand or gravel.

The restricted permeability and the depth to bedrock are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome these limitations. In areas where the limitations cannot be overcome, the septic tank system should be connected to a commercial sewer if one is available.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

WyD2—Wynn silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, moderately deep, well drained soil is on till plains and terraces. Individual areas are irregular in shape and are 3 to 20 acres in size. The dominant size is about 10 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is 16 inches thick. It is brown and firm. The upper part is clay loam, and the lower part is clay. The underlying material is brown clay about 2 inches thick. Fractured limestone and shale bedrock is at a depth of about 24 inches. In places the soil is more than 40 or less than 20 inches deep over bedrock. In some areas the surface layer is silty clay loam. In other areas loam till is within a depth of 40 inches.

Included with this soil in mapping are the very poorly drained Millsdale soils on the bottom of drainageways and some areas of the well drained Eden soils on the steeper slopes. Eden soils are more clayey than the Wynn soil. Included soils make up less than 10 percent of the unit.

Available water capacity is low in the Wynn soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer can be tilled throughout a fairly wide range in moisture content.

Some areas of this soil are used for cultivated crops. Some are used for pasture, and some are wooded.

Because of the hazard of erosion and the low available water capacity, this soil is poorly suited to cultivated crops. It may become droughty during years of low rainfall. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, and grassed waterways help to prevent excessive soil loss and increase the available water capacity. A crop rotation dominated by grasses and legumes is the most effective means of controlling runoff and erosion.

This soil is fairly well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. The soil is better suited to deep-rooted legumes than to grasses because of the low available water capacity. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The major management concerns are the erosion hazard, the equipment limitation, and plant competition. The slope hinders the use of some machinery. Logging roads should be built on the contour, and clearcutting should be avoided. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling.

The slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed so that they conform to the natural slope of the land. Cutting and filling can modify the slope, but the depth to bedrock is a limitation in some areas. Erosion can be controlled by disturbing as little of the surface as possible and by revegetating disturbed areas as soon as possible. Topsoil should be stockpiled before construction and replaced after construction. Diversion terraces are needed to divert runoff from some areas. Sediment-control basins may be needed to trap sediment from construction sites.

Low strength and the slope are severe limitations on sites for local roads and streets. The roads should be constructed on the contour if possible. A more stable base material, such as sand or gravel, is needed.

The depth to bedrock, the restricted permeability, and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field and installing the distribution lines on the contour help to overcome these limitations. If the limitations cannot be overcome, an alternative means of sewage disposal is needed.

The land capability classification is IVe. The woodland ordination symbol is 5R.

XeB2—Xenia silt loam, 1 to 5 percent slopes, eroded. This nearly level and gently sloping, deep, moderately well drained soil is on broad ridgetops and the sides of drainageways on till plains and moraines. Individual areas are irregularly shaped or elongated and are 3 to 160 acres in size. The dominant size is about 30 acres.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 39 inches thick. The upper part is dark yellowish brown and brown, mottled, firm silty clay loam, and the lower part is brown, mottled, friable silty clay loam and loam. The underlying material to a depth of about 60 inches is brown loam. In a few areas the loess cap is more than 40 or less than 22 inches thick. In some severely eroded areas, the surface layer is dark yellowish brown clay loam or silty clay loam. In some places the depth to the underlying material is less than 24 or more than 40 inches. In other places the underlying material is stratified silt loam and very fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Fincastle soils in depressions and drainageways. Also included are small areas of the moderately sloping, well drained Russell soils on side slopes. Included soils make up 5 to 15 percent of the unit.

Available water capacity is high in the Xenia soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer can be easily tilled throughout a fairly wide range in moisture content. The water table is often at a depth of 2 to 6 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. Some are used for pasture or hay or are wooded.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, grassed waterways, and grade stabilization structures. Cover crops also help to control erosion and improve or maintain tilth and the organic matter content. Subsurface drains are needed in seepy areas in some of the drainageways and swales.

This soil is well suited to grasses and legumes, such as bromegrass, timothy, and alfalfa, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings can survive and grow well if competing vegetation is controlled or removed by adequate site preparation or by spraying, cutting, or girdling.

The shrink-swell potential and the wetness are limitations if this soil is used as a site for dwellings. The wetness is a severe limitation on sites for dwellings with basements. Strengthening foundations, footings, and basement walls, installing foundation drain tile, and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling and by wetness. Low strength and frost action are severe limitations on sites for local roads and streets. Road damage can be minimized by adequate road ditches and culverts and by additions of a more stable base material, such as sand and gravel.

The restricted permeability and the wetness are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. Perimeter drains help to remove excess water. Proper grading also helps to overcome the wetness.

The land capability classification is IIe. The woodland ordination symbol is 5A.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 190,950 acres in Wayne County, or nearly 74 percent of the total acreage, meets the soil requirements for prime farmland. This land is throughout the county.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify for prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Don Weaver, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; 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 listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 161,489 acres in the survey area was used for crops and pasture in 1982 (*6*). Of this total, 144,487 acres was used for row crops, mainly soybeans and corn; 12,995 acres for permanent pasture; and 4,007 acres for other crops and idle cropland.

The potential of the soils in Wayne County for increased production of food is fair. About 14,982 acres of potentially good cropland is currently used as woodland and about 15,904 acres as pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

The paragraphs that follow describe the main management concerns on the cropland and pasture in the county. These concerns are drainage, water erosion, soil blowing, fertility, and tilth.

Soil drainage is the major problem on about 44 percent of the cropland and pasture in Wayne County. Most of the very poorly drained soils, such as Brookston, Westland, and Ragsdale, are sufficiently drained for agricultural production. A few depressional areas of these soils, however, cannot be economically drained. Drainage ditches to a suitable outlet would have to be deep and extend for great distances.

Unless artificially drained, the somewhat poorly drained soils are so wet that crops are damaged during many years. Examples are Crosby, Sleeth, Shoals, and Randolph soils, which make up about 62,890 acres in the county.

Miami and Wynn soils are well drained but tend to dry out slowly after rains. Small areas of wetter soils along drainageways and in swales are commonly included in areas of these soils, especially those that have a slope of 2 to 6 percent. A drainage system is needed in some of these wetter areas.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drains and tile is needed in most areas of the very poorly drained soils used for intensive row cropping. Drains should be more closely spaced in slowly permeable soils than in the more permeable soils. Finding adequate outlets for tile drainage is difficult in many areas of Mahalasville soils.

Organic soils, such as Houghton, oxidize and subside when their pore space is filled with air. Therefore, special drainage systems are needed to control the depth and the period of drainage. Keeping the water table at the level required by the crops during the growing season and raising it to the surface during other parts of the year minimize the oxidation and subsidence of organic soils.

Information about the design of drainage systems for each kind of soil is provided in the Technical Guide, available in local offices of the Soil Conservation Service.

Water erosion is the major problem on about 33 percent of the cropland and pasture in the county. It is a hazard if the slope is more than 2 percent.

Loss of the surface soil through erosion reduces productivity (fig. 9). 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 the eroded Miami and Eldean soils because the exposed subsoil is more clayey 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 is eroded. Loss of the surface layer is especially damaging on Wynn soils because bedrock limits the depth of the root zone.

A secondary result of erosion is the sedimentation of streams. Control of erosion helps to prevent 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 other wildlife.

Erosion can be controlled by maintaining a cover of plants or crop residue, reducing the runoff rate, and increasing the rate of water infiltration. A cropping system that keeps a vegetative cover on the soil for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. On livestock farms, which include pasture and hayland,

Figure 9.—A poor stand of soybeans resulting from erosion on Miami silt loam, 12 to 18 percent slopes, eroded.

Figure 10.—Bromegrass and alfalfa hay in an area of Miami silt loam, 12 to 18 percent slopes, eroded. A cover of these plants helps to control erosion.

including forage crops of grasses and legumes in the cropping sequence reduces the susceptibility of the more sloping areas to erosion and provides nitrogen and improves tilth for the following crop (fig. 10). Bromegrass and orchardgrass are commonly grown along with alfalfa on the well drained soils in the higher lying areas. The very poorly drained and poorly drained soils are well suited to reed canarygrass.

In some areas of Wayne County, slopes are too short and irregular for contour tillage or terracing. On these soils cropping systems that provide a substantial vegetative cover are needed to control erosion unless a system of conservation tillage is applied.

Examples of conservation tillage are chisel tillage and mulch tillage, which leave crop residue on the surface and thus increase the rate of water infiltration and reduce the hazards of runoff and erosion. These tillage methods can be used on most soils in the county. No-till planting, which is becoming more common in the county, is effective in reducing the susceptibility of the more sloping areas to erosion. It is suitable on most of the well drained and somewhat poorly drained soils in the county. Till-plant and ridge tillage, which can be used on nearly all soils, except for those on flood plains, also are effective in controlling erosion. They are being used on an increasing acreage in the county.

Diversions, parallel tile-outlet terraces, and sediment- and water-control basins reduce the length of slopes and thus are effective in controlling sheet, rill, and gully erosion. They are most practical on deep, well drained soils that are highly susceptible to erosion. Terracing reduces soil loss and the associated loss of fertilizer elements; helps to prevent the damage to crops and watercourses caused by sedimentation; helps to eliminate the need for grassed waterways, which take land that could be used for row crops out of production; and makes farming on the contour easier. Contour farming reduces fuel consumption and the amount of pesticides entering watercourses. Soils that have bedrock within a depth of 40 inches and soils that have a clayey subsoil cannot be easily terraced.

Grassed waterways are needed in many areas, such as the more sloping areas of Miami and Eldean soils. They also are needed in many areas where a large watershed drains Crosby and Brookston soils. In the grassed waterways in Wayne County, tile drainage generally is needed to control seepage.

Grade stabilization structures are needed in many areas to control the erosion that can occur when surface water drains into open ditches. They are also needed in open ditches where, because of an excessive grade, the water flows so rapidly that it erodes the banks and the channel bottom.

Soil blowing is a hazard on the dark soils when they have no plant cover. Soils that are plowed in the fall are very susceptible to soil blowing the following spring. A vegetative cover or surface mulch helps to control soil blowing.

Soil fertility is naturally low or moderate in most of the soils on uplands and terraces in the county. Most of these soils naturally are strongly acid or medium acid. Applications of ground limestone generally are needed to raise the pH level sufficiently for good production of alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potassium levels are naturally low in most of these soils.

Soils on flood plains, such as Genesee and Shoals, are neutral or mildly alkaline and are naturally higher in content of plant nutrients than most soils on uplands and terraces. Very poorly drained soils, such as Mahalasville, Treaty, and Westland, are in slight depressions and receive runoff from the adjacent uplands. They normally are slightly acid or neutral.

On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to be applied.

Soil tilth is an important factor affecting the germination of seeds and 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 dark and is moderate in content of organic matter. Generally, the structure of these soils is moderate to weak. A surface crust forms during periods of intense rainfall. When dry, the crust in some areas is hard and impervious to water. The hard crust reduces the infiltration rate and increases the runoff rate. Regular additions of crop residue, manure, and other organic material improve soil structure and help to prevent excessive crusting.

Tilth is a problem in the dark, clayey Mahalasville, Treaty, Westland, and Ragsdale soils, which often stay wet until late in spring. If plowed when wet, these soils tend to be very cloddy when dry. As a result of the cloddiness, preparing a good seedbed is difficult. Fall plowing generally results in good tilth in the spring.

Fall plowing is generally not suitable on light colored soils that have a silt loam surface layer because a crust forms during winter and spring. Many of the soils are nearly as dense and hard at planting time as they were before they were plowed in the fall. Also, about 33 percent of the cropland consists of the more sloping soils that are subject to damaging erosion if they are plowed in the fall.

Field crops suited to the soils and climate in the county include many that are not now commonly grown. Corn and soybeans are the main row crops. Grain sorghum, sunflowers, sugar beets, and similar crops can be grown if economic conditions are favorable. Wheat and oats are the main close-growing crops. Barley and rye could be grown. Grass seed could be produced from bromegrass, fescue, orchardgrass, redtop, and bluegrass.

Specialty crops are of limited commercial importance in Wayne County. Only a small acreage is used for vegetables and small fruits. Deep, well drained soils that warm up early in spring are especially well suited to many vegetables and small fruits. Examples are Ockley soils and the Eldean soils that have a slope of less than 6 percent. Irrigating these soils increases production. Crops can generally be planted and harvested earlier on these soils than on the other soils in the county.

If drained, mucks are well suited to a wide range of vegetable crops. Examples are Houghton soils, which make up about 100 acres in the county.

Most of the well drained soils in the county are suitable for orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

The latest information about growing specialty 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. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; 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 residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil 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 listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

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 miscellaneous areas 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 very cold or very 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. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Wayne County has about 26,200 acres of woodland. Originally, vast areas in the county were forested, but most of these areas have been cleared. Many of the remaining tracts of timber are in areas that are too erodible or too wet for farming. Changes in farming methods, equipment, and economics threaten to further reduce the timbered acreage in the county.

Most of the soils in the county are suitable for some kind of timber production. Each soil differs from other soils in the properties that affect tree growth. Information in this soil survey can be used in selecting trees that are adapted to a particular site and in identifying the soils that are well suited to woodland.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general 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 an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site 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. Commonly grown 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.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs 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 depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep 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. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that 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 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the 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 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 campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for 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 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 and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Areas of good wetland wildlife habitat are around the ponds and along the streams and rivers in Wayne County. A few wetland and marsh areas provide habitat for aquatic animals and waterfowl. Fence rows, woodland, and other types of cover provide habitat for many kinds of wildlife. Deer, rabbits, quail, squirrels, muskrats, and many other species are common in the county.

This soil survey can be very useful in identifying specific areas that are suitable for wildlife habitat. The habitat in many areas of the county can be improved. The wide range of soils, topography, and plant cover in Wayne County results in a good potential for various kinds of wildlife habitat.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in 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* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features 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, soybeans, wheat, oats, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features 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, timothy, lovegrass, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features 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 bluestem, goldenrod, beggarweed, wheatgrass, broom sedge, ragweed, pokeweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, beech, wild cherry, sweetgum, willow, apple, black walnut, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover 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. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, spikerush, wild millet, wildrice, algae, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife 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 wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, woodchuck, coyote, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

Edge habitat consists of areas where major land uses or cover types adjoin. A good example is the border between dense woodland and a field of no-till corn. Although not rated in the table, edge habitat is of primary importance to animals from the smallest songbirds to white-tailed deer. Most of the animals that inhabit openland or woodland also frequent edge habitat, and desirable edge areas are consistently used by 10 times as many wildlife as are the centers of large areas of woodland or cropland.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, ponding, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, ponding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, ponding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the 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.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils.

Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

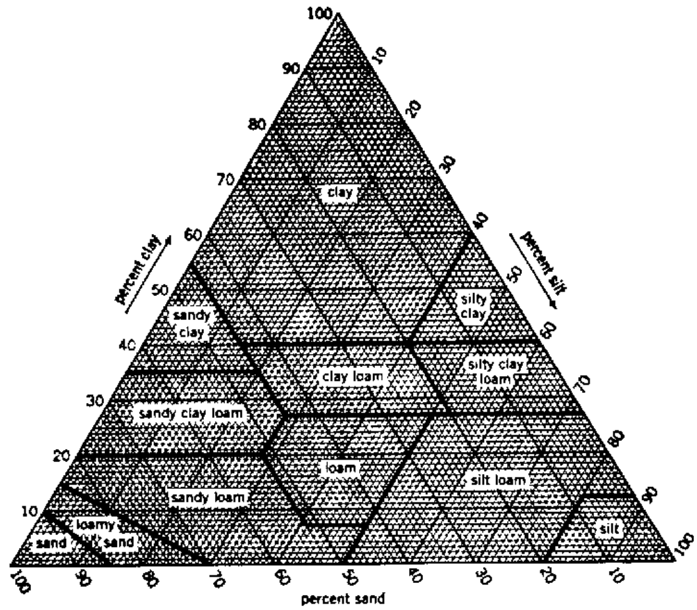

Figure 11.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given 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 the fraction of the soil that is less than 2 millimeters in diameter (fig. 11). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups 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 (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. 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. 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. 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. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 20 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. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. 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. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive 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 mainly of deep, well drained to excessively drained sands or gravelly sands. 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 having a layer that impedes the downward movement of water or soils of 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 clays 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.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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 the average, once or less in 2 years; and *frequent* that it occurs, on the average, 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.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalf (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group 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 typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*4*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Celina Series

The Celina series consists of deep, moderately well drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loess and glacial till. Slopes range from 1 to 5 percent.

Celina soils are similar to Xenia soils and are commonly adjacent to Miami and Strawn soils. Xenia soils have a silty mantle that is thicker than that of the Celina soils. The well drained Miami and Strawn soils do not have gray mottles in the upper part of the subsoil. They are in the higher, more sloping areas.

Typical pedon of Celina silt loam, 1 to 5 percent slopes, eroded, in a cultivated area; 100 feet east and 1,500 feet north of the southwest corner of sec. 29, T. 17 N., R. 14 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; friable; slightly acid; abrupt smooth boundary.
A—11 to 17 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; friable; slightly acid; clear wavy boundary.
2Bt1—17 to 24 inches; yellowish brown (10YR 5/4) clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.
2Bt2—24 to 32 inches; brown (10YR 4/3) clay loam; few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear wavy boundary.
2Bt3—32 to 37 inches; brown (10YR 5/3) clay loam; few fine faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin patchy very dark grayish brown (10YR 3/2) clay films lining pores; slight effervescence; mildly alkaline; clear wavy boundary.
2C—37 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The loess cap is 0 to 18 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is silt loam or loam. The 2Bt1 and 2Bt2 horizons have value of 4 or 5 and chroma of 3 to 6. They are clay loam or silty clay loam. The 2Bt1 is medium acid or slightly acid, and the 2Bt2 is slightly acid or neutral. The 2Bt3 horizon is clay loam or loam. It is neutral or mildly alkaline. The 2C horizon has chroma of 3 or 4.

Crosby Series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on till plains and moraines. These soils formed in a thin layer of loess and in the underlying glacial till. Slopes range from 1 to 6 percent.

Crosby soils are similar to Fincastle soils and are commonly adjacent to Losantville, Miami, Strawn, and Treaty soils. Fincastle soils have a silt cap that is thicker than that of the Crosby soils. The well drained Losantville, Miami, and Strawn soils do not have mottles in the upper part of the subsoil. They are in the more sloping areas. The poorly drained Treaty soils are in depressions. Their surface layer is thicker and darker than that of the Crosby soils.

Typical pedon of Crosby silt loam, 1 to 4 percent slopes, in a cultivated field; 2,150 feet east and 1,100 feet south of the northwest corner of sec. 11, T. 16 N., R. 13 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; massive; friable; many medium roots; neutral; abrupt smooth boundary.
E—6 to 13 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; many medium and fine roots; slightly acid; clear wavy boundary.
2Bt—13 to 23 inches; dark grayish brown (10YR 4/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; many fine roots; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds and lining pores; neutral; clear wavy boundary.
2BC—23 to 26 inches; brown (10YR 4/3) loam; many medium faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; neutral; clear wavy boundary.
2C—26 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 21 to 39 inches. The Ap horizon has value of 4 or 5. The E horizon has value of 5 or 6. The A and E horizons are typically silt loam, but the range includes loam. The 2Bt horizon has value of 4 or 5 and chroma of 2 or 3. It is silty clay loam or clay loam. The 2BC horizon has value of 4 or 5 and chroma of 2 or 3. It is clay loam or loam. The 2C horizon has value of 4 or 5 and chroma of 3 or 4. It is mildly alkaline or moderately alkaline and is slightly effervescent or strongly effervescent.

Eden Series

The Eden series consists of moderately deep, well drained, slowly permeable soils on upland side slopes. These soils formed in material weathered from limestone and shale bedrock. Slopes range from 25 to 40 percent.

These soils have hue of 10YR in the C horizon, which is too red to be within the range of the Eden series. Also, the increase in clay content between the A and B horizons is not sufficient for the B horizon to qualify as an argillic horizon. These differences, however, do not alter the usefulness or behavior of the soils.

Eden soils are commonly adjacent to Rodman and Wynn soils. Rodman soils formed in outwash. They are in positions on the landscape similar to those of the Eden soils. Wynn soils formed in glacial drift and in the underlying residual material. They are in the less sloping areas.

Typical pedon of Eden flaggy silty clay loam, 25 to 40 percent slopes, in a wooded area; 1,400 feet north and 1,500 feet west of the southeast corner of sec. 24, T. 13 N., R. 2 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) flaggy silty clay loam, pale brown (10YR 6/3) dry; moderate very fine subangular blocky structure; friable; about 2 percent limestone fragments; neutral; gradual wavy boundary.

Bt—4 to 21 inches; dark yellowish brown (10YR 4/4) flaggy silty clay; strong medium subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 20 percent limestone fragments; neutral; gradual wavy boundary.

C—21 to 36 inches; yellowish brown (10YR 5/4) flaggy clay; few fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; about 20 percent limestone fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

Cr—36 inches; weathered shale interbedded with thin layers of fractured limestone.

The solum is 20 to 40 inches thick. The content of limestone fragments ranges from 10 to 35 percent throughout the solum. The A horizon has value of 4 or 5 and chroma of 2 or 3. It is silty clay loam, clay loam, or the flaggy analogs of these textures. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is clay, silty clay, or the flaggy analogs of these textures. It is strongly acid to moderately alkaline. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is clay, silty clay, or the flaggy analogs of these textures. It is mildly alkaline or moderately alkaline.

Eldean Series

The Eldean series consists of well drained soils on outwash plains and terraces. These soils are moderately deep over gravelly loamy coarse sand. They are moderately permeable in the solum and rapidly permeable in the underlying material. They formed in sandy outwash. Slopes range from 0 to 18 percent.

Eldean soils are similar to Ockley soils and are commonly adjacent to Mahalasville, Rodman, Sleeth, and Westland soils. Ockley soils are deeper to loose gravelly coarse sand than the Eldean soils. Also, they have less clay in the subsoil. The very poorly drained Mahalasville and Westland soils are in depressions. Their surface layer is thicker and darker than that of the Eldean soils. Rodman soils have less clay in the subsoil than the Eldean soils. They are in the more sloping areas. The somewhat poorly drained Sleeth soils have mottles in the B horizon and are in the lower landscape positions.

Typical pedon of Eldean loam, 0 to 2 percent slopes, in a cultivated field; 160 feet north and 660 feet east of the center of sec. 36, T. 15 N., R. 1 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many medium and fine roots; about 8 percent gravel; medium acid; abrupt smooth boundary.

BA—9 to 13 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; many medium and fine roots; about 2 percent gravel; medium acid; clear wavy boundary.

Bt1—13 to 19 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; many medium and fine roots; thin discontinuous dark brown (10YR 3/3) clay films on the faces of peds; about 10 percent gravel; slightly acid; clear wavy boundary.

Bt2—19 to 29 inches; strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; firm; many fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds and lining pores; about 10 percent gravel; slightly acid; clear wavy boundary.

BC—29 to 34 inches; brown (10YR 5/3) gravelly loam; weak coarse subangular blocky structure; friable; few fine roots; about 34 percent gravel; slight effervescence; moderately alkaline; clear irregular boundary.

2C—34 to 60 inches; pale brown (10YR 6/3) very gravelly loamy coarse sand; single grain; loose; about 40 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The BA horizon has hue of 10YR or 7.5YR and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is gravelly clay loam, clay loam, or clay. The BC horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is gravelly loam, gravelly sandy loam, or gravelly clay loam. The 2C horizon has value of 4 to 6 and chroma of 2 to 4. It is very gravelly coarse sandy loam, gravelly loam, sand, gravelly loamy coarse sand, very gravelly loamy coarse sand, or gravelly coarse sand. It is mildly alkaline or moderately alkaline and is slightly effervescent or strongly effervescent.

Fincastle Series

The Fincastle series consists of deep, somewhat poorly drained soils on till plains and moraines. These soils are moderately permeable in the solum and moderately slowly permeable in the underlying material. They formed in loess and glacial till. Slopes range from 0 to 2 percent.

Fincastle soils are similar to Crosby and Reesville soils and are commonly adjacent to Russell, Treaty, and Xenia soils. Crosby soils have more clay in the subsoil than the Fincastle soils. Also, they have a thinner loess cap. The solum of Reesville soils formed entirely in loess. The well drained Russell and moderately well drained Xenia soils are in the more sloping areas in the slightly higher landscape positions. They do not have gray colors in the upper part of the solum. The very poorly drained Treaty soils are in depressions. Their surface layer is thicker and darker than that of the Fincastle soils.

Typical pedon of Fincastle silt loam, 0 to 2 percent slopes, in a cultivated field; 2,300 feet west and 1,740 feet north of the southeast corner of sec. 1, T. 12 N., R. 1 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

E—8 to 14 inches; brown (10YR 4/3) silt loam; many medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; medium acid; clear wavy boundary.

Bt1—14 to 21 inches; brown (10YR 4/3) silty clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear wavy boundary.

Bt2—21 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds and lining pores; slightly acid; clear wavy boundary.

2Bt3—32 to 39 inches; brown (10YR 4/3) clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thick continuous very dark grayish brown (10YR 3/2) clay films on faces of peds and lining pores; neutral; clear wavy boundary.

2BC—39 to 56 inches; dark grayish brown (10YR 4/2) clay loam; common medium faint brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; neutral; clear wavy boundary.

2C—56 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint yellowish brown (10YR 5/6) mottles; massive; firm; slight effervescence; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. The silty mantle ranges from 22 to 40 inches in thickness. The Ap horizon has chroma of 2 or 3. The Bt and 2Bt horizons have value of 4 or 5 and chroma of 2 to 6. The 2BC horizon is clay loam or loam. The 2C horizon has value of 4 or 5 and chroma of 3 to 6.

Genesee Series

The Genesee series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Genesee soils are similar to Stonelick soils and are commonly adjacent to Shoals and Sloan soils. Stonelick soils have less clay in the subsoil than the Genesee soils. The somewhat poorly drained Shoals soils have gray mottles in the subsoil. They are in positions on the landscape similar to those of the Genesee soils. The very poorly drained Sloan soils are in slight depressions. Their surface layer is thicker and darker than that of the Genesee soils.

Typical pedon of Genesee silt loam, occasionally flooded, in a wooded area; 2,400 feet west and 100 feet south of the northeast corner of sec. 21, T. 18 N., R. 14 E.

A—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

Bw—12 to 24 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

C1—24 to 32 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

C2—32 to 42 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

Cg—42 to 60 inches; grayish brown (10YR 5/2) loam; massive; friable; neutral.

The solum is 10 to 26 inches thick. The A horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silt loam, but the range includes loam. The B horizon has value of 4 to 6 and chroma of 3 to 6. It is silt loam, loam, sandy loam, or fine sandy loam. It is neutral or mildly alkaline. The C horizon has value of 4 or 5 and chroma of 2 to 4. It is loam, silt loam, sandy loam, or fine sandy loam. It is neutral or mildly alkaline.

Hennepin Series

The Hennepin series consists of deep, well drained, moderately slowly permeable soils on slopes that border stream valleys and moraines. These soils formed in glacial till. Slopes range from 25 to 50 percent.

Hennepin soils are commonly adjacent to Losantville and Miami soils in the higher landscape positions. The adjacent soils have more clay in the subsoil than the Hennepin soils. Also, Miami soils have a thicker subsoil and are less sloping.

Typical pedon of Hennepin loam, 25 to 50 percent slopes, in a wooded area; 300 feet south and 1,200 feet west of the northeast corner of sec. 5, T. 14 N., R. 1 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; about 5 percent gravel; neutral; clear wavy boundary.

Bw—7 to 15 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; about 5 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

C—15 to 60 inches; yellowish brown (10YR 5/4) loam; massive; friable; about 15 percent gravel; strong effervescence; moderately alkaline.

The solum is 10 to 20 inches thick. The content of coarse fragments ranges from 5 to 15 percent throughout the profile. The A horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly loam, but the range includes silt loam. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. It is neutral or mildly alkaline. The C horizon has value of 4 to 6 and chroma of 3 to 6. It is mildly alkaline or moderately alkaline and is slightly effervescent or strongly effervescent.

Houghton Series

The Houghton series consists of deep, very poorly drained, moderately permeable soils in depressional areas on uplands and outwash plains. These soils formed almost entirely in deep deposits of decomposed plant remains. Slopes range from 0 to 2 percent.

Houghton soils are commonly adjacent to Mahalasville soils. The adjacent soils have less organic matter throughout the solum than the Houghton soils. They are in the slightly higher landscape positions.

Typical pedon of Houghton muck, undrained, in an idle field; 1,960 feet south and 340 feet west of the northeast corner of sec. 15, T. 16 N., R. 12 E.

Oa1—0 to 9 inches; dark reddish brown (5YR 2/2), broken face and rubbed, sapric material; about 5 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; friable; neutral; abrupt smooth boundary.

Oa2—9 to 39 inches; black (N 2/0), broken face and rubbed, sapric material; about 10 percent fiber, less than 5 percent rubbed; weak very coarse subangular blocky structure; friable; neutral; clear wavy boundary.

Oa3—39 to 45 inches; black (5YR 2/1), broken face and rubbed, sapric material; about 15 percent fiber, less than 10 percent rubbed; weak very thick platy structure; friable; neutral; clear wavy boundary.

Oa4—45 to 60 inches; olive gray (5Y 4/2), broken face and rubbed, sapric material; about 15 percent fiber, less than 5 percent rubbed; massive; friable; neutral.

The organic material is more than 51 inches thick. It is mainly herbaceous. The hemic material has a combined thickness of less than 10 inches, and the fibric material has a combined thickness of less than 5 inches. The control section has hue of 10YR, 7.5YR, or 5YR, value of 2 to 4, and chroma of 1 to 3 or is neutral in hue. The subsurface tier is slightly acid or neutral.

Losantville Series

The Losantville series consists of deep, well drained, slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 2 to 18 percent.

Losantville soils are commonly adjacent to Crosby and Treaty soils. The somewhat poorly drained Crosby soils have gray mottles in the subsoil and are in the less sloping areas. The very poorly drained Treaty soils are in slight depressions. They have gray colors in the subsoil. Their surface layer is thicker and darker than that of the Losantville soils.

Typical pedon of Losantville silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 45 feet east and 735 feet south of the northwest corner of sec. 8, T. 16 N., R. 12 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; about 3 percent gravel; neutral; abrupt smooth boundary.

Bt1—7 to 12 inches; dark yellowish brown (10YR 4/4) clay; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; medium continuous dark yellowish brown (10YR 3/4) clay films on faces of peds and lining pores; about 3 percent gravel; neutral; clear wavy boundary.

Bt2—12 to 16 inches; dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm; medium continuous brown (10YR 4/3) clay films on faces of peds and lining pores; about 4 percent gravel; neutral; abrupt wavy boundary.

C1—16 to 26 inches; yellowish brown (10YR 5/4) loam; massive; firm; thin patchy dark brown (10YR 3/3) clay films lining pores; about 6 percent gravel;

strong effervescence; mildly alkaline; gradual wavy boundary.

C2—26 to 40 inches; yellowish brown (10YR 5/4) loam; massive; friable; gray (10YR 6/1) silt coatings; about 6 percent gravel; strong effervescence; mildly alkaline; gradual wavy boundary.

C3—40 to 60 inches; yellowish brown (10YR 5/4) loam; massive; friable; about 8 percent gravel; strong effervescence; mildly alkaline.

The solum is 12 to 22 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is silt loam, clay loam, or loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay or clay loam. It is slightly acid or neutral. The C horizon has chroma of 3 to 6.

Mahalasville Series

The Mahalasville series consists of deep, very poorly drained soils in depressions on terraces and moraines. These soils are slowly permeable in the solum and moderately rapidly permeable in the underlying material. They formed in outwash sediments. Slopes range from 0 to 2 percent.

Mahalasville soils are commonly adjacent to Eldean, Houghton, and Ockley soils. The well drained Eldean and Ockley soils are underlain by sand and gravel. They are in the higher landscape positions. Houghton soils contain more organic matter in the solum than the Mahalasville soils. They are in the slightly lower landscape positions.

Typical pedon of Mahalasville silt loam, in a cultivated field; 1,060 feet west and 1,940 feet north of the southeast corner of sec. 7, T. 16 N., R. 13 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; massive; friable; slightly acid; abrupt smooth boundary.

AB—10 to 16 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; few medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

Btg1—16 to 24 inches; gray (10YR 6/1) silty clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; thin continuous dark gray (7.5YR 4/0) clay films on faces of peds and lining pores; slightly acid; clear wavy boundary.

Btg2—24 to 42 inches; gray (10YR 6/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds and lining pores; neutral; clear wavy boundary.

BCg—42 to 47 inches; pinkish gray (7.5YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; slight effervescence; mildly alkaline; clear wavy boundary.

Cg1—47 to 56 inches; brown (10YR 4/3) silt loam; many medium faint dark yellowish brown (10YR 4/6) mottles; massive; firm; strong effervescence; mildly alkaline; clear wavy boundary.

Cg2—56 to 60 inches; dark gray (N 4/0) silt loam; few medium distinct dark yellowish brown (10YR 4/6) mottles; massive; firm; strong effervescence; mildly alkaline.

The solum is 40 to 55 inches thick. The mollic epipedon is 10 to 16 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 2. The BC horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 6. It is silt loam, silty clay loam, clay loam, or loam. The C horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 6. It is silt loam or loam.

Miami Series

The Miami series consists of deep, well drained, moderately slowly permeable or moderately permeable soils on till plains and moraines. These soils formed in loess and glacial till. Slopes range from 2 to 50 percent.

Miami soils are similar to Russell soils and are commonly adjacent to Celina, Crosby, Hennepin, and Treaty soils. Russell soils have a silty mantle that is thicker than that of the Miami soils. The moderately well drained Celina and somewhat poorly drained Crosby soils have gray mottles in the subsoil and are in the less sloping areas. Hennepin soils have less clay in the subsoil than the Miami soils and are in the more sloping areas. The very poorly drained Treaty soils are in depressions. Their surface layer is thicker and darker than that of the Miami soils.

Typical pedon of Miami silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,900 feet north and 400 feet west of the southeast corner of sec. 1, T. 15 N., R. 13 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak and moderate fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt1—6 to 12 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; few medium and fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 7/2) silt coatings lining channels; about 2 percent gravel; neutral; clear wavy boundary.

Bt2—12 to 20 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

BC—20 to 32 inches; yellowish brown (10YR 5/4) loam; weak very coarse prismatic structure parting to weak medium subangular blocky; firm; thin patchy brown (10YR 4/3) clay films on faces of peds; about 2 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

C—32 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 5 percent gravel; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. The loess cap is 0 to 12 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly silt loam, but the range includes loam and clay loam. The Bt1 horizon has value of 4 or 5 and chroma of 3 or 4. It is silty clay loam, clay loam, or loam. The Bt2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or silty clay loam. The BC horizon has colors similar to those of the Bt horizon. It is loam or clay loam. The C horizon has value of 5 or 6 and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Millsdale Series

The Millsdale series consists of moderately deep, very poorly drained, moderately slowly permeable soils on till plains and terraces. These soils formed in glacial drift and in material weathered from the underlying limestone and shale. Slopes range from 0 to 2 percent.

These soils have a slightly higher content of cobbles and stones in the lower part of the subsoil than is definitive for the Millsdale series. Also, the underlying bedrock is more fractured. These differences, however, do not greatly alter the usefulness or behavior of the soils.

Millsdale soils are commonly adjacent to Randolph and Wynn soils. Randolph soils do not have a dark surface layer. They are in the higher landscape positions. Wynn soils do not have gray mottles in the subsoil. They are in the more sloping areas.

Typical pedon of Millsdale silty clay loam, in a cultivated field; 1,900 feet south and 800 feet east of the northwest corner of sec. 19, T. 13 N., R. 1 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; massive; friable; neutral; abrupt smooth boundary.

Bt1—10 to 14 inches; very dark gray (10YR 3/1) silty clay loam; many medium faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; neutral; clear wavy boundary.

2Bt2—14 to 20 inches; light brownish gray (2.5Y 6/2) channery clay; many medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; about 30 percent rock fragments; neutral; clear wavy boundary.

3C—20 to 28 inches; light yellowish brown (2.5Y 6/4) very flaggy clay loam; many medium faint yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; massive; firm; about 40 percent rock fragments 3 to 10 inches across the longest axis; strong effervescence; moderately alkaline; clear wavy boundary.

3Cr—28 inches; light gray (10YR 6/1) fractured limestone and shale bedrock.

The solum is 20 to 38 inches thick, and the depth to bedrock is 22 to 40 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay loam or silt loam. The Bt horizon has hue of 2.5Y or 10YR, value of 3 to 6, and chroma of 1 to 4. It is silty clay loam, clay loam, channery silty clay loam, or channery clay. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7, and chroma of 2 to 6. It is clay, clay loam, or the channery, very flaggy, or flaggy analogs of these textures.

Ockley Series

The Ockley series consists of deep, well drained soils on outwash plains and terraces. These soils are moderately permeable in the solum and very rapidly permeable in the underlying material. They formed in loess over outwash material. Slopes range from 0 to 6 percent.

Ockley soils are similar to Eldean soils and are commonly adjacent to Mahalasville, Sleeth, and Westland soils. Eldean soils have a fine textured solum that is less than 40 inches thick. The very poorly drained Mahalasville and Westland soils are in slight depressions and swales. Their surface layer is thicker and darker than that of the Ockley soils. The somewhat poorly drained Sleeth soils have gray mottles in the subsoil and are on the lower flats.

Typical pedon of Ockley silt loam, 0 to 2 percent slopes, in a cultivated field; 990 feet north and 2,140 feet east of the southwest corner of sec. 1, T. 13 N., R. 1 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

Bt1—8 to 17 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; about 2 percent gravel; neutral; clear wavy boundary.

2Bt2—17 to 28 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; about 8 percent gravel; slightly acid; clear wavy boundary.

2Bt3—28 to 35 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium prismatic structure parting to fine medium subangular blocky; firm; about 10 percent gravel; slightly acid; clear wavy boundary.

2BC—35 to 48 inches; mottled dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; about 14 percent gravel; slightly acid; clear wavy boundary.

3C—48 to 60 inches; brown (10YR 5/3) very gravelly coarse sand; single grain; loose; about 40 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 40 to 60 inches. The Ap horizon has value of 4 or 5 and chroma of 3 or 4. It is dominantly silt loam, but the range includes loam and silty clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam and silty clay loam, but the range includes sandy clay loam. This horizon is medium acid to neutral. The C horizon has value of 4 or 5 and chroma of 3 or 4.

Ragsdale Series

The Ragsdale series consists of deep, very poorly drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

Ragsdale soils are similar to Treaty soils and are commonly adjacent to Reesville soils. Treaty soils have a silty mantle that is thinner than that of the Ragsdale soils. The somewhat poorly drained Reesville soils do not have a thick, dark surface layer. Also, they have less clay in the surface layer than the Ragsdale soils. They are in the higher landscape positions.

Typical pedon of Ragsdale silty clay loam, in a cultivated field; 50 feet east and 2,600 feet north of the southwest corner of sec. 36, T. 13 N., R. 1 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

BA—11 to 18 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear wavy boundary.

Bt1—18 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—26 to 35 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and dark gray (10YR 4/1) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thick continuous gray (10YR 5/1) clay films on faces of peds; neutral; gradual wavy boundary.

Bt3—35 to 48 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) and dark gray (10YR 4/1) mottles; weak medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual irregular boundary.

BC—48 to 60 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; thin patchy dark gray (10YR 4/1) clay films lining channels; slight effervescence; mildly alkaline; clear wavy boundary.

C—60 to 70 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct dark gray (10YR 4/1) and grayish brown (10YR 5/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 52 to 60 inches thick. The loess is 60 to 80 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay loam or silt loam. The BA and Bt horizons have value of 4 or 5 and chroma of 1 or 2. They are silt loam or silty clay loam. The BC horizon has value of 4 or 5 and chroma of 2 to 6. The C horizon has value of 4 or 5 and chroma of 3 to 6. It is silt loam or silt.

Randolph Series

The Randolph series consists of moderately deep, somewhat poorly drained, moderately slowly permeable soils on till plains and terraces. These soils formed in glacial drift and in material weathered from the underlying limestone and shale. Slopes range from 0 to 2 percent.

These soils have a slightly higher content of cobbles and stones in the lower part of the subsoil than is definitive for the Randolph series. Also, the underlying bedrock is more fractured. These differences, however, do not greatly alter the usefulness or behavior of the soils.

Randolph soils are commonly adjacent to Millsdale and Wynn soils. The very poorly drained Millsdale soils are in depressions. Their surface layer is thicker and darker than that of the Randolph soils. The well drained Wynn soils do not have mottles in the subsoil and are in the higher, more sloping areas.

Typical pedon of Randolph silt loam, 0 to 2 percent slopes, in a cultivated field; 500 feet west and 2,000 feet south of the northeast corner of sec. 24, T. 13 N., R. 2 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; massive; friable; medium acid; abrupt smooth boundary.

A—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; slightly acid; clear wavy boundary.

Bt1—14 to 18 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—18 to 28 inches; brown (10YR 5/3) silty clay; many medium faint grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds and lining voids; neutral; clear wavy boundary.

2Bt3—28 to 36 inches; light olive brown (2.5Y 5/4) very channery clay loam; many medium faint light olive brown (2.5Y 5/6) mottles; weak medium subangular blocky structure; firm; thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of peds; about 40 percent rock fragments; slight effervescence; mildly alkaline; clear wavy boundary.

3C—36 to 39 inches; light gray (10YR 7/2) very flaggy loam; many medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; firm; about 50 percent rock fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

3Cr—39 inches; light gray (10YR 6/1) fractured limestone and shale bedrock.

The solum is 20 to 38 inches thick, and the depth to bedrock is 22 to 40 inches. The A horizon has value of 4 or 5 and chroma of 1 or 2. The Bt horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 to 4. The upper part of this horizon is silty clay loam, clay loam, or the channery or flaggy analogs of these textures. The lower part is clay loam, silty clay, clay, or the channery or very channery analogs of these textures. The content of stones 3 to 6 inches across the longest axis is as much as 45 percent. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7, and chroma of 2 to 6. It is loam, clay loam, or the very flaggy or flaggy analogs of these textures. The content of stones 3 to 10 inches across the longest axis is as much as 60 percent in this horizon.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained, moderately slowly permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

Reesville soils are similar to Fincastle soils and are commonly adjacent to Ragsdale soils. Fincastle soils have a silty mantle that is thinner than that of the Reesville soils. The very poorly drained Ragsdale soils are in depressions. Their surface layer is thicker and darker than that of the Reesville soils.

Typical pedon of Reesville silt loam, 0 to 2 percent slopes, in a cultivated field; 700 feet east and 50 feet north of the southwest corner of sec. 25, T. 13 N., R. 1 W.

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

BA—12 to 18 inches; brown (10YR 5/3) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

Bt1—18 to 26 inches; brown (10YR 4/3) silty clay loam; common fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—26 to 34 inches; brown (10YR 4/3) silty clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds and lining voids; slightly acid; clear wavy boundary.

BC—34 to 48 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; neutral; clear wavy boundary.

C1—48 to 58 inches; brown (10YR 5/3) silt loam; common coarse faint dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/6) mottles; massive; friable; strong effervescence; moderately alkaline; clear wavy boundary.

2C2—58 to 60 inches; yellowish brown (10YR 5/4) loam; common coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 30 to 60 inches thick. The loess is 40 to 60 inches thick. The Ap horizon is grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2). The BA horizon has value of 4 or 5 and chroma of 2 or 3. It is silt loam or silty clay loam. The Bt horizon also is silt loam or silty clay loam. It has value of 4 or 5 and chroma of 2 to 4. The BC horizon also has value of 4 or 5 and chroma of 2 to 4. Reaction is medium acid to neutral in the BA and Bt horizons and neutral or mildly alkaline in the BC horizon. The C1 horizon has value of 4 or 5 and chroma of 3 or 4. The 2C2 horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4) clay loam or loam.

Rodman Series

The Rodman series consists of excessively drained soils on side slopes on kames, moraines, and outwash plains. These soils are shallow over gravelly coarse sand. They are moderately rapidly permeable in the solum and very rapidly permeable in the underlying material. They formed in outwash. Slopes range from 15 to 50 percent.

Rodman soils are commonly adjacent to Eden, Eldean, and Miami soils. Eden soils formed in material weathered from bedrock. They are in positions on the landscape similar to those of the Rodman soils. Eldean soils have a solum that is finer textured than that of the Rodman soils and are deeper over loose gravelly coarse sand. They are in the less sloping areas. Miami soils formed in loamy glacial till on the higher upland slopes.

Typical pedon of Rodman gravelly loam, 25 to 50 percent slopes, in a wooded area; 650 feet south and 1,300 feet west of the northeast corner of sec. 35, T. 14 N., R. 1 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) gravelly loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; about 20 percent gravel; neutral; clear wavy boundary.

A2—3 to 6 inches; very dark grayish brown (10YR 3/2) gravelly loam, gray (10YR 5/1) dry; common medium faint brown (10YR 4/3) mottles; moderate fine subangular blocky structure; friable; about 20 percent gravel; neutral; clear wavy boundary.

Bw—6 to 12 inches; brown (10YR 4/3) gravelly loam; weak medium subangular blocky structure; friable; about 25 percent gravel; neutral; clear wavy boundary.

C—12 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; about 35 percent gravel; slight effervescence; mildly alkaline.

The thickness of the solum is 10 to 15 inches and coincides with the depth to loose gravelly coarse sand. The content of gravel ranges from 10 to 40 percent throughout the solum. The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A and Bw horizons are typically gravelly loam, but the range includes gravelly sandy loam. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. The C horizon has value of 4 or 5 and chroma of 1 to 4. It is gravelly coarse sand or sand.

Russell Series

The Russell series consists of deep, well drained, moderately permeable soils on till plains and moraines. These soils formed in loess and glacial till. Slopes range from 2 to 12 percent.

Russell soils are similar to Miami soils and are commonly adjacent to Fincastle and Xenia soils. Miami soils have a loess cap that is thinner than that of the Russell soils. The somewhat poorly drained Fincastle and moderately well drained Xenia soils have gray mottles in the subsoil and are in the lower, less sloping areas.

Typical pedon of Russell silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 1,700 feet west and 150 feet south of the center of sec. 26, T. 15 N., R. 12 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt1—6 to 16 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—16 to 30 inches; strong brown (7.5YR 4/6) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt3—30 to 40 inches; strong brown (7.5YR 5/6) clay loam; weak medium subangular blocky structure; firm; thin patchy dark brown (7.5YR 3/4) clay films lining channels; about 2 percent gravel; medium acid; clear wavy boundary.

2Bt4—40 to 66 inches; brown (7.5YR 5/4) loam; weak coarse subangular blocky structure; friable; about 4 percent gravel; slightly acid; clear wavy boundary.

2C—66 to 80 inches; yellowish brown (10YR 5/4) loam; massive; friable; about 7 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The loess is 20 to 40 inches thick. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or silt loam. The 2Bt horizon has colors similar to those of the Bt horizon. It is clay loam or loam and has a gravel content of 2 to 7 percent. It is medium acid to neutral. The 2C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4). It has a gravel content of 5 to 10 percent.

Shoals Series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Shoals soils are commonly adjacent to Genesee, Sloan, and Stonelick soils. The well drained Genesee soils do not have gray mottles in the solum. They are in positions on the landscape similar to those of the Shoals soils. The very poorly drained Sloan soils are in slight depressions. Their surface layer is thicker and darker than that of the Shoals soils. The well drained Stonelick soils are in the slightly higher landscape positions. They do not have gray mottles and have less clay in the solum than the Shoals soils.

Typical pedon of Shoals silt loam, occasionally flooded, in a cultivated field; 900 feet west and 100 feet south of the northeast corner of sec. 5, T. 14 N., R. 1 W.

Ap—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; few fine distinct reddish brown (2.5YR 4/4) mottles; weak medium granular structure; friable; neutral; clear smooth boundary.

Cg1—3 to 7 inches; dark grayish brown (10YR 4/2) loam; common medium distinct reddish brown (2.5YR 4/4) mottles; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

Cg2—7 to 11 inches; dark grayish brown (10YR 4/2) loam; common medium distinct reddish brown (2.5YR 4/4) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

Cg3—11 to 15 inches; grayish brown (10YR 5/2) loam; common medium faint brown (10YR 4/3) and reddish brown (2.5YR 4/4) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

Cg4—15 to 60 inches; mottled grayish brown (10YR 5/2), brown (10YR 4/3), and yellowish brown (10YR 5/6) loam; massive; friable; neutral.

The Ap horizon has value of 4 or 5. It is dominantly silt loam, but the range includes loam. The C horizon has value of 4 or 5 and chroma of 2 to 4. It is loam or silt loam. It is neutral or mildly alkaline.

Sleeth Series

The Sleeth series consists of deep, somewhat poorly drained soils on outwash plains and terraces. These soils are moderately permeable in the solum and very rapidly permeable in the underlying material. They formed in outwash. Slopes range from 0 to 2 percent.

Sleeth soils are commonly adjacent to Eldean, Ockley, and Westland soils. The well drained Eldean and Ockley soils are in the slightly higher landscape positions. They do not have gray mottles in the subsoil. The very poorly drained Westland soils are in slight depressions. They have a thick, dark surface layer.

Typical pedon of Sleeth silt loam, in a cultivated field; 1,900 feet east and 820 feet north of the southwest corner of sec. 1, T. 13 N., R. 1 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

A—8 to 16 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

Bt1—16 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint gray (10YR 5/1) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

2Bt2—26 to 46 inches; dark grayish brown (10YR 4/2) clay loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thin patchy very dark grayish brown (10YR 3/2) clay films on faces of peds; about 15 percent gravel; slightly acid; clear wavy boundary.

3C—46 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 58 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silt loam, but the range includes loam. The Bt horizon has value of 4 to 6 and chroma of 1 to 4 and has mottles of high chroma. The C horizon has value of 5 or 6 and chroma of 1 to 4. It is mildly alkaline or moderately alkaline and has free carbonates.

Sloan Series

The Sloan series consists of deep, very poorly drained, moderately slowly permeable or moderately permeable soils on flood plains. These soils formed in alluvium. Slopes are 0 to 1 percent.

Sloan soils are commonly adjacent to the well drained Genesee and Stonelick and somewhat poorly drained Shoals soils in the slightly higher areas. The surface layer of the adjacent soils is thinner and lighter colored than that of the Sloan soils. Also, Stonelick soils have less clay in the 10- to 40-inch control section.

Typical pedon of Sloan silty clay loam, occasionally flooded, in a cultivated field; 360 feet west and 940 feet north of the southeast corner of sec. 27, T. 16 N., R. 12 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; massive; friable; neutral; abrupt smooth boundary.

A—10 to 19 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; about 5 percent gravel; neutral; clear wavy boundary.

Bg1—19 to 27 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; about 2 percent gravel; neutral; clear wavy boundary.

Bg2—27 to 40 inches; gray (10YR 5/1) loam; common medium faint yellowish brown (10YR 5/4) and pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; friable; about 2 percent gravel; neutral; clear wavy boundary.

Cg—40 to 60 inches; grayish brown (10YR 5/2) fine sandy loam; common fine faint yellowish brown (10YR 5/6) mottles; massive; friable; about 5 percent gravel; slight effervescence; mildly alkaline.

The solum is 22 to 50 inches thick. It is slightly acid to mildly alkaline. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes loam, silt loam, and clay loam. The Bg horizon has value of 4 or 5 and chroma of 1 or 2. It is clay loam, silty clay loam, or loam. The Cg horizon has value of 4 to 6 and chroma of 1 to 4. It is silty clay loam, clay loam, loam, silt loam, sandy loam, or fine sandy loam and is stratified.

Stonelick Series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Genesee soils and are commonly adjacent to Shoals and Sloan soils. Genesee and Shoals soils have less sand and more clay in the 10- to 40-inch control section than the Stonelick soils. Shoals soils have gray mottles in the subsoil. They are somewhat poorly drained and are in the slightly lower landscape positions. Sloan soils are very poorly drained and are in slight depressions. Their surface layer is thicker and darker than that of the Stonelick soils.

Typical pedon of Stonelick loam, occasionally flooded, in a cultivated field; 330 feet west and 1,650 feet south of the northeast corner of sec. 5, T. 13 N., R. 1 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak very fine granular structure; very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

A—6 to 9 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C1—9 to 18 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C2—18 to 29 inches; brown (10YR 4/3) sandy loam; massive; very friable; about 5 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

C3—29 to 50 inches; very pale brown (10YR 7/4) gravelly loamy sand; single grain; loose; about 25 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

C4—50 to 60 inches; very pale brown (10YR 7/4) gravelly loamy sand; single grain; loose; about 30 percent gravel; strong effervescence; moderately alkaline.

Reaction is mildly alkaline or moderately alkaline throughout the profile. The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is dominantly loam, but the range includes sandy loam and fine sandy loam. The C horizon has value of 4 to 7 and chroma of 3 or 4. It is sandy loam, fine sandy loam, loamy sand, loam, or the gravelly analogs of these textures.

Strawn Series

The Strawn series consists of deep, well drained, moderately slowly permeable soils on moraines and till plains. These soils formed in glacial till. Slopes range from 2 to 18 percent.

Strawn soils are commonly adjacent to Celina, Crosby, Losantville, and Treaty soils. The moderately well drained Celina soils are in the less sloping areas. They have mottles in the subsoil. The somewhat poorly drained Crosby soils are in the lower, less sloping areas. They have gray mottles in the subsoil. Losantville soils have more clay in the subsoil than the Strawn soils. They are in positions on the landscape similar to those of the Strawn soils. The very poorly drained Treaty soils are in depressions. They are gray throughout the solum and have a surface layer that is darker than that of the Strawn soils.

Typical pedon of Strawn clay loam, 6 to 12 percent slopes, severely eroded, in a cultivated field; 400 feet north and 30 feet west of the center of sec. 5, T. 14 N., R. 1 W.

Ap—0 to 7 inches; brown (10YR 4/3) clay loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; firm; few pebbles; neutral; abrupt smooth boundary.

Bt—7 to 14 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

C1—14 to 25 inches; pale brown (10YR 6/3) loam; massive; firm; few pebbles; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—25 to 60 inches; pale brown (10YR 6/3) loam; massive; firm; few pebbles; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates are typically 12 to 20 inches but range from 10 to 24 inches. The A horizon has value of 4 or 5 and chroma of 3 or 4. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly clay loam, but the range includes loam. The C horizon has value of 5 or 6 and chroma of 3 or 4.

Treaty Series

The Treaty series consists of deep, very poorly drained soils on till plains and moraines. These soils are moderately permeable in the solum and moderately slowly permeable in the underlying material. They formed in loess and glacial till. Slopes range from 0 to 2 percent.

Treaty soils are similar to Ragsdale soils and are commonly adjacent to Crosby, Fincastle, Losantville, and Miami soils. Ragsdale soils have a loess cap that is thicker than that of the Treaty soils. The somewhat poorly drained Crosby and Fincastle and well drained Losantville soils are in the slightly higher areas. They do not have a thick, dark surface layer. The well drained Miami soils also do not have a thick, dark surface layer. They are in the higher, more sloping areas.

Typical pedon of Treaty silty clay loam, in a cultivated area; 2,100 feet west and 100 feet north of the southeast corner of sec. 1, T. 12 N., R. 2 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; massive; firm; medium acid; abrupt smooth boundary.

AB—10 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; medium acid; clear wavy boundary.

Btg1—16 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium faint gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear wavy boundary.

Btg2—24 to 33 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

Btg3—33 to 38 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium faint gray (10YR 5/1) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

2BCg—38 to 42 inches; brown (10YR 5/3) clay loam; common medium distinct gray (10YR 6/1) mottles; weak coarse subangular blocky structure; firm; slight effervescence; mildly alkaline; clear wavy boundary.

2Cg—42 to 60 inches; light brownish gray (10YR 6/2) loam; common medium faint gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; mildly alkaline.

The solum is 40 to 65 inches thick. The silty mantle is 24 to 40 inches thick. The mollic epipedon is 10 to 18 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay loam or silt loam. The AB horizon also is silty clay loam or silt loam. It has value of 2 to 5 and chroma of 1 or 2. The Btg horizon has value of 4 or 5 and chroma of 1 or 2. It is silty clay loam or clay loam. It is medium acid or slightly acid in the upper part and slightly acid or neutral in the lower part. The 2BC horizon is clay loam or loam. It is neutral or mildly alkaline. The C horizon has value of 5 or 6 and chroma of 2 or 3.

Westland Series

The Westland series consists of deep, very poorly drained soils on outwash plains and terraces. These soils are moderately permeable in the solum and very rapidly permeable in the underlying material. They formed in outwash material. Slopes range from 0 to 2 percent.

Westland soils are commonly adjacent to the well drained Eldean and Ockley and somewhat poorly drained Sleeth soils in the slightly higher positions on the landscape. The adjacent soils do not have a thick, dark surface layer.

Typical pedon of Westland silty clay loam, in a cultivated field; 250 feet north and 1,730 feet east of the southwest corner of sec. 1, T. 13 N., R. 1 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; friable; common medium roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

BA—10 to 16 inches; dark gray (10YR 4/1) silty clay loam; moderate fine subangular blocky structure; firm; common medium roots; about 5 percent gravel; neutral; clear wavy boundary.

Btg1—16 to 21 inches; dark gray (10YR 4/1) silty clay loam; moderate medium subangular blocky structure; firm; common medium roots; thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

2Btg2—21 to 29 inches; dark gray (10YR 4/1) clay loam; moderate medium subangular blocky structure; firm; thin patchy very dark grayish brown (10YR 3/2) clay films on faces of peds; few medium roots; about 10 percent gravel; neutral; clear wavy boundary.

2Btg3—29 to 37 inches; olive gray (5Y 5/2) clay loam; few fine distinct yellowish brown (10YR 5/6) and dark gray (10YR 4/1) mottles; strong medium subangular blocky structure; firm; few fine roots; thin patchy gray (10YR 5/1) clay films on faces of peds; about 10 percent gravel; neutral; clear wavy boundary.

2BCg—37 to 47 inches; grayish brown (10YR 5/2) loam; common fine faint gray (10YR 6/1) mottles; weak medium subangular blocky structure; friable; few fine roots; about 10 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

3Cg—47 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand; single grain; loose; about 40 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to gravelly coarse sand range from 40 to 60 inches. The mollic epipedon is 10 to 15 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bt and 2BC horizons have value of 4 or 5 and chroma of 1 or 2. The 2BC horizon is typically loam, but the range includes gravelly loam, clay loam, and gravelly clay loam. The C horizon has value of 4 to 7 and chroma of 1 to 6.

Wynn Series

The Wynn series consists of moderately deep, well drained, slowly permeable soils on till plains and terraces. These soils formed in glacial drift and in the underlying limestone and shale residuum. Slopes range from 2 to 18 percent.

Wynn soils are commonly adjacent to Eden, Millsdale, and Randolph soils. Eden soils formed in material weathered from limestone and shale bedrock and contain more clay in the subsoil than the Wynn soils. They are on the steeper slopes. The very poorly drained Millsdale and somewhat poorly drained Randolph soils have gray mottles in the subsoil and are on flats or in depressions.

Typical pedon of Wynn silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 1,120 feet north and 1,300 feet west of the southeast corner of sec. 24, T. 13 N., R. 2 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate very fine subangular blocky structure; friable; slightly acid; gradual wavy boundary.

BA—4 to 12 inches; dark brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; firm; slightly acid; gradual wavy boundary.

2Bt1—12 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; medium acid; gradual wavy boundary.

3Bt2—16 to 23 inches; yellowish brown (10YR 5/4) channery clay; moderate medium subangular blocky structure; firm; about 20 percent rock fragments; neutral; gradual wavy boundary.

3C—23 to 34 inches; mottled brown (10YR 5/3), yellow (10YR 7/6), and light gray (10YR 7/2) flaggy clay; massive; firm; about 20 percent rock fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

3Cr—34 inches; light gray (10YR 6/1) fractured limestone and shale bedrock.

The thickness of the solum and the depth to limestone and shale bedrock range from 20 to 40 inches. The A horizon has chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon is clay loam, gravelly clay loam, clay, channery clay loam, or channery clay. It is neutral to medium acid. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7, and chroma of 2 to 6. It is clay, clay loam, or the channery or flaggy analogs of these textures.

Xenia Series

The Xenia series consists of deep, moderately well drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loess and glacial till. Slopes range from 1 to 5 percent.

Xenia soils are similar to Celina soils and are commonly adjacent to Fincastle and Russell soils. Celina soils have a surface layer that is thinner than that of the Xenia soils. Fincastle soils have gray mottles in the upper part of the subsoil. They are somewhat poorly drained and are in the lower areas. Russell soils do not have mottles in the subsoil. They are well drained and are on the higher, steeper slopes.

Typical pedon of Xenia silt loam, 1 to 5 percent slopes, eroded, in a cultivated field; 250 feet west and 1,910 feet south of the center of sec. 22, T. 15 N., R. 12 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

Bt1—9 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/8) and brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds and lining voids; medium acid; clear wavy boundary.

Bt2—16 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct grayish brown (10YR 5/2), yellowish brown (10YR 5/8), and brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds and lining voids; common dark brown (7.5YR 3/2) soft iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

Bt3—29 to 38 inches; brown (10YR 4/3) silty clay loam; many medium faint grayish brown (2.5Y 5/2), dark yellowish brown (10YR 4/6), and brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 3/4) clay films lining channels; common dark brown (7.5YR 3/2) soft iron and manganese oxide accumulations; neutral; clear wavy boundary.

2BC—38 to 48 inches; brown (10YR 4/3) loam; many medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 3/4) clay films lining channels; about 3 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2C—48 to 60 inches; brown (10YR 5/3) loam; few fine faint dark grayish brown (10YR 4/2), pale brown (10YR 6/3), and yellowish brown (10YR 5/6) mottles; massive; friable; about 7 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The loess is 22 to 40 inches thick. The Ap horizon has chroma of 2 or 3. The BA horizon, if it occurs, has value of 4 or 5 and chroma of 3 or 4. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or clay loam. The BC horizon has value of 4 or 5 and chroma of 3 or 4. It is loam or clay loam. The C horizon has value of 5 or 6 and chroma of 3 or 4.

Formation of the Soils

This section relates the major factors of soil formation to the soils in Wayne County. It also describes the processes of soil formation.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that 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 into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always required for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils in Wayne County were deposited by glaciers or by meltwater from the glaciers. Some of these materials were worked and redeposited by the subsequent actions of water and wind. The glaciers covered the county about 10,000 to 20,000 years ago. Although the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Wayne County were deposited as glacial till, outwash, and alluvium.

Glacial till is material laid down directly by a glacier with a minimum of water action. It consists of particles of different sizes that are mixed together. Many of the small pebbles in glacial till have sharp edges and corners, indicating that they have not been worn by water. The glacial till in Wayne County is calcareous, firm loam. Miami soils are an example of soils that formed in glacial till. These soils typically are moderately fine textured or medium textured and have well developed structure.

Outwash material was deposited by running water from melting glaciers. The size of the particles that make up outwash varies according to the speed of the stream that carried the material. When the water slowed down, the coarser particles were deposited. Fine particles, such as very fine sand, silt, and clay, can be carried by the more slowly moving water. Outwash deposits generally occur as layers of particles of similar size, such as fine sand, sand, gravel, and other coarse particles. Eldean soils are an example of soils that formed in outwash material.

Alluvial material was recently deposited by floodwater along present streams. This material varies in texture, depending on the speed of the water from which it was deposited. Alluvium deposited along a swift stream, such as the Whitewater River, is coarser textured than that deposited along a slower stream, such as Nettle Creek. Stonelick and Genesee soils are examples of soils that formed in alluvium.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Wayne County. Bacteria, fungi, and earthworms, however, have also been important. The chief contribution of plant and animal life to soil formation 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 native plants that grew on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became humus. The roots of the plants provided channels for the downward movement of water and air through the soil and added organic matter as they decayed. Bacteria helped to break down the organic matter into plant nutrients.

The vegetation in Wayne County was mainly deciduous trees. Differences in natural soil drainage and minor variations in the parent material have affected the composition of the forest species. The well drained upland soils, such as Miami soils, were mainly covered with sugar maple, beech, white oak, red oak, yellow-poplar, and ash. The poorly drained soils supported primarily swamp white oak, maple, and cottonwood. The soils that formed dominantly under forest vegetation generally have less organic matter than the soils that formed dominantly under grasses. In a few wet areas, sphagnum and other mosses contributed substantially to the accumulation of organic matter. Treaty and Westland soils, for example, formed under wet conditions and contain a considerable amount of organic matter.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil, the amount of water available for the weathering of minerals and the transporting of weathered products, and the rate of chemical reactions in the soil.

The climate in Wayne County is cool and humid. It is presumably similar to the climate under which the soils formed. The soils in this county differ from those that formed under a dry, warm climate and from those that formed under a hot, moist climate. Climate is uniform throughout the county, although its effect is modified locally by runoff. Only minor differences among the soils are the result of differences in climate. More information about the climate is available under the heading "General Nature of the County."

Relief

Relief has markedly affected the soils in Wayne County through its effect on natural drainage, erosion, plant cover, and soil temperature. Slopes range from 0 to 50 percent. Runoff is most rapid on the steeper slopes. Water is temporarily ponded in low areas.

Natural soil drainage in the county ranges from well drained on the more sloping ridgetops to very poorly drained in the nearly level depressions. Through its effect on aeration in the soil, drainage determines the color of the soil. Water and air freely move through well drained soils but slowly through very poorly drained soils. In Miami and other well drained, well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Westland and other poorly aerated, very poorly drained soils are dull gray and mottled.

Time

Usually a long time is needed for the processes of soil formation to form distinct soil horizons. Differences in length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly. Others form slowly.

The soils in Wayne County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to the soil-forming factors for a long enough time to allow distinct horizons to form. Some soils, however, have not been in place long enough for the development of distinct horizons. Examples are Stonelick and other young soils that formed in recent alluvial material.

Miami and Crosby soils show the effect of time on the leaching of lime. The depth to free carbonates is 21 to 39 inches in the Crosby soils and 24 to 40 inches in the Miami soils. In contrast, the young Stonelick soils are calcareous at a depth of about 10 inches.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Wayne County. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils more than one of these processes have helped to differentiate horizons.

Some organic matter has accumulated in the surface layer of all the soils in the 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, such as Treaty and Westland soils, have a thick, black surface layer.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in the county. Leaching probably preceded the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid or neutral reaction. Leaching of wet soils is slow because of a high water table or the slow movement of water through the profile.

Clay accumulates in pores and other voids and forms films on the surface along which water moves. The leaching of bases and the translocation of silicate clay minerals are among the more important processes of horizon differentiation in the county. Miami soils are an example of soils in which translocated silicate clay minerals in the form of clay films have accumulated in the Bt horizon.

Gleying, or the reduction and transfer of iron, has occurred in all of the very poorly drained and somewhat poorly drained soils in the county. In the naturally wet soils, this process has significantly affected horizon differentiation. It is evidenced by a gray color in the subsoil. Reduction is commonly accompanied by some transfer of iron, either from upper horizons to lower ones or completely out of the profile. Mottles, which are in some horizons, indicate the segregation of iron.

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Glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

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.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

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 coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

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. 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 that part of the soil profile between depths of 10 inches and 40 or 80 inches.

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 (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for 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 they are wet 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.

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 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 the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

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.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry 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 soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

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.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other 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 drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (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.

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.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

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 overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock 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.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

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.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate

1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

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. The soil is not strong enough to support 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 more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

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).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple 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. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform 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 unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material).

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 (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through 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 semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or 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 filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure 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—

	pH
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 accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil 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.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary 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.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

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.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

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 multipled by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It 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:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

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. 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 grain* (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. It protects the soil 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. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

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 and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

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 water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or 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 loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

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 soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such 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 ovendry 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

[Recorded in the period 1951-74 at Cambridge City, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	35.4	16.1	25.7	64	-15	13	2.65	1.53	3.55	6	5.2
February---	38.6	18.8	28.7	65	-10	15	2.38	1.08	3.43	5	4.6
March------	48.0	26.9	37.5	78	5	103	3.41	1.77	4.75	7	4.8
April------	61.9	38.2	50.1	84	19	309	4.08	2.08	5.70	8	.6
May--------	72.4	47.7	60.1	90	29	623	4.44	2.47	6.04	9	.0
June-------	81.7	56.7	69.2	95	40	876	4.08	2.01	5.76	7	.0
July-------	85.5	60.1	72.8	97	45	1,017	4.02	1.98	5.67	7	.0
August-----	84.5	57.6	71.0	96	43	961	2.78	1.48	3.83	5	.0
September--	78.7	50.6	64.7	95	31	741	2.88	1.01	4.38	5	.0
October----	67.1	39.0	53.1	87	21	406	2.37	.81	3.61	5	.1
November---	50.9	30.1	40.5	77	9	93	3.27	1.76	4.49	7	1.9
December---	39.1	21.2	30.2	66	-9	45	2.94	1.31	4.26	6	5.3
Yearly:											
Average--	62.0	38.6	50.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-15	---	---	---	---	---	---
Total----	---	---	---	---	---	5,202	39.30	34.36	44.05	77	22.5

* 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 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Cambridge City, Indiana]

Probability	Temperature		
	24^{o} F or lower	28^{o} F or lower	32^{o} F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 15	May 3	May 18
2 years in 10 later than--	Apr. 11	Apr. 28	May 13
5 years in 10 later than--	Apr. 4	Apr. 19	May 4
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 18	Oct. 5	Sept. 23
2 years in 10 earlier than--	Oct. 22	Oct. 9	Sept. 27
5 years in 10 earlier than--	Oct. 30	Oct. 18	Oct. 5

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Cambridge City, Indiana]

Probability	Daily minimum temperature during growing season		
	Higher than 24^{o} F	Higher than 28^{o} F	Higher than 32^{o} F
	Days	Days	Days
9 years in 10	192	163	138
8 years in 10	197	169	144
5 years in 10	209	181	154
2 years in 10	220	193	164
1 year in 10	226	199	169

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
CeB2	Celina silt loam, 1 to 5 percent slopes, eroded	1,630	0.6
CrA	Crosby silt loam, 1 to 4 percent slopes	44,900	17.5
CtA	Crosby silt loam, stony subsoil, 1 to 6 percent slopes	9,035	3.5
EdF	Eden flaggy silty clay loam, 25 to 40 percent slopes	1,940	0.7
EoA	Eldean loam, 0 to 2 percent slopes	8,030	3.1
EoB2	Eldean loam, 2 to 6 percent slopes, eroded	6,170	2.4
EoC2	Eldean loam, 6 to 12 percent slopes, eroded	610	0.2
EoD2	Eldean loam, 12 to 18 percent slopes, eroded	290	0.1
ExB3	Eldean clay loam, 2 to 6 percent slopes, severely eroded	1,070	0.4
ExC3	Eldean clay loam, 6 to 18 percent slopes, severely eroded	3,140	1.2
FcA	Fincastle silt loam, 0 to 2 percent slopes	1,300	0.5
Ge	Genesee silt loam, occasionally flooded	7,700	3.0
Hb	Haplaquepts, loamy	475	0.2
HeF	Hennepin loam, 25 to 50 percent slopes	1,700	0.7
Hu	Houghton muck, undrained	100	*
LbB2	Losantville silt loam, 2 to 6 percent slopes, eroded	4,500	1.7
LbC2	Losantville silt loam, 6 to 12 percent slopes, eroded	880	0.3
LbD2	Losantville silt loam, 12 to 18 percent slopes, eroded	830	0.3
LcC3	Losantville clay loam, 6 to 12 percent slopes, severely eroded	2,300	0.9
LcD3	Losantville clay loam, 12 to 18 percent slopes, severely eroded	535	0.2
LeB2	Losantville loam, stony subsoil, 2 to 6 percent slopes, eroded	3,300	1.3
LxC3	Losantville clay loam, stony subsoil, 6 to 12 percent slopes, severely eroded	4,000	1.5
Ma	Mahalasville silt loam	750	0.3
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded	20,750	8.1
MnC2	Miami silt loam, 6 to 12 percent slopes, eroded	8,000	3.1
MnD2	Miami silt loam, 12 to 18 percent slopes, eroded	6,300	2.4
MnE	Miami silt loam, 18 to 25 percent slopes	1,050	0.4
MnF	Miami silt loam, 25 to 50 percent slopes	790	0.3
MrA	Miami silt loam, gravelly substratum, 0 to 2 percent slopes	3,450	1.3
MrB2	Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded	12,300	4.8
MrC2	Miami silt loam, gravelly substratum, 6 to 12 percent slopes, eroded	2,650	1.0
Ms	Millsdale silty clay loam	600	0.2
OcA	Ockley silt loam, 0 to 2 percent slopes	13,000	5.0
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded	620	0.2
Or	Orthents, loamy	960	0.4
Pr	Pits, Quarry	100	*
Rc	Ragsdale silty clay loam	1,110	0.4
RhA	Randolph silt loam, 0 to 2 percent slopes	530	0.2
RkA	Reesville silt loam, 0 to 2 percent slopes	680	0.3
RmD	Rodman gravelly loam, 15 to 25 percent slopes	170	0.1
RmF	Rodman gravelly loam, 25 to 50 percent slopes	720	0.3
RsB2	Russell silt loam, 2 to 6 percent slopes, eroded	1,350	0.5
RsC2	Russell silt loam, 6 to 12 percent slopes, eroded	510	0.2
Sh	Shoals silt loam, occasionally flooded	5,700	2.2
Sk	Sleeth silt loam	2,680	1.0
Sn	Sloan silty clay loam, occasionally flooded	545	0.2
St	Stonelick loam, occasionally flooded	6,370	2.5
SuB3	Strawn clay loam, 2 to 6 percent slopes, severely eroded	4,830	1.9
SuC3	Strawn clay loam, 6 to 12 percent slopes, severely eroded	18,300	7.2
SuD3	Strawn clay loam, 12 to 18 percent slopes, severely eroded	5,180	2.0
Tr	Treaty silty clay loam	15,600	6.0
Ts	Treaty silty clay loam, stony subsoil	3,200	1.2
UmB	Urban land-Miami complex, 2 to 6 percent slopes	1,050	0.4
UmC	Urban land-Miami complex, 6 to 12 percent slopes	550	0.2
UoA	Urban land-Miami complex, gravelly substratum, 0 to 2 percent slopes	1,300	0.5
UoB	Urban land-Miami complex, gravelly substratum, 2 to 6 percent slopes	945	0.4
Us	Urban land-Millsdale complex	475	0.2
We	Westland silty clay loam	5,250	2.0
WyB2	Wynn silt loam, 2 to 6 percent slopes, eroded	1,250	0.5
WyC2	Wynn silt loam, 6 to 12 percent slopes, eroded	870	0.3
WyD2	Wynn silt loam, 12 to 18 percent slopes, eroded	320	0.1
XeB2	Xenia silt loam, 1 to 5 percent slopes, eroded	2,750	1.1
	Water areas more than 40 acres in size	268	0.1
	Water areas less than 40 acres in size	424	0.2
	Total	258,682	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
CeB2	Celina silt loam, 1 to 5 percent slopes, eroded
CrA	Crosby silt loam, 1 to 4 percent slopes (where drained)
CtA	Crosby silt loam, stony subsoil, 1 to 6 percent slopes (where drained)
EoA	Eldean loam, 0 to 2 percent slopes
EoB2	Eldean loam, 2 to 6 percent slopes, eroded
FcA	Fincastle silt loam, 0 to 2 percent slopes (where drained)
Ge	Genesee silt loam, occasionally flooded
LbB2	Losantville silt loam, 2 to 6 percent slopes, eroded
LeB2	Losantville loam, stony subsoil, 2 to 6 percent slopes, eroded
Ma	Mahalasville silt loam (where drained)
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded
MrA	Miami silt loam, gravelly substratum, 0 to 2 percent slopes
MrB2	Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded
Ms	Millsdale silty clay loam (where drained)
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded
Rc	Ragsdale silty clay loam (where drained)
RhA	Randolph silt loam, 0 to 2 percent slopes (where drained)
RkA	Reesville silt loam, 0 to 2 percent slopes (where drained)
RsB2	Russell silt loam, 2 to 6 percent slopes, eroded
Sh	Shoals silt loam, occasionally flooded (where drained)
Sk	Sleeth silt loam (where drained)
Sn	Sloan silty clay loam, occasionally flooded (where drained)
St	Stonelick loam, occasionally flooded
Tr	Treaty silty clay loam (where drained)
Ts	Treaty silty clay loam, stony subsoil (where drained)
We	Westland silty clay loam (where drained)
WyB2	Wynn silt loam, 2 to 6 percent slopes, eroded
XeB2	Xenia silt loam, 1 to 5 percent slopes, eroded

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
CeB2 Celina	IIe	105	40	45	4.5	9.0
CrA Crosby	IIe	105	37	47	3.4	6.8
CtA Crosby	IIe	90	32	40	3.0	6.0
EdF Eden	VIIe	---	---	---	---	---
EoA Eldean	IIs	110	35	42	4.5	9.0
EoB2 Eldean	IIe	100	35	40	4.5	9.0
EoC2 Eldean	IIIe	85	25	35	4.0	8.0
EoD2 Eldean	IVe	80	20	30	3.5	7.0
ExB3 Eldean	IIIe	90	30	40	4.5	9.0
ExC3 Eldean	VIe	---	---	---	3.0	6.0
FcA Fincastle	IIw	130	46	52	4.3	8.6
Ge Genesee	IIw	105	37	41	3.5	8.0
Hb**. Haplaquepts						
HeF Hennepin	VIIe	---	---	---	1.2	2.4
Hu Houghton	Vw	---	---	---	---	---
LbB2 Losantville	IIe	90	36	42	3.7	7.4
LbC2 Losantville	IIIe	80	32	38	3.2	6.4
LbD2 Losantville	IVe	70	28	33	3.2	6.4
LcC3 Losantville	IVe	60	24	28	2.6	5.2
LcD3 Losantville	VIe	---	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
LeB2---------------------- Losantville	IIe	90	36	42	3.7	7.4
LxC3---------------------- Losantville	IVe	60	24	28	2.6	5.2
Ma------------------------ Mahalasville	IIw	155	54	62	5.1	10.2
MnB2---------------------- Miami	IIe	105	37	47	3.4	6.8
MnC2---------------------- Miami	IIIe	95	33	43	3.1	6.2
MnD2---------------------- Miami	IVe	80	28	36	2.6	5.2
MnE----------------------- Miami	VIe	---	---	---	---	4.6
MnF----------------------- Miami	VIIe	---	---	---	---	3.2
MrA----------------------- Miami	I	105	40	45	5.0	9.0
MrB2---------------------- Miami	IIe	90	35	40	4.5	9.0
MrC2---------------------- Miami	IIIe	80	30	38	4.2	8.4
Ms------------------------ Millsdale	IIIw	112	44	50	4.8	9.6
OcA----------------------- Ockley	I	110	38	44	3.6	7.2
OcB2---------------------- Ockley	IIe	105	37	42	3.4	6.8
Or**. Orthents						
Pr**. Pits						
Rc------------------------ Ragsdale	IIw	155	54	62	5.1	10.2
RhA----------------------- Randolph	IIIw	110	38	38	4.4	8.8
RkA----------------------- Reesville	IIw	120	42	52	5.0	10.0
RmD, RmF------------------ Rodman	VIIs	---	---	---	---	0.2
RsB2---------------------- Russell	IIe	115	40	46	3.8	7.6

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
RsC2---------------------- Russell	IIIe	105	37	42	3.4	6.8
Sh------------------------ Shoals	IIw	130	46	52	4.3	8.6
Sk------------------------ Sleeth	IIw	120	42	48	4.0	8.0
Sn------------------------ Sloan	IIIw	126	42	45	5.0	10.0
St------------------------ Stonelick	IIw	80	28	35	3.5	7.0
SuB3---------------------- Strawn	IIIe	101	30	40	3.7	7.4
SuC3---------------------- Strawn	IVe	95	28	37	3.5	7.0
SuD3---------------------- Strawn	VIe	---	---	---	3.1	6.2
Tr, Ts-------------------- Treaty	IIw	150	52	65	4.8	9.6
UmB**: Urban land-Miami						
UmC**, UoA**, UoB**. Urban land-Miami						
Us**. Urban land-Millsdale						
We------------------------ Westland	IIw	140	49	56	4.6	9.2
WyB2---------------------- Wynn	IIe	90	30	42	3.8	7.6
WyC2---------------------- Wynn	IIIe	75	26	36	3.6	7.2
WyD2---------------------- Wynn	IVe	60	20	32	3.0	6.0
XeB2---------------------- Xenia	IIe	115	40	46	3.8	7.6

* 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.

** See description of the map unit for composition and behavior characteristics of the map unit.

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)	Climate (c)
		Acres	Acres	Acres	Acres
I	16,450	---	---	---	---
II	166,925	108,555	50,340	8,030	---
III	21,095	19,420	1,675	---	---
IV	32,340	32,340	---	---	---
V	100	---	100	---	---
VI	9,905	9,905	---	---	---
VII	5,320	4,430	---	890	---
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	Windthrow hazard	Common trees	Site index	Volume*	
CeB2 Celina	5A	Slight	Slight	Slight	Slight	Northern red oak	90	72	Eastern white pine, black walnut, red pine, yellow-poplar, white ash, northern red oak, white oak.
						Yellow-poplar	110	124	
						White oak	---	---	
						Black walnut	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
						White ash	---	---	
CrA, CtA Crosby	4A	Slight	Slight	Slight	Slight	White oak	75	57	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak	85	67	
						Yellow-poplar	85	81	
						Northern red oak	75	57	
EdF Eden	4R	Moderate	Moderate	Moderate	Moderate	Black oak	68	50	Northern red oak, white oak, white ash, eastern white pine, eastern redcedar, Virginia pine.
						White oak	61	44	
						White ash	60	51	
						Scarlet oak	68	50	
						Black walnut	74	---	
						Eastern redcedar	42	---	
EoA, EoB2, EoC2 Eldean	4A	Slight	Slight	Slight	Slight	Northern red oak	80	62	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
						Black oak	80	62	
						White oak	80	62	
						Black walnut	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
						White ash	---	---	
						Yellow-poplar	---	---	
EoD2 Eldean	4R	Moderate	Moderate	Slight	Slight	Northern red oak	80	62	Eastern white pine, black walnut, white ash, red pine, white oak.
						Black oak	80	62	
						White oak	80	62	
						Black walnut	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
						White ash	---	---	
						Yellow-poplar	---	---	
ExB3, ExC3 Eldean	4A	Slight	Slight	Slight	Slight	Northern red oak	80	62	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
						Black oak	80	62	
						White oak	80	62	
						Black walnut	---	---	
						Black cherry	---	---	
						Sugar maple	---	---	
						White ash	---	---	
						Yellow-poplar	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
FcA----------------- Fincastle	4A	Slight	Slight	Slight	Slight	Northern red oak----	75	57	Eastern white pine, bald-cypress, white ash, red maple, yellow-poplar, American sycamore.
						White oak-----------	75	57	
						Pin oak------------	85	67	
						Yellow-poplar-------	85	81	
						Sweetgum-----------	80	93	
Ge------------------ Genesee	8A	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	107	Eastern white pine, black walnut, yellow-poplar.
HeF----------------- Hennepin	5R	Severe	Severe	Slight	Slight	Northern red oak----	85	67	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine, eastern redcedar.
						White oak-----------	---	---	
Hu------------------ Houghton	2W	Slight	Severe	Severe	Severe	White ash-----------	51	28	
						Red maple-----------	51	33	
						Black willow--------	---	---	
						Quaking aspen-------	56	29	
						Silver maple--------	76	30	
LbB2, LbC2, LcC3--- Losantville	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, yellow-poplar, black walnut.
						Northern red oak----	80	62	
LbD2, LcD3---------- Losantville	4R	Moderate	Moderate	Slight	Slight	White oak-----------	75	57	Eastern white pine, yellow-poplar, black walnut.
						Northern red oak----	80	62	
LeB2, LxC3---------- Losantville	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, yellow-poplar, black walnut.
						Northern red oak----	80	62	
Ma------------------ Mahalasville	5W	Slight	Severe	Severe	Severe	Pin oak-------------	85	67	Eastern white pine, bald-, cypress, red maple, white ash, sweetgum.
						White oak-----------	75	57	
						Sweetgum------------	90	106	
MnB2, MnC2, MnD2--- Miami	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	
MnE----------------- Miami	5R	Moderate	Moderate	Slight	Slight	White oak-----------	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Common trees	Site index	Volume*	
MnF----------------- Miami	5R	Severe	Severe	Slight	Slight	White oak-----------	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	
MrA, MrB2, MrC2---- Miami	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Yellow-poplar, white ash, black walnut, red pine, white oak.
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	
Ms----------------- Millsdale	5W	Slight	Severe	Severe	Severe	Pin oak-------------	86	68	Red maple, American sycamore, eastern cottonwood, pin oak, green ash, swamp white oak, baldcypress, sweetgum.
						Red maple-----------	---	---	
						Eastern cottonwood--	---	---	
						Black cherry--------	---	---	
						Green ash-----------	---	---	
						Swamp white oak-----	---	---	
OcA, OcB2---------- Ockley	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Northern red oak----	90	72	
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	
Rc----------------- Ragsdale	5W	Slight	Severe	Severe	Severe	Pin oak-------------	90	72	Eastern white pine, bald-cypress, red maple, white ash, sweetgum.
						White oak-----------	75	57	
						Sweetgum------------	90	106	
RhA---------------- Randolph	4A	Slight	Slight	Slight	Slight	Northern red oak----	75	57	Eastern white pine, yellow-poplar.
						Sugar maple---------	90	56	
						Yellow-poplar-------	85	81	
RkA---------------- Reesville	4W	Slight	Moderate	Slight	Slight	Northern red oak----	76	58	Red maple, silver maple, pin oak, sweet-gum, red pine, swamp white oak, bald-cypress, green ash, eastern cottonwood, American sycamore.
						Yellow-poplar-------	86	82	
						Sugar maple---------	90	56	
						Green ash-----------	---	---	
						Swamp white oak-----	---	---	
						Black cherry--------	---	---	
						Red maple-----------	---	---	
						Pin oak-------------	---	---	
						Eastern cottonwood--	---	---	
RmD---------------- Rodman	4R	Moderate	Severe	Severe	Slight	Northern red oak----	70	52	Eastern white pine, red pine, jack pine.
						White oak-----------	70	52	
						Red pine------------	75	115	
						Eastern white pine--	85	150	
RmF---------------- Rodman	4R	Severe	Severe	Severe	Slight	Northern red oak----	70	52	Eastern white pine, red pine, jack pine.
						White oak-----------	70	52	
						Red pine------------	75	115	
						Eastern white pine--	85	150	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Common trees	Site index	Volume*	
RsB2, RsC2---------- Russell	5A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Sweetgum------------	90 90 98 76	72 72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, white oak, northern red oak, green ash, black cherry.
Sh----------------- Shoals	5W	Slight	Moderate	Moderate	Slight	Pin oak------------- Sweetgum------------ Yellow-poplar------- Virginia pine------- Eastern cottonwood-- White ash-----------	90 86 90 90 --- ---	72 95 90 130 --- ---	Sweetgum, red maple, swamp chestnut oak, pin oak, yellow-poplar.
Sk----------------- Sleeth	5A	Slight	Slight	Slight	Slight	Pin oak------------- Yellow-poplar------- Sweetgum------------ White oak-----------	85 85 80 70	67 81 79 52	Eastern white pine, bald-cypress, white, ash, red maple, yellow-poplar, American sycamore.
Sn----------------- Sloan	5W	Slight	Severe	Severe	Severe	Pin oak------------- Swamp white oak----- Red maple----------- Green ash----------- Eastern cottonwood--	86 --- --- --- ---	68 --- --- --- ---	Red maple, green ash, eastern cottonwood, sweetgum, pin oak, swamp white oak, silver maple, American sycamore.
St----------------- Stonelick	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	62 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
SuB3, SuC3---------- Strawn	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	62 62 90 ---	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
SuD3--------------- Strawn	4R	Moderate	Moderate	Moderate	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	62 62 90 ---	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
Tr, Ts Treaty	5W	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum Northern red oak	90 75 90 ---	72 57 106 ---	Eastern white pine, bald-cypress, red maple, white ash, sweetgum.
We Westland	5W	Slight	Severe	Severe	Severe	Pin oak Sweetgum White oak	85 90 75	67 106 57	Eastern white pine, bald-cypress, red maple, white ash, sweetgum.
WyB2, WyC2 Wynn	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar White ash Black walnut Black cherry Sugar maple	85 85 95 --- --- --- ---	67 67 98 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine, white oak.
WyD2 Wynn	5R	Moderate	Moderate	Slight	Slight	White oak Northern red oak Yellow-poplar White ash Black walnut Black cherry Sugar maple	85 85 95 --- --- --- ---	67 67 98 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine, white oak.
XeB2 Xenia	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

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 height, in feet, of--				
	<8	8-15	16-25	26-35	>35
CeB2---------------- Celina	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
CrA, CtA----------- Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
EdF---------------- Eden	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrow-wood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---
EoA, EoB2, EoC2, EoD2, ExB3, ExC3- Eldean	Siberian peashrub	Autumn-olive, eastern redcedar, radiant crab-apple, Tatarian honeysuckle, Washington hawthorn, Amur honeysuckle, lilac.	Austrian pine, eastern white pine, jack pine, red pine.	---	---
FcA---------------- Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Ge----------------- Genesee	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Hb*. Haplaquepts					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
HeF. Hennepin	Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, osageorange, Russian-olive, jack pine, Washington hawthorn, silky dogwood, Amur privet, American cranberrybush.	Honeylocust, northern catalpa.	---	---
Hu. Houghton					
LbB2, LbC2, LbD2, LcC3, LcD3, LeB2, LxC3. Losantville	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Washington hawthorn, white fir, blue spruce, northern white-cedar.	Norway spruce, Austrian pine.	Eastern white pine.
Ma. Mahalasville	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir Washington hawthorn.	Eastern white pine	Pin oak.
MnB2, MnC2, MnD2, MnE, MnF. Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MrA, MrB2, MrC2. Miami	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	Northern white-cedar, Washington hawthorn, blue spruce, Austrian pine, white fir.	Norway spruce	Eastern white pine, pin oak.
Ms. Millsdale	---	American cranberrybush, silky dogwood, Amur privet, Amur honeysuckle.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	---
OcA, OcB2. Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Or*. Orthents					
Pr*. Pits					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Rc----------------- Ragsdale	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
RhA---------------- Randolph	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
RkA---------------- Reesville	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
RmD, RmF. Rodman					
RsB2, RsC2--------- Russell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Sh----------------- Shoals	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Sk----------------- Sleeth	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Sn----------------- Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
St----------------- Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow------	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
SuB3, SuC3, SuD3-- Strawn	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine.
Tr, Ts------------ Treaty	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
UmB*, UmC*: Urban land.					
Miami.					
UoA*, UoB*: Urban land.					
Miami.					
Us*: Urban land.					
Millsdale.					
We--------------- Westland	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
WyB2, WyC2, WyD2-- Wynn	Siberian peashrub	Eastern redcedar, radiant crab-apple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine Austrian pine, red pine, jack pine.	---	---
XeB2------------- Xenia	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--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	Golf fairways
CeB2 Celina	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.
CrA, CtA Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
EdF Eden	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: large stones, slope.
EoA Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Severe: erodes easily.	Moderate: droughty.
EoB2 Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: droughty.
EoC2 Eldean	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
EoD2 Eldean	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
ExB3 Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: droughty.
ExC3 Eldean	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
FcA Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ge Genesee	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Hb*. Haplaquepts					
HeF Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hu Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
LbB2 Losantville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: droughty.
LbC2 Losantville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LbD2: Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LcC3: Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
LcD3: Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LeB2: Losantville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: droughty.
LxC3: Losantville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
Ma: Mahalasville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MnB2: Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MnC2: Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MnD2, MnE: Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MnF: Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MrA: Miami	Slight	Slight	Slight	Slight	Slight.
MrB2: Miami	Slight	Slight	Moderate: slope.	Slight	Slight.
MrC2: Miami	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Ms: Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
OcA: Ockley	Slight	Slight	Moderate: small stones.	Slight	Slight.
OcB2: Ockley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Or*. Orthents					
Pr*. Pits					

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Rc: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RhA: Randolph	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, depth to rock.
RkA: Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RmD: Rodman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
RmF: Rodman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
RsB2: Russell	Slight	Slight	Moderate: slope.	Slight	Slight.
RsC2: Russell	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Sh: Shoals	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Sk: Sleeth	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Sn: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
St: Stonelick	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty, flooding.
SuB3: Strawn	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
SuC3: Strawn	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
SuD3: Strawn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Tr, Ts: Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
UmB*: Urban land.					
Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
UmC*: Urban land.					

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UmC*:					
Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
UoA*:					
Urban land.					
Miami	Slight	Slight	Slight	Slight	Slight.
UoB*:					
Urban land.					
Miami	Slight	Slight	Moderate: slope.	Slight	Slight.
Us*:					
Urban land.					
Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
We Westland	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
WyB2 Wynn	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight	Moderate: depth to rock.
WyC2 Wynn	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
WyD2 Wynn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
XeB2 Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CeB2---------------- Celina	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrA---------------- Crosby	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CtA---------------- Crosby	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
EdF---------------- Eden	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
EoA---------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EoB2---------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EoC2---------------- Eldean	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
EoD2---------------- Eldean	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ExB3---------------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ExC3---------------- Eldean	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FcA---------------- Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ge----------------- Genesee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Hb*. Haplaquepts										
HeF---------------- Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Hu----------------- Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
LbB2---------------- Losantville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LbC2---------------- Losantville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LbD2, LcC3, LcD3--- Losantville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LeB2---------------- Losantville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
LxC3----------------- Losantville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ma----------------- Mahalasville	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MnB2----------------- Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC2----------------- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MnD2, MnE----------- Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MnF----------------- Miami	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
MrA, MrB2----------- Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MrC2----------------- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ms----------------- Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
OcA, OcB2----------- Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Or*. Orthents										
Pr*. Pits										
Rc----------------- Ragsdale	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
RhA----------------- Randolph	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RkA----------------- Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RmD, RmF----------- Rodman	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RsB2----------------- Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RsC2----------------- Russell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sh----------------- Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Sk----------------- Sleeth	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--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
Sn: Sloan	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
St: Stonelick	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
SuB3, SuC3: Strawn	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SuD3: Strawn	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Tr, Ts: Treaty	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
UmB*: Urban land.										
Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UmC*, UoA*, UoB*: Urban land.										
Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Us*: Urban land.										
Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
We: Westland	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
WyB2: Wynn	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WyC2: Wynn	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WyD2: Wynn	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
XeB2: Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--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. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CeB2: Celina	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
CrA: Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CtA: Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
EdF: Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: large stones, slope.
EoA: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
EoB2: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
EoC2: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
EoD2: Eldean	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
ExB3: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
ExC3: Eldean	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
FcA: Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ge: Genesee	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Hb*. Haplaquepts						
HeF: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--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
Hu------------------ Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
LbB2---------------- Losantville	Moderate: wetness.	Slight----------	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
LbC2, LcC3---------- Losantville	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
LbD2, LcD3---------- Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LeB2---------------- Losantville	Moderate: wetness.	Slight----------	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
LxC3---------------- Losantville	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Ma------------------ Mahalasville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
MnB2---------------- Miami	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action, shrink-swell.	Slight.
MnC2---------------- Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MnD2, MnE, MnF------ Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MrA----------------- Miami	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
MrB2---------------- Miami	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MrC2---------------- Miami	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Ms------------------ Millsdale	Severe: depth to rock, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, depth to rock, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
OcA----------------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
OcB2---------------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 12.--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
Or*. Orthents						
Pr*. Pits						
Rc---------------- Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
RhA--------------- Randolph	Severe: depth to rock, wetness.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness, depth to rock.
RkA--------------- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
RmD, RmF---------- Rodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
RsB2-------------- Russell	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RsC2-------------- Russell	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Sh---------------- Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
Sk---------------- Sleeth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Sn---------------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
St---------------- Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, droughty, flooding.
SuB3-------------- Strawn	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength, frost action.	Slight.
SuC3-------------- Strawn	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
SuD3-------------- Strawn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--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
Tr, Ts-----------Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
UmB*: Urban land.						
Miami------------	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action, shrink-swell.	Slight.
UmC*: Urban land.						
Miami------------	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
UoA*: Urban land.						
Miami------------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
UoB*: Urban land.						
Miami------------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Us*: Urban land.						
Millsdale--------	Severe: depth to rock, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, depth to rock, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
We---------------Westland	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
WyB2-------------Wynn	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: depth to rock.
WyC2-------------Wynn	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope, depth to rock.
WyD2-------------Wynn	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
XeB2-------------Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CeB2: Celina	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
CrA, CtA: Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
EdF: Eden	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
EoA, EoB2: Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EoC2: Eldean	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EoD2: Eldean	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
ExB3: Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
ExC3: Eldean	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FcA: Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ge: Genesee	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Hb*. Haplaquepts					
HeF: Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hu: Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.

See footnote at end of table.

TABLE 13.--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
LbB2: Losantville	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Slight	Slight	Good.
LbC2: Losantville	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
LbD2, LcC3, LcD3: Losantville	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
LeB2: Losantville	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Slight	Slight	Good.
LxC3: Losantville	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Ma: Mahalasville	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: hard to pack, ponding.
MnB2: Miami	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
MnC2: Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MnD2, MnE, MnF: Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MrA, MrB2: Miami	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: too clayey, thin layer.
MrC2: Miami	Moderate: percs slowly, slope.	Severe: seepage, slope.	Slight	Moderate: slope.	Fair: too clayey, slope, thin layer.
Ms: Millsdale	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too clayey.	Severe: depth to rock, ponding.	Poor: depth to rock, too clayey, hard to pack.
OcA, OcB2: Ockley	Slight	Severe: seepage.	Severe: seepage.	Slight	Poor: small stones.
Or*. Orthents					
Pr*. Pits					
Rc: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

See footnote at end of table.

TABLE 13.--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
RhA----------------- Randolph	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: too clayey, depth to rock, hard to pack.
RkA----------------- Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RmD, RmF------------ Rodman	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
RsB2---------------- Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
RsC2---------------- Russell	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Sh------------------ Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Sk------------------ Sleeth	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Sn------------------ Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
St------------------ Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
SuB3---------------- Strawn	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, small stones.
SuC3---------------- Strawn	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
SuD3---------------- Strawn	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Tr, Ts-------------- Treaty	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
UmB*: Urban land.					
Miami---------------	Severe: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.

See footnote at end of table.

TABLE 13.--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
UmC*: Urban land.					
Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UoA*: Urban land.					
Miami	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
UoB*: Urban land.					
UoB*: Miami	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Us*: Urban land.					
Millsdale	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too clayey.	Severe: depth to rock, ponding.	Poor: depth to rock, too clayey, hard to pack.
We Westland	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
WyB2 Wynn	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
WyC2 Wynn	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
WyD2 Wynn	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
XeB2 Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CeB2 Celina	Fair: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CrA Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CtA Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
EdF Eden	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, too clayey.
EoA, EoB2, EoC2 Eldean	Good	Probable	Probable	Poor: small stones, area reclaim.
EoD2 Eldean	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
ExB3, ExC3 Eldean	Good	Probable	Probable	Poor: small stones, area reclaim.
FcA Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ge Genesee	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Hb*. Haplaquepts				
HeF Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hu Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
LbB2, LbC2 Losantville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LbD2 Losantville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
LcC3 Losantville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LcD3 Losantville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
LeB2, LxC3 Losantville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ma Mahalasville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MnB2 Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
MnC2 Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MnD2, MnE Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MnF Miami	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MrA, MrB2 Miami	Good	Probable	Probable	Fair: small stones, area reclaim.
MrC2 Miami	Good	Probable	Probable	Fair: small stones, area reclaim, slope.
Ms Millsdale	Poor: low strength, depth to rock, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
OcA, OcB2 Ockley	Good	Probable	Probable	Poor: small stones, area reclaim.
Or*. Orthents				
Pr*. Pits				
Rc Ragsdale	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RhA Randolph	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
RkA Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RmD Rodman	Fair: slope.	Probable	Probable	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RmF------------------ Rodman	Poor: slope.	Probable-------------	Probable-------------	Poor: area reclaim, small stones, slope.
RsB2, RsC2------------ Russell	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Sh------------------- Shoals	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sk------------------- Sleeth	Fair: wetness.	Probable-------------	Probable-------------	Poor: area reclaim.
Sn------------------- Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
St------------------- Stonelick	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: small stones.
SuB3, SuC3------------ Strawn	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
SuD3------------------ Strawn	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Tr, Ts---------------- Treaty	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
UmB*: Urban land.				
Miami----------------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
UmC*: Urban land.				
Miami----------------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
UoA*: Urban land.				
Miami----------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
UoB*: Urban land.				
Miami----------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Us*: Urban land.				

See footnote at end of table

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Us*:				
Millsdale	Poor: low strength, area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
We: Westland	Poor: wetness.	Probable	Probable	Poor: wetness, small stones, area reclaim.
WyB2, WyC2: Wynn	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, small stones.
WyD2: Wynn	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope, small stones.
XeB2: Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "moderate" and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

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
CeB2 Celina	Moderate: slope.	Severe: piping.	Severe: no water.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
CrA Crosby	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
CtA Crosby	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
EdF Eden	Severe: slope.	Severe: hard to pack, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
EoA, EoB2 Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily, droughty.
EoC2, EoD2 Eldean	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
ExB3 Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily, droughty.
ExC3 Eldean	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
FcA Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
Ge Genesee	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Hb*. Haplaquepts						
HeF Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
Hu Houghton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
LbB2 Losantville	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty.
LbC2, LbD2, LcC3, LcD3 Losantville	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
LeB2 Losantville	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
LxC3------------- Losantville	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
Ma--------------- Mahalasville	Severe: seepage.	Severe: thin layer, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
MnB2------------- Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
MnC2, MnD2, MnE, MnF------------- Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
MrA-------------- Miami	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MrB2------------- Miami	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MrC2------------- Miami	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ms--------------- Millsdale	Moderate: depth to rock.	Severe: ponding.	Severe: no water.	Depth to rock, frost action, ponding.	Depth to rock, ponding.	Wetness, depth to rock.
OcA-------------- Ockley	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OcB2------------- Ockley	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Or*. Orthents						
Pr*. Pits						
Rc--------------- Ragsdale	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
RhA-------------- Randolph	Moderate: depth to rock.	Severe: thin layer.	Severe: no water.	Depth to rock, frost action.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
RkA-------------- Reesville	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
RmD, RmF--------- Rodman	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty, rooting depth.
RsB2------------- Russell	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
RsC2: Russell	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Sh: Shoals	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Sk: Sleeth	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action	Wetness	Wetness.
Sn: Sloan	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
St: Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Droughty.
SuB3: Strawn	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
SuC3, SuD3: Strawn	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Tr, Ts: Treaty	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, erodes easily.	Wetness, erodes easily.
UmB*: Urban land.						
Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
UmC*: Urban land.						
Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
UoA*: Urban land.						
Miami	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
UoB*: Urban land.						
Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Us*: Urban land.						
Millsdale	Moderate: depth to rock.	Severe: ponding.	Severe: no water.	Ponding, depth to rock, frost action.	Depth to rock, ponding.	Wetness, depth to rock.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
We------------ Westland	Severe: seepage.	Severe: ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding---------	Wetness.
WyB2----------- Wynn	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
WyC2, WyD2-------- Wynn	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
XeB2----------- Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[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: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
CeB2: Celina	0-17	Silt loam	ML	A-4	0	100	90-100	90-100	70-85	26-40	3-10
	17-37	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-95	70-85	32-48	12-28
	37-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	75-95	75-90	65-90	50-80	20-36	4-16
CrA: Crosby	0-13	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	50-90	15-30	4-15
	13-23	Clay loam, silty clay loam.	CL	A-6, A-7	0-3	90-100	85-100	75-95	65-95	35-50	15-25
	23-60	Loam	CL, ML, CL-ML	A-4, A-6	0-3	85-100	80-95	75-90	50-65	15-30	4-14
CtA: Crosby	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	65-90	20-35	5-15
	9-13	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-95	35-45	15-20
	13-22	Clay loam, loam	CL	A-6, A-7	0-10	85-95	80-95	65-95	50-80	30-45	10-20
	22-60	Loam	CL-ML, CL	A-4, A-6	0-10	85-95	80-90	65-90	50-70	20-35	5-15
EdF: Eden	0-4	Flaggy silty clay loam.	CL, CH	A-7, A-6	25-40	75-95	70-95	70-95	65-95	35-65	12-35
	4-36	Flaggy silty clay, flaggy clay, silty clay.	CH, CL	A-7	10-45	75-100	55-100	50-100	50-95	45-75	20-45
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
EoA, EoB2, EoC2, EoD2: Eldean	0-13	Loam	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	13-29	Clay, sandy clay, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	29-34	Gravelly clay loam, loam, gravelly sandy loam.	CL, GC, SC	A-4, A-6, A-7, A-2	0-10	55-85	45-85	45-75	30-60	30-45	8-20
	34-60	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
ExB3, ExC3: Eldean	0-10	Clay loam	CL	A-6, A-4	0-5	85-100	75-100	65-100	55-80	25-40	9-18
	10-23	Clay, sandy clay, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	23-60	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
FcA: Fincastle	0-14	Silt loam	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	14-32	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	32-56	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-98	85-95	75-85	30-40	10-15
	56-60	Loam	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11
Ge: Genesee	0-12	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	12-60	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
Hb*. Haplaquepts											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HeF----------- Hennepin	0-7	Loam------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	7-15	Loam, sandy loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	15-60	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
Hu-------------- Houghton	0-60	Sapric material	PT	A-8	0	---	---	---	---	---	---
LbB2, LbC2, LbD2- Losantville	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0-2	95-100	90-100	80-100	65-90	20-30	5-12
	7-16	Clay, clay loam	CL	A-7, A-6	0-2	90-100	85-100	75-95	60-90	35-50	15-25
	16-60	Loam------------	CL, CL-ML	A-4	0-5	85-95	80-95	65-85	50-70	20-30	5-10
LcC3, LcD3------- Losantville	0-7	Clay loam--------	CL	A-6	0-2	95-100	90-100	80-100	65-80	30-40	11-20
	7-16	Clay, clay loam	CL	A-7, A-6	0-2	90-100	85-100	75-95	60-90	35-50	15-25
	16-60	Loam------------	CL, CL-ML	A-4	0-5	85-95	80-95	65-85	50-70	20-30	5-10
LeB2------------ Losantville	0-7	Loam------------	CL, CL-ML	A-4, A-6	0-2	95-100	90-100	80-100	65-90	20-30	5-12
	7-18	Clay, clay loam	CL	A-7, A-6	0-2	90-100	85-100	75-95	60-90	35-50	15-25
	18-60	Loam------------	CL, CL-ML	A-4	0-5	85-95	80-95	65-85	50-70	20-30	5-10
LxC3------------ Losantville	0-7	Clay loam--------	CL	A-6	0-2	95-100	90-100	80-100	65-80	30-40	11-20
	7-17	Clay, clay loam	CL	A-7, A-6	0-2	90-100	85-100	75-95	60-90	35-50	15-25
	17-60	Loam------------	CL, CL-ML	A-4	0-5	85-95	80-95	65-85	50-70	20-30	5-10
Ma-------------- Mahalasville	0-10	Silt loam--------	CL, ML	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
	10-42	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	42-47	Loam, silt loam	ML, CL-ML, CL	A-6, A-4	0	95-100	90-95	85-95	60-90	22-35	3-15
	47-60	Stratified silt to sand.	CL, SC, SP-SC, CL-ML	A-4, A-2-4	0	75-90	70-80	50-80	10-60	15-30	NP-10
MnB2, MnC2, MnD2, MnE, MnF-------- Miami	0-6	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	6-20	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	20-60	Loam------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
MrA, MrB2, MrC2-- Miami	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	70-90	20-30	6-15
	8-36	Silty clay loam, clay loam.	CL	A-6	0	100	90-100	80-100	65-95	30-40	10-20
	36-60	Loam, silt loam	CL-ML, CL	A-4, A-6	0	100	90-100	75-100	55-85	20-35	5-15
Ms-------------- Millsdale	0-10	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	75-100	60-95	32-50	12-25
	10-28	Clay, silty clay loam, clay loam.	CH, CL	A-7	0-5	85-100	55-100	45-100	40-95	40-60	20-35
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
OcA, OcB2-------- Ockley	0-8	Silt loam--------	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	8-35	Silty clay loam, clay loam, silt loam.	CL	A-6, A-4	0	90-100	80-100	70-90	55-90	25-40	8-15
	35-48	Gravelly clay loam, gravelly sandy clay loam.	CL, SC	A-6, A-4, A-2	0-2	70-85	45-85	40-70	25-55	25-40	8-15
	48-60	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	10-40	2-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--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	
Or*. Orthents											
Pr*. Pits											
Rc---------------- Ragsdale	0-11	Silty clay loam	CL	A-6	0	100	100	90-100	80-100	30-35	10-15
	11-48	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	80-95	25-35	8-13
	48-70	Silt loam--------	CL-ML, ML, CL	A-4	0	100	100	90-100	70-90	<25	3-8
RhA--------------- Randolph	0-14	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	75-85	20-38	4-15
	14-28	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0-5	75-95	75-95	75-85	70-80	35-60	14-32
	28-39	Very gravelly clay loam, gravelly sandy clay loam, sandy loam.	GC, SM-SC, SC, GM-GC	A-2, A-1, A-4, A-6	0-15	30-70	20-60	15-55	10-50	20-30	5-15
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RkA--------------- Reesville	0-12	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	25-35	4-10
	12-34	Silty clay loam	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	20-50	4-28
	34-48	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	80-90	20-40	4-20
	48-60	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	80-90	70-90	20-40	3-18
RmD, RmF---------- Rodman	0-6	Gravelly loam----	ML, CL, SM, SC	A-4	0-2	70-85	65-85	60-80	36-65	<30	3-9
	6-12	Gravelly loam, sandy loam, loam.	ML, CL, SC, SM	A-4, A-2, A-1	0-2	70-85	60-85	40-75	20-55	<30	NP-10
	12-60	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	22-50	7-20	2-10	---	NP
RsB2, RsC2-------- Russell	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	6-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	30-66	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-95	80-90	60-80	35-45	15-25
	66-80	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	20-30	5-12
Sh---------------- Shoals	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	20-35	6-15
	3-60	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
Sk---------------- Sleeth	0-16	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	90-100	75-95	50-85	20-35	3-15
	16-46	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	85-95	85-95	80-90	65-75	30-40	15-25
	46-60	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--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	
Sn---------------- Sloan	0-10	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-95	35-45	12-20
	10-40	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	40-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
St---------------- Stonelick	0-9	Loam-------------	ML, CL, SM, CL-ML	A-4	0	85-100	70-100	60-95	45-90	20-32	2-10
	9-60	Stratified loam to gravelly loamy sand.	SM, SP-SM, GM	A-2, A-4, A-3, A-1-b	0	85-100	55-95	40-60	5-40	<15	NP
SuB3, SuC3, SuD3- Strawn	0-7	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-100	75-95	50-95	25-45	10-23
	7-14	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	90-100	80-100	75-95	50-95	25-45	10-23
	14-60	Loam, silt loam, clay loam.	CL, SC	A-4, A-6	0-5	75-100	70-100	60-95	40-95	20-35	7-18
Tr---------------- Treaty	0-16	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	16-38	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	38-42	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	75-95	55-85	25-40	5-15
	42-60	Loam, silt loam	CL-ML, CL	A-4, A-6	0	90-100	90-95	75-90	55-75	20-30	5-15
Ts---------------- Treaty	0-18	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-25
	18-31	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	31-65	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	75-95	55-85	25-40	5-15
	65-80	Loam, silt loam	CL-ML, CL	A-4, A-6	0	90-100	90-95	75-90	55-75	20-30	5-15
UmB*, UmC*: Urban land.											
Miami------------	0-6	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	6-20	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	20-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
UoA*, UoB*: Urban land.											
Miami------------	0-8	Silt loam--------	CL	A-4, A-6	0-2	95-100	90-100	76-95	55-75	25-35	8-15
	8-36	Clay loam--------	CL	A-6, A-7	0-5	90-100	90-95	80-95	60-76	30-45	10-20
	36-60	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	90-95	76-90	55-75	20-30	5-15
Us*: Urban land.											
Millsdale--------	0-10	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	75-100	60-95	32-50	12-25
	10-28	Clay, silty clay loam, clay loam.	CH, CL	A-7	0-5	85-100	80-100	75-100	60-95	40-60	20-35
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--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	
We----------------	0-16	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-90	30-45	10-25
Westland	16-37	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	80-100	65-95	35-50	15-30
	37-47	Gravelly clay loam, gravelly sandy loam, loam.	CL	A-6, A-7	0-5	65-75	60-70	55-70	50-70	30-50	15-30
	47-60	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
WyB2, WyC2, WyD2-	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	85-100	80-90	24-38	5-15
Wynn	12-16	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	75-100	70-95	30-50	15-30
	16-34	Clay, clay loam, channery clay.	CH, CL, GC	A-7	0-15	90-100	45-95	40-95	35-90	40-60	25-40
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
XeB2--------------	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
Xenia	9-38	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	38-60	Loam--------------	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	75-90	40-65	15-30	NP-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" 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	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
CeB2: Celina	0-17	14-26	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	6	1-3
	17-37	35-48	1.45-1.70	0.2-0.6	0.16-0.19	4.5-7.8	Moderate	0.37			
	37-60	16-27	1.60-1.82	0.2-0.6	0.06-0.10	7.4-8.4	Low	0.37			
CrA: Crosby	0-13	11-24	1.35-1.45	0.6-2.0	0.20-0.24	5.1-6.5	Low	0.43	3	5	1-3
	13-23	35-45	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	Moderate	0.43			
	23-60	15-27	1.70-2.00	0.06-0.6	0.05-0.17	7.4-8.4	Low	0.43			
CtA: Crosby	0-9	15-24	1.40-1.55	0.6-2.0	0.19-0.22	5.1-7.3	Low	0.37	3	5	1-3
	9-13	35-40	1.45-1.60	0.06-0.2	0.16-0.17	5.1-7.3	Moderate	0.37			
	13-22	25-40	1.50-1.70	0.06-0.2	0.10-0.16	5.1-7.3	Moderate	0.37			
	22-60	15-27	1.70-2.00	0.06-0.2	0.05-0.15	7.4-8.4	Low	0.37			
EdF: Eden	0-4	27-60	1.45-1.65	0.06-0.6	0.11-0.17	4.5-8.4	Moderate	0.17	3	8	.5-3
	4-36	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.1-8.4	Moderate	0.28			
	36	---	---	---	---	---	---	---			
EoA, EoB2, EoC2, EoD2: Eldean	0-13	15-25	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Low	0.37	4	5	1-3
	13-29	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate	0.37			
	29-34	25-45	1.30-1.60	0.6-2.0	0.07-0.14	6.6-8.4	Low	0.37			
	34-60	2-8	1.55-1.70	>6.0	0.01-0.04	7.4-8.4	Low	0.10			
ExB3, ExC3: Eldean	0-10	27-33	1.35-1.55	0.6-2.0	0.16-0.18	5.6-7.3	Low	0.37	3	6	.5-2
	10-23	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate	0.37			
	23-60	2-8	1.55-1.70	>6.0	0.01-0.04	7.4-8.4	Low	0.10			
FcA: Fincastle	0-14	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	5	1-3
	14-32	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.37			
	32-56	24-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate	0.37			
	56-60	20-26	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low	0.37			
Ge: Genesee	0-12	18-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low	0.37	5	5	1-3
	12-60	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	Low	0.37			
Hb*. Haplaquepts											
HeF: Hennepin	0-7	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low	0.32	4	5	1-3
	7-15	18-30	1.30-1.60	0.2-2.0	0.14-0.22	6.1-7.8	Low	0.32			
	15-60	18-30	1.45-1.70	0.06-0.6	0.07-0.11	6.1-8.4	Low	0.32			
Hu: Houghton	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	---	---	2	2	>70
LbB2, LbC2, LbD2: Losantville	0-7	18-27	1.30-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	3	6	1-3
	7-16	35-45	1.40-1.70	0.2-2.0	0.09-0.19	6.1-7.8	Moderate	0.37			
	16-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low	0.37			
LcC3, LcD3: Losantville	0-7	27-35	1.30-1.60	0.2-0.6	0.17-0.19	5.6-7.3	Moderate	0.37	2	6	.5-2
	7-16	35-45	1.40-1.70	0.2-2.0	0.09-0.19	6.1-7.8	Moderate	0.37			
	16-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low	0.37			
LeB2: Losantville	0-7	18-27	1.30-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	3	6	1-3
	7-18	35-45	1.40-1.70	0.2-2.0	0.09-0.19	6.1-7.8	Moderate	0.37			
	18-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
LxC3------------ Losantville	0-7	27-35	1.30-1.60	0.2-0.6	0.17-0.19	5.6-7.3	Moderate-----	0.37	2	6	.5-2
	7-17	35-45	1.40-1.70	0.2-2.0	0.09-0.19	6.1-7.8	Moderate-----	0.37			
	17-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low----------	0.37			
Ma-------------- Mahalasville	0-10	17-27	1.30-1.45	0.2-0.6	0.22-0.24	6.6-7.3	Low----------	0.28	5	6	3-5
	10-42	27-35	1.40-1.60	0.06-0.2	0.18-0.20	6.6-7.3	Moderate-----	0.28			
	42-47	8-25	1.40-1.60	0.06-0.2	0.17-0.19	7.4-7.8	Low----------	0.28			
	47-60	3-18	1.50-1.70	2.0-6.0	0.19-0.21	7.9-8.4	Low----------	0.28			
MnB2, MnC2, MnD2, MnE, MnF-------- Miami	0-6	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	.5-3
	6-20	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.0	Moderate-----	0.37			
	20-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate-----	0.37			
MrA, MrB2, MrC2-- Miami	0-8	18-25	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.37	5	6	1-3
	8-36	27-35	1.35-1.45	0.6-2.0	0.18-0.21	5.6-6.5	Moderate-----	0.37			
	36-60	18-27	1.40-1.60	0.6-2.0	0.16-0.20	7.4-7.8	Low----------	0.37			
Ms-------------- Millsdale	0-10	27-32	1.30-1.50	0.6-2.0	0.19-0.22	6.1-7.3	Moderate-----	0.32	4	6	4-7
	10-28	35-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-8.4	High---------	0.32			
	28	---	---	---	---	---	-------------	----			
OcA, OcB2-------- Ockley	0-8	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.37	5	5	.5-3
	8-35	20-35	1.45-1.60	0.6-2.0	0.15-0.22	4.5-6.0	Moderate-----	0.37			
	35-48	20-35	1.40-1.55	0.6-2.0	0.06-0.11	5.6-6.5	Moderate-----	0.24			
	48-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
Or*. Orthents											
Pr*. Pits											
Rc-------------- Ragsdale	0-11	28-30	1.40-1.60	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	7	4-6
	11-48	20-30	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.28			
	48-70	10-20	1.50-1.70	0.6-2.0	0.20-0.22	7.4-8.4	Low----------	0.28			
RhA------------- Randolph	0-14	16-27	1.30-1.45	0.6-2.0	0.17-0.22	5.1-7.3	Low----------	0.37	3	6	1-3
	14-28	35-50	1.40-1.70	0.2-0.6	0.13-0.16	5.1-7.8	Moderate-----	0.37			
	28-39	18-36	1.50-1.70	0.2-0.6	0.04-0.11	7.4-8.4	Low----------	0.37			
	39	---	---	---	---	---	-------------	----			
RkA------------- Reesville	0-12	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.1-7.3	Low----------	0.37	5	5	2-4
	12-34	27-35	1.30-1.55	0.6-2.0	0.17-0.22	5.1-7.8	Moderate-----	0.37			
	34-48	20-25	1.30-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.37			
	48-60	12-25	1.45-1.70	0.2-0.6	0.15-0.18	7.4-8.4	Low----------	0.37			
RmD, RmF--------- Rodman	0-6	8-25	1.20-1.50	2.0-6.0	0.10-0.12	6.6-7.8	Low----------	0.20	3	8	4-6
	6-12	5-25	1.10-1.50	2.0-6.0	0.09-0.12	6.6-7.8	Low----------	0.20			
	12-60	0-10	1.80-2.00	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
RsB2, RsC2------- Russell	0-6	11-25	1.30-1.45	0.6-2.0	0.21-0.24	5.1-7.3	Low----------	0.37	5	5	.5-3
	6-30	25-33	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	30-66	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	66-80	14-27	1.60-1.80	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.37			
Sh-------------- Shoals	0-3	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.37	5	5	2-5
	3-60	18-33	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low----------	0.37			
Sk-------------- Sleeth	0-16	11-22	1.30-1.45	0.6-2.0	0.20-0.24	6.6-7.3	Low----------	0.32	5	5	.5-3
	16-46	20-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-6.5	Moderate-----	0.32			
	46-60	2-5	1.60-1.80	>20	0.02-0.04	7.9-8.4	Low----------	0.10			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Sn---------------- Sloan	0-10	27-33	1.25-1.50	0.6-2.0	0.18-0.22	6.1-7.8	Moderate-----	0.37	5	6	3-6
	10-40	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	40-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low----------	0.37			
St---------------- Stonelick	0-9	10-22	1.20-1.45	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.24	5	5	1-3
	9-60	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	Low----------	0.24			
SuB3, SuC3, SuD3- Strawn	0-7	27-30	1.35-1.55	0.6-2.0	0.15-0.20	5.6-6.5	Moderate-----	0.37	3	7	1-2
	7-14	27-35	1.35-1.55	0.6-2.0	0.15-0.20	5.6-7.8	Moderate-----	0.37			
	14-60	22-30	1.50-1.70	0.2-0.6	0.08-0.12	7.4-8.4	Low----------	0.37			
Tr---------------- Treaty	0-16	28-35	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	7	4-6
	16-38	28-35	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
	38-42	20-35	1.50-1.70	0.6-2.0	0.15-0.19	6.6-7.8	Moderate-----	0.43			
	42-60	15-27	1.70-1.90	0.2-0.6	0.17-0.19	7.4-8.4	Low----------	0.43			
Ts---------------- Treaty	0-18	28-35	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	7	4-6
	18-31	28-35	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
	31-65	20-35	1.50-1.70	0.6-2.0	0.15-0.19	6.6-7.8	Moderate-----	0.43			
	65-80	15-27	1.70-1.90	0.2-0.6	0.17-0.19	7.4-8.4	Low----------	0.43			
UmB*, UmC*: Urban land.											
Miami-----------	0-6	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	.5-3
	6-20	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.0	Moderate-----	0.37			
	20-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate-----	0.37			
UoA*, UoB*: Urban land.											
Miami-----------	0-8	20-27	1.30-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.37	5	5	.5-3
	8-36	27-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-----	0.37			
	36-60	15-26	1.45-1.60	0.6-2.0	0.17-0.19	7.4-8.4	Low----------	0.37			
Us*: Urban land.											
Millsdale-------	0-10	27-32	1.30-1.50	0.6-2.0	0.19-0.22	6.1-7.3	Moderate-----	0.32	4	6	4-7
	10-28	35-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-8.4	High---------	0.32			
	28	---	---	---	---	---	-------------	----			
We---------------- Westland	0-16	27-35	1.35-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	7	2-6
	16-37	27-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.28			
	37-47	15-30	1.40-1.60	0.6-2.0	0.14-0.16	5.6-7.3	Moderate-----	0.28			
	47-60	1-7	1.50-1.75	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
WyB2, WyC2, WyD2- Wynn	0-12	17-27	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	4	5	1-3
	12-16	30-40	1.35-1.55	0.2-0.6	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	16-34	35-55	1.45-1.75	0.06-0.6	0.08-0.12	6.6-8.4	High---------	0.37			
	34	---	---	---	---	---	-------------	----			
XeB2-------------- Xenia	0-9	11-22	1.40-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	5	1-3
	9-38	27-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
	38-60	20-27	1.55-1.90	0.2-2.0	0.05-0.19	7.9-8.4	Low----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

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
					Ft			In				
CeB2 Celina	C	None	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
CrA, CtA Crosby	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
EdF Eden	C	None	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low.
EoA, EoB2, EoC2, EoD2, ExB3, ExC3 Eldean	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
FcA Fincastle	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
Ge Genesee	B	Occasional	Brief	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low	Low.
Hb*. Haplaquepts												
HeF Hennepin	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Low.
Hu Houghton	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.
LbB2, LbC2, LbD2, LcC3, LcD3, LeB2, LxC3 Losantville	C	None	---	---	4.0-6.0	Perched	Jan-Apr	>60	---	Moderate	Moderate	Moderate.
Ma Mahalasville	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
MnB2, MnC2, MnD2, MnE, MnF, MrA, MrB2, MrC2 Miami	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ms Millsdale	B/D	None	---	---	+1-1.0	Perched	Jan-Apr	20-40	Hard	High	High	Low.

See footnote at end of table.

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
					Ft			In				
OcA, OcB2: Ockley	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Or*. Orthents												
Pr*. Pits												
Rc: Ragsdale	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
RhA: Randolph	C	None	---	---	1.0-2.5	Perched	Jan-Apr	20-40	Hard	High	High	Moderate.
RkA: Reesville	C	None	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
RmD, RmF: Rodman	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
RsB2, RsC2: Russell	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
Sh: Shoals	C	Occasional	Brief	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
Sk: Sleeth	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
Sn: Sloan	B/D	Occasional	Brief	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High	High	Low.
St: Stonelick	B	Occasional	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low	Low.
SuB3, SuC3, SuD3: Strawn	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Tr, Ts: Treaty	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
UmB*, UmC*, UoA*, UoB*: Urban land.												
Miami	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.

See footnote at end of table.

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
					Ft			In				
Us*:												
Urban land.												
Millsdale--------	B/D	None--------	---	---	+1-1.0	Perched	Jan-Apr	20-40	Hard	High-----	High-----	Low.
We----------------- Westland	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
WyB2, WyC2, WyD2-- Wynn	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Low.
XeB2--------------- Xenia	B	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--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
Celina	Fine, mixed, mesic Aquic Hapludalfs
Crosby	Fine, mixed, mesic Aeric Ochraqualfs
*Eden	Fine, mixed, mesic Typic Hapludalfs
Eldean	Fine, mixed, mesic Typic Hapludalfs
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Haplaquepts	Fine-loamy, mixed, nonacid, mesic Typic Haplaquepts
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Houghton	Euic, mesic Typic Medisaprists
Losantville	Fine, mixed, mesic Typic Hapludalfs
Mahalasville	Fine-silty, mixed, mesic Typic Argiaquolls
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
*Millsdale	Fine, mixed, mesic Typic Argiaquolls
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Orthents	Loamy, mixed, mesic Typic Udorthents
Ragsdale	Fine-silty, mixed, mesic Typic Argiaquolls
*Randolph	Fine, mixed, mesic Aeric Ochraqualfs
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sleeth	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Strawn	Fine-loamy, mixed, mesic Typic Hapludalfs
Treaty	Fine-silty, mixed, mesic Typic Argiaquolls
Westland	Fine-loamy, mixed, mesic Typic Argiaquolls
Wynn	Fine, mixed, mesic Typic Hapludalfs
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

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